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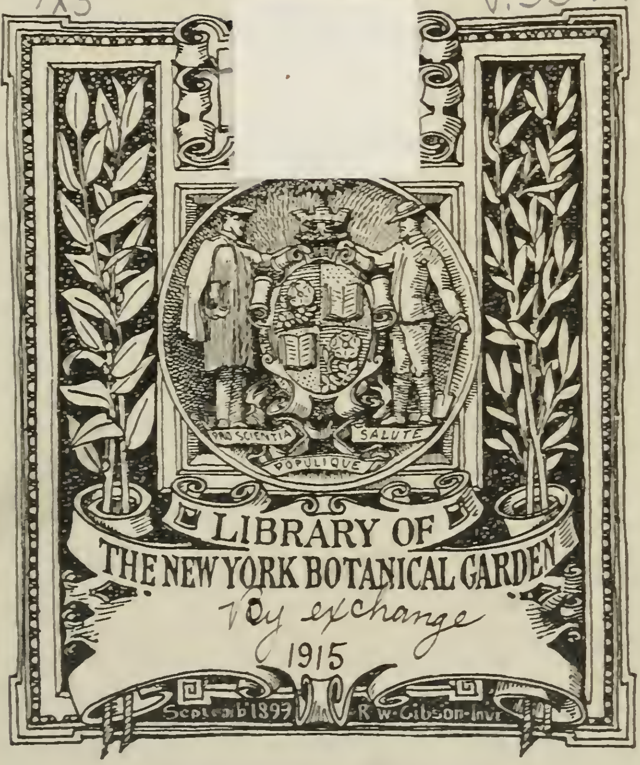
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[a]Printed in scientific and technical publications outside the Department.
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EXPERIMENT STATION RECORD.

Vol. XXXIII. July, 1915. No. 1.

Under the plan adopted by the last Congress for the reorganization of the Federal Department of Agriculture, the States Relations Service was formally established by Secretary Houston, and began its activities with the new fiscal year on July 1, 1915. The new organization developed upon the foundation of the Office of Experiment Stations, which it will include. In addition the cooperative demonstration work of the Department has been transferred from the Bureau of Plant Industry and joined with the extension work of the States.

The functions assigned to the new Service are first of all, as the name implies, to represent the Secretary of Agriculture in his relations with the state agricultural colleges and experiment stations under the Morrill, Hatch, Adams, and Smith-Lever Acts and acts supplementary thereto. In addition, the Service is to carry on the activities authorized by Congress for farmers' cooperative demonstration work, investigations relating to agricultural schools, farmers' institutes, the relative utility and economy of agricultural products used for food, clothing, and other uses in the home, and the maintenance of agricultural experiment stations in Alaska, Hawaii, Porto Rico, and Guam, and such other matters as the Secretary of Agriculture may designate from time to time.

To carry on these various lines of work the Service will comprise the following offices: (1) The Office of the Director of the Service, which includes the general work and administration of the Service; (2) the Office of Experiment Stations, including the relations with the State and insular experiment stations, publication of Experiment Station Record, etc.; (3) the Office of Extension Work in the South, including the farmers' cooperative demonstration work and the Smith-Lever agricultural extension work in fifteen Southern States; (4) the Office of Extension Work in the North and West, including the demonstration and extension work in the remaining States; and (5) The Office of Home Economics, including investigations relative to foods, clothing, and household equipment and management.

The work of the Service relating to agricultural instruction is to be under the immediate attention of the Director, as is also that relating to farmers' institutes and similar organizations, the latter being conducted in close cooperation with the offices of extension work. The Service will thus have jurisdiction over matters relating to all the extension work of the Department, and those connected with the administration of the Smith-Lever Act.

With the exception of the addition of the farmers' cooperative demonstration work which, as is well known, has arisen in the Bureau of Plant Industry, and the separation of the irrigation and drainage investigations by transfer to the newly expanded Office of Public Roads and Rural Engineering, most of the duties of the Service are those which have been previously conducted by the Office of Experiment Stations. The reorganization involves no radical alterations in personnel or policy except as stated, and the Office of Experiment Stations remains as an integral part of the new and larger organization. The history of this office is coincident with that of the experiment station system in this country, and a brief review of its development and activities through a period of nearly twenty-seven years seems opportune at the present juncture.

The Office of Experiment Stations was organized in 1888 by the late Hon. Norman J. Colman, then Commissioner of Agriculture. It was established primarily as the agency of the Department in carrying out the provisions of the Hatch Act of 1887, especially Section 3 of that Act which provides, in addition to other requirements, that it shall be the duty of the Commissioner of Agriculture with reference to the new stations "to indicate from time to time such lines of inquiry as to him shall seem most important; and, in general, to furnish such advice and assistance as will best promote the purpose of this act." Specific provision was made for this work in the appropriation act approved July 18, 1888, in which $10,000 was appropriated for the purposes enumerated in the above section, and also "to compile, edit, and publish such of the results of the experiments made under Section 2 of said Act by said experiment stations as he may deem necessary."

Even before the passage of the Hatch Act had established the principle of federal aid to the States for agricultural research, the need of a central clearing house which would aid in joining the separate agricultural colleges into a single well-united system had been foreseen by the Commissioners of Agriculture and many of the institutions themselves. The matter had been under consideration at the special conventions of the agricultural colleges and other agricultural workers held by the Department in 1872, and subsequently those in 1882 and 1883. At the convention of 1885, called specifically to consider the establishment of closer relations between the Department and other agricultural institutions, a resolution was adopted recommending the creation of a bureau or division in this Department which should be the special medium of intercommunication and exchange between the Department and the various institutions represented. In advocacy of such an agency Commissioner Colman said in his annual report for 1885:

"For many years it has become more and more apparent that one great need of the agricultural interests of the United States is a better understanding and a more intimate relation between the several agricultural colleges and experiment stations, and a more practical cooperation between these institutions and the Department of Agriculture. . . . These agricultural colleges were severally endowed by one and the same act of Congress. They are now separately carrying on experiments at an expense of time and means, and yet without any central head through which to report and compare results with each other. . . .

"Believing that the Department of Agriculture can, if wisely conducted, become a vitalizing center for a more general cooperative effort for the promotion of agricultural science, and that the various state experiment stations should be encouraged by the most cordial cooperation on the part of this branch of the National Government, I have endeavored, with my very limited means and force, to organize a branch in this Department to take charge of the returns from these colleges and stations, and to collate and distribute the information obtained for the benefit of all interested parties. I am happy to say that the institutions alluded to warmly approve of this plan, and are aiding me with their suggestions and cooperation."

The Hatch Act passed March 2, 1887, but did not become operative until the following year, when the appropriation under it was made.

A definite organization for the new Office was effected October 1, 1888. On this date Prof. W. O. Atwater, who had been one of the leading advocates of a national system of experiment stations, began his duties as director, retaining as well the directorship of the Connecticut Storrs Station and his professorship in chemistry in Wesleyan University. Dr. A. W. Harris, now president of Northwestern University, became assistant director of the Office, and with one clerical assistant completed its initial organization.

The general policy of the Office and many of the lines of its future work were mapped out to a large extent by Professor Atwater, and in considerable measure have been adhered to in subsequent years. Some of its proposed principal functions were outlined in the report of Commissioner Colman for 1888, as follows:

"The most immediately pressing need seems to be that of a clearing house and an exchange for the stations. The stations are widely separated; they need to know more about each other's work; they need each other's help, especially that which comes from the interchange of experience. Much is gained by the proper distribution of work and by cooperation where that is feasible. As a clearing house this Office can facilitate intercommunication between the stations, collate the results of their work, and facilitate its most advantageous coordination. It can serve as an exchange or distributing point for information in two ways, negotiating between the stations and the agricultural public on the one side and between the stations and the world of science on the other.

"One of the means by which this Department can mediate between the stations and the agricultural public is the issuing of a series of farmers' bulletins, which should collate the results of station work bearing upon special topics, and the teachings of other research, and put the whole into a form so plain that the intelligent farmer will understand it, so brief that he will read it through, and so practical that he will take it to heart. Thus while each station is distributing its own results to the farmers of its own State, this instrumentality will help to make the several stations serviceable to the agriculture of the whole country.

"As a mediator between the stations and the world of science, this branch of the Department should be in a condition to collate the results of experimental research in this country and in Europe, and publish them in convenient form for the use of the station workers and others interested in the science of agriculture. The past forty years has been a period of great and increasing activity in agricultural inquiry, especially in Europe. The mass of material accumulated is large and rapidly growing; it is mostly in foreign languages, and in costly journals, publications of learned societies, monographs, and other books, which but few of our workers have, and which with lack of leisure, but few could sufficiently utilize if they had them. Indexes of literature of given subjects and, especially, abstracts of experimental research are wanted.

"One need is a journal for the stations, to contain accounts of their current research, abstracts of similar work in this and in other countries, and other matters of mutual interest. What is wanted is a publication, properly edited, adapted to our special conditions, appearing regularly and giving the latest information, doing for workers in these lines what *Die Landwirthschaftlichen Versuchs-Stationen*, the *Centralblatt für Agriculturchemie*, and other publications do for the German stations; in short, a means to provide prompt and constant intercommunication between the stations and bring them from outside the things they want to know.

"Information is also greatly needed in regard to past work and its results. This would be probably best brought to the stations in the form of monographs on special subjects. . . . It is important to avoid going over old ground, to start where others have left off, and with the benefit of their experience."

Of the various lines of work here suggested, the first to be taken up was that of getting into communication with the various agricultural colleges and experiment stations. One of the earliest steps was the preparation of an address list of the stations. This was soon supplemented by an organization list, showing the personnel of the institutions, such as has been issued in somewhat modified form ever since. This material, together with historical accounts of the experiment station movement, federal legislation and rulings relating thereto, and similar data, constituted Bulletin 1, issued in February, 1889. Bulletin 2 was a digest of the annual reports of the stations for 1888, while other early bulletins dealt with the organization and lines of work in progress in special lines, such as horticulture and botany, reprints of the proceedings of the annual conventions of the Association of American Agricultural Colleges and Experiment Stations, etc. In 1890 the publication was commenced of a card index of experiment station literature, now embracing over thirty-five thousand entries. The useful series of compilations of analyses and similar data was instituted in 1892 by a compilation of such data for feeding stuffs. Reference may also be made to Bulletin 180, a list of the publications of the experiment stations to June 30, 1906; the monthly list of experiment station publications, begun in 1904; and the large amount of historical and statistical data embraced in the annual reports of the Office.

The abstract journal referred to was provided in the *Experiment Station Record*, the first volume of which appeared in 1889. Thirty-two volumes of this publication have now been completed, the last two volumes of which, representing merely the last fiscal year, contain nearly eight thousand abstracts as well as editorials, special articles, and brief notes on important phases of the progress of agricultural investigation and science. In addition to comprehensive indexes for each volume, two general indexes have been issued, covering respectively Volumes I to XII and XIII to XXV. The latter index contained fully two hundred thousand separate entries.

The first farmers' bulletin was published in 1889. The series proved so popular that it was soon transferred from the Office and made a general series for the Department. Nearly seven hundred of these publications have been issued to date, many of them in very large editions and distributed by Members of Congress on a large scale. A considerable number of these farmers' bulletins have been prepared in this Office, notably the series known as Experiment Station Work, of which seventy-six numbers appeared, containing over six hundred articles, based mainly on the practical work of the experiment stations.

The Office has, indeed, from the beginning been recognized as one of the most active branches of the Department in the dissemination of information through publications. In addition to the thirty-two volumes of the *Record*, the many farmers' bulletins, special lists, indexes, reports, etc., already referred to, nearly three hundred bulletins, mainly of a scientific and technical nature, one hundred and twenty-five circulars, and many other documents of miscellaneous nature have already appeared.

Considerable attention has been given from the first to means for bringing to public notice the work of the stations as a whole. An extensive collective exhibit of the methods and results of experiment station work was prepared for the World's Columbian Exposition in Chicago, in 1893, and a similar exhibit for most of the subsequent expositions in this country, as well as for the Paris Exposition of 1900. In connection with these expositions much bibliographical material relating to the stations has been collected and published by the Office, such as Bulletin 15, a handbook of experiment station work; Bulletin 80, an elaborate report on the history and status of each station in the United States; and Bulletin 112, a similar report on the experiment stations in foreign countries.

One of the first projects to be undertaken was the assembling of the library of station publications, now believed to be the most complete collection of these publications in existence. A collection has also been attempted of the books published by college and experiment station workers, with a view to illustrating the marked influence of these institutions in this direction.

With each succeeding year the Office has come into more intimate relations with the various experiment stations as regards the supervision of their expenditures from federal funds, and in an advisory capacity with their general management and development. An annual inspection has been made of each station since 1894. Following the passage of the Adams Act in 1906, the duties of the Office in relation to the use by the stations of the federal funds were much increased. Inasmuch as the legality of the expenditures is so largely dependent upon the character of the investigation, the supervision of the funds becomes in a large measure a supervision of the investigations and experiments as far as their character, original features, and continuity are concerned. The passage of the Smith-Lever Act in 1914 added similar duties as to the administration of funds for extension work.

The Office has also conducted negotiations between the various bureaus of the Department and the stations with reference to the large amount of cooperative work which has been undertaken, and has likewise exerted its influence through the Association of American Agricultural Colleges and Experiment Stations and a large number of other organizations devoted to various phases of agricultural science.

The establishment of the Office also enabled the Department to give to its constantly increasing multitude of correspondents definite information based on experimental inquiries in many lines not covered by its own investigations. For a considerable period a large share of its work consisted in answering inquiries, but with the extension of the work and organization of the Department such work has been largely assumed by the other bureaus.

Closely allied to the work of the Office with reference to the experiment stations have been its relationships with institutions for agricultural education. One of the first pieces of work undertaken by the Office was the preparation of a brief history of agricultural education and research in the United States for the Paris Exposition of 1889. After the passage of the Morrill Act of 1890, the Office was made the depository of the reports of the agricultural colleges to the Secretary of Agriculture; and through its close association with the Association of American Agricultural Colleges and Experiment Stations was called on to aid the rapidly growing movement for agricultural education in various ways. The director of the Office has served on the standing committee on agricultural instruction of the Association for many years, and has been dean of the Graduate School of Agriculture since its beginning in 1902.

In recent years many of its activities have been conducted through its agricultural education service, which represents the Department in its relations with agricultural colleges and schools at home and abroad. Much attention has been given to improving the courses of instruction in agriculture by reducing the various branches to sound pedagogical form, the encouragement of agricultural instruction of secondary grade, and the development of adequate graduate instruction. The work of aiding in the development of farmers' institutes was officially undertaken in 1903, when a farmers' institute specialist was appointed, and has since continued with increasing attention to the various other phases of extension work.

In addition to its general supervision of the expenditures of the experiment stations under the Hatch and Adams Acts, the Office has had in direct charge the management of the so-called insular stations. The first of these was established in Alaska in 1898, followed by the federal stations in Hawaii and Porto Rico in 1901, and that in Guam in 1908. These stations have from the start given much emphasis to special problems, the general policy having been to determine and develop the agricultural possibilities of Alaska, to diversify the agriculture of Hawaii and Porto Rico, and to restore that of Guam to its former importance. Many important results have already been secured by these stations and their recommendations have effected valuable improvements in the agricultural practice of their respective localities.

In 1894 the state experiment stations were specifically authorized by Congress to include the study of the food of man in their inquiries and instructed to report their progress to this Department. An appropriation was also made of $10,000 "to enable the Secretary of Agriculture to investigate and report upon the nutritive value of the various articles and commodities used for human food." The prosecution of this inquiry was assigned to the Office of Experiment Stations, which had already instituted work in collating information regarding the methods and results of food investigations in this country and in Europe. The enterprise subsequently became a part of the regular work of the Office and has contributed largely to the available fund of technical and popular data on nutrition, and to the introduction of studies along this line into the curricula of a large number of colleges and schools.

The purpose of the nutrition investigations has been to study the use as food of the products of farm, ranch, and garden and to bring the results obtained to the attention of housekeepers and thus help them in making the best, most rational, and most economical use of their available resources; and to provide material for the teacher, physician, and others who need accurate information on food and nutrition in their professional work. Very many questions have been studied and the results obtained have been of decided value to the producer of food supplies and to those who manufacture, handle, and market them, as well as to the housekeeper, the teacher, and the professional man.

The respiration calorimeter, an instrument of precision for measuring the total income and outgo of matter and energy in experiments with man, has been perfected, found useful for a great variety of experimental work, and extensively and profitably employed for such purposes. Later developments of this instrument are forms suited to the study of problems of vegetable physiology and other questions of interest in connection with the work of the Department.

A total of 132 nutrition publications have been issued, of which 62 are technical bulletins. The publications as a whole have been in much demand, their total distribution to the close of the fiscal year 1915 being 16,305,800 copies, of which 15,952,150 copies were farmers' bulletins.

The scope of this work was increased in 1914 to include similar studies of agricultural products in their relation to clothing and other uses in the home. This extension was brought about very largely in response to the demands of housekeepers, educators, and others for work along these lines, in consequence of their appreciation of the value of the studies with foods already undertaken.

In 1898 Congress added further to the work of the Office by appropriating $10,000 "for the purpose of collecting from agricultural colleges, agricultural experiment stations, and other sources . . . valuable information and data on the subject of irrigation, and publishing the same in bulletin form." This work has grown from year to year as Congress has increased the appropriations, the allotment for the past year being $106,400. At the time the work was begun the most conspicuous need of the arid region was legislation controlling the use of water for irrigation. Largely through the efforts of this Office most of the arid States have since that time adopted comprehensive codes of water laws.

As demands for legal studies have decreased more attention has been given to engineering and agricultural improvement in irrigation practice. Local appreciation of the value of this work is evidenced by the fact that in most of the arid States either the States themselves or some of their public institutions have of late been cooperating with the Office on a dollar for dollar basis. The object of all these investigations is the best use of the water supply of the arid region, which is so limited that under the most favorable conditions only a small percentage of the arable land can be irrigated.

Previous to 1902 the Department gave no special attention to land drainage, although it has been estimated that there are in the United States approximately seventy-nine million acres of land, exclusive of tidal marshes, that can not be profitably cultivated on account of excess moisture but which could be reclaimed at a net profit of nearly $1,600,000,000. In that year authority was given the Office in connection with its irrigation investigations to investigate the making of plans for the removal of seepage and surplus water by drainage. Subsequently the work was further extended in scope, and in 1907 was organized as a separate division of the Office.

In recent years it has included a study of the requirements of drainage in various localities and under different conditions, the collection of technical data of service to engineers and others having to do with the design of drainage improvements, and the rendering of assistance by correspondence to owners of land needing draining, by personal consultation, and occasionally by surveys with reports presenting detailed plans for the requisite improvements. Investigations have been conducted in nearly every State and approximately ten million acres have been surveyed. Of late much attention has been given to the many difficult problems in the abatement and prevention of seepage and alkali in irrigated sections.

The vast increase in scope of the original activities of the Office, and especially the addition to its duties of the special investigations in irrigation, drainage, and human nutrition, necessitated a large increase in its personnel and facilities. The initial corps of three employees had grown at the time of the reorganization to about two hundred and seventy-five, of whom over half were engaged in field work outside of Washington. The funds for its maintenance rose from $10,000 in 1888 to $1,930,780 in 1915.

To the student of governmental institutions, the Office of Experiment Stations has presented an example of an agency exercising chiefly advisory functions. Although charged with administrative duties toward the funds for experiment stations, it has relied less on the authority of law than on its influence in promoting the development and the well-being of the experiment station system. In accordance with the Hatch Act, it has been an integral part of that system, and in a broad sense it has sought to realize the part somewhat vaguely set forth in the clause leading to its establishment.

From the first the Office has maintained close and sympathetic relations with the stations throughout the entire country, studying their conditions and problems at first hand. From these studies and the history of investigation, standards of work and of organization have been set forth, and the effort has been made to stand between the stations and influences which did not represent their best interests in the long run. The fact that this relationship has been so largely voluntary and informal, and in a sense a personal one, rather than a strictly official one operating under force of law, has shown the mutual confidence and understanding which have developed through these twenty-seven years. Stimulation and assistance rather than restraint or attempt at centralized direction has been the guiding motive at all times.

The same principles have very largely determined the course of action in the special lines of service which have been added to its more general duties from time to time, and this will continue without interruption in the enlarged field of the States Relations Service.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Concerning the organic phosphorus compound of wheat bran and the hydrolysis of phytin, R. J. Anderson (*New York State Sta. Tech. Bul. 40 (1915), pp. 31*).—"This bulletin contains reports of investigations concerning (1) the nature and composition of the principal organic phosphoric acid isolated from 0.2 per cent hydrochloric acid extract of wheat bran, (2) the products formed from phytin by the action of the enzym phytase contained in wheat bran, (3) the hydrolysis of the organic phosphorus compound of wheat bran in different solvents, and (4) the nature and composition of the organic phosphorus compound of wheat bran when isolated from solvents which destroy the enzym phytase.

"It has been shown in previous reports [E. S. R., 28, p. 17] that the organic phosphorus compounds isolated from 0.2 per cent hydrochloric acid extracts of wheat bran differ in composition from phytin and phytic acid or inosit hexaphosphoric acid. It has also been shown [E. S. R., 32, p. 17] that the above substance is not a homogeneous compound but that it can be separated into several fractions which differ in composition.

"The first part of this bulletin describes the further separation of these compounds and the isolation of a new organic phosphoric acid, inosit triphosphoric acid, as a crystalline strychnin salt from the water-insoluble portion of the acid barium salts. The neutral barium inosit triphosphate, $C_6H_9O_{15}P_3Ba_3$, was prepared from the crystalline strychnin salt. It was a white amorphous powder. The free inosit triphosphoric acid, $C_6H_{15}O_{15}P_3$, was prepared from the barium salt, and it was obtained as a noncrystallizable sirup. The reactions of inosit triphosphoric acid differ in several particulars from those of phytic acid or inosit hexaphosphoric acid, but like the latter it decomposes, when heated in a sealed tube with dilute sulphuric acid, into inosit and phosphoric acid.

"The chief products of the hydrolysis of phytin by the phytase in wheat bran are inorganic phosphoric acid and certain intermediate compounds apparently consisting of inosit tri-, di-, and monophosphoric acids. These intermediate substances are identical with the compounds which we have previously isolated from 0.2 per cent hydrochloric acid extracts of wheat bran. A portion of the phytin was completely hydrolyzed by the action of the enzym into phosphoric acid and inosit because the solution was found to contain some free inosit. All of the phytin was partially hydrolyzed since the final reaction mixture did not contain any unchanged inosit hexaphosphoric acid.

"The results herein reported amplify and confirm the experiments of Suzuki, Yoshimura, and Takaishi [E. S. R., 19, p. 966], and of Plimmer [E. S. R., 29, p. 166], concerning the presence of the enzym 'phytase' in wheat bran which is capable of hydrolyzing phytin with the production of inorganic phosphoric acid. The maximum activity of the enzym has been shown to occur in the presence of 0.1 per cent hydrochloric acid and 0.2 per cent acetic acid. With increasing concentration of the hydrochloric acid the activity rapidly diminishes, and with 0.5 per cent hydrochloric acid there is practically no hydrolysis of the organic phosphorus. The enzym is destroyed by boiling water and by boiling 0.2 per cent hydrochloric acid. It is also destroyed by a short exposure to 0.5 per cent hydrochloric acid and to 0.25 per cent ammonia. It is shown that wheat bran normally contains about 0.1 per cent of inorganic phosphorus, which is equal to about 11 per cent of the total soluble phosphorus.

"By digesting wheat bran in 1 per cent hydrochloric acid, which is sufficiently strong to destroy the enzym phytase, it is possible to isolate from the extract crystalline barium salts of the following composition:

$$C_6H_{12}O_{24}P_6Ba_3+8H_2O \text{ and } (C_6H_{11}O_{24}P_6)_2Ba_7+14H_2O.$$

These salts are identical with the tribarium phytate and heptabarium phytate obtained from oats, corn, cotton-seed meal, and commercial phytin. All of these materials contain, therefore, the same organic phosphorus compound, viz, phytic acid or inosit hexaphosphoric acid, $C_6H_{18}O_{24}P_6$."

A proposed modification of the Kober method for quantitative ammonia distillation by aeration, F. L. DILLINGHAM (*Jour. Amer. Chem. Soc., 36 (1914), No. 6, pp. 1310–1312*).—The value of the Kober and Graves method[a] for determining ammonia was studied with ammonium sulphate. As a pump drawing only 360 liters of air per hour was available, more aeration, as recommended by the originators of the method, was used. "A large number of determinations were made, and in no case could all the ammonia be recovered by this method of aeration. In each case quantities of ammonia varying, in round numbers, from 3 to 15 per cent were found to be retained in the residual liquid in the Kjeldahl flask. . . .

"This failure to recover all of the ammonia, by aeration alone, suggested a modification of the method, which has been carefully tried out and which it is desired to offer. The modification consists in utilizing the heat of neutralization and in heating the liquid in the Kjeldahl flask over a low flame during the entire period of aeration. Pieces of zinc may be added to prevent bumping. It is well also to use a larger amount of water than the original method calls for. The outlet tube of the Kjeldahl flask should be provided with a glass trap to prevent carrying over of the sodium hydroxid. This modification will allow all of the ammonia to be recovered from ammonia sulphate in one and one-half hours. The liquid in the absorption bottle naturally becomes quite hot from the steam, but no loss of ammonia occurs, provided the standard acid is present in excess. When the absorption of ammonia is complete the absorption bottle may be cooled and the excess of standard acid titrated in the usual manner."

A substitute for potassium permanganate to liberate formaldehyde gas from a water solution, S. G. DIXON (*Jour. Amer. Med. Assoc., 63 (1914), No. 12, p. 1025*).—The substitute proposed is sodium dichromate. The formaldehyde is mixed with sulphuric acid and kept as a stock solution.

A procedure for separating organic ammoniates from the mineral portion of commercial fertilizers, C. H. JONES and G. F. ANDERSON (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, pp. 580, 581*).—The method consists of drying from 100 to 600 gm. of materials, preferably unground, at a temperature of not over 170° F., cooling and weighing, and dropping the sample in 25 to 50 gm. portions into a beaker nearly filled with carbon tetrachlorid. The mixture is then stirred, allowed to settle, the portion which floats skimmed off with an ordinary tablespoon, and the floats placed on a dry filter. The process is continued until the entire sample has been treated, using another beaker if neces-

[a] Jour. Amer. Chem. Soc., 35 (1913), p. 1594.

sary. The filters containing the organic portions of the fertilizer are dried in an air bath, cooled, weighed, and preserved for microscopical and chemical analyses.

The above procedure has been subjected to extensive use on many commercial fertilizer and crude nitrogenous stock samples. It was found that the following materials float on carbon tetrachlorid: Dried blood, fish, tankage, hoof meal, horn meal, leather, kanona tankage, morocco clippings, azotin, cottonseed meal, castor meal, castor pomace, beet refuse compound, nitrogenous manure, casein, peat, garbage tankage, tartar pomace, mowrah meal, rape meal, soy-bean meal, wheat gluten, tobacco stems, fillerine (partly), and cinders (certain types). Ground bone, nitrate of lime, cyanamid, grape pomace, aluminum nitrid, nitrate of soda, sulphate of ammonia, acid phosphate, rock phosphate, basic slag, dissolved bone black, animal charcoal, muriate and sulphate of potash, and kainit sink in carbon tetrachlorid.

A table is given showing the results obtained by the chemical analysis of the floats, including the determination of water insoluble nitrogen by the alkaline permanganate method (E. S. R., 23, p. 705) and also the finding obtained by visual inspections. The results show large variations in the nitrogen content of the mixtures which contribute to furnish the organic nitrogen found in commercial fertilizers. The water insoluble nitrogen indicates similar ranges.

The inorganic portions of the samples were also tested as regards their insoluble nitrogen content and its activity. The activity noted compared favorably with that shown by the organic (float) portion.

A classification for organic nitrogen activity as determined by the alkaline permanganate method is presented. The method may be used for other purposes also.

Comparison of a few methods for total phosphoric acid in superphosphate, C. A. PETERS (*Jour. Indus. and Engin. Chem., 7 (1915), No. 1, pp. 39, 40*).—These data were taken from a thesis presented at the Massachusetts Agricultural College by A. G. Weigel, and consist of the results of a comparative study of a superphosphate homemade from ground rock. The results confirmed previous knowledge, indicating that "the official gravimetric method of determining total phosphoric acid gives high results when phosphoric acid is determined in superphosphate without evaporation of the solution to dryness on a steam bath to remove silica. Several methods other than the official gravimetric give equally good results in half the time."

The determination of creatin in muscle, L. BAUMANN (*Jour. Biol. Chem., 17 (1914), No. 1, pp. 15–17*).—Many of the methods proposed in the literature for determining the creatin in flesh and blood are tedious and time-consuming. A method which follows gives results that are within the limits of experimental error.

"Fifty gm. of hashed muscle is weighed into a round bottom, short-necked Jena flask; to this 125 cc. of 5 times normal sulphuric acid and a few chips of unglazed porcelain are added and the whole boiled for three hours under a reflux condenser. At the end of this time the muscle is disintegrated. The solution is now filtered quantitatively through a 15 cm. filter paper into a 250 cc. volumetric flask (the volume of the sulphuric acid and the dilution being proportional to the weight of muscle used for analysis), the residue (less than 2 gm. of dry material) is washed thoroughly with distilled water, the fluid is cooled, and the flask filled to the mark.

"Twenty cc. of the claret-colored extract is pipetted into a small porcelain disk (8.5 cm. in diameter) and 18 cc. of 10 per cent sodium hydrate is added while stirring. The partially neutralized fluid is then evaporated on the water bath to about 10 cc. and transferred quantatively to a 50 cc. volumetric flask containing 30 cc. of saturated aqueous picric acid solution (the solid particles adhering to the sides of the dish are of no consequence provided the washing has been thorough). The flask is filled to the mark with distilled water when its contents have reached the proper temperature, shaken vigorously, then filtered through a dry filter paper. To 25 cc. of the clear filtrate 6 cc. of the 10 per cent sodium hydrate is added, and the creatinin determined colorimetrically according to Folin, allowing 10 minutes for the color to develop. The standard is a creatinin solution containing about 7 mg. of creatinin per 10 cc. of solution. It may easily be prepared by heating pure anhydrous creatin (about 80 mg.) with 50 cc. of 5 times normal sulphuric acid for 3 hours under a reflux condenser, then diluting at once in a volumetric flask to 100 cc. The titer of this solution remains constant for months."

A new apparatus for determining crude fiber in foods, feeding stuffs, and feces, A. D. EMMETT (*Abs. in Science, n. ser., 39 (1914), No. 1017, p. 957*).—It is often very difficult in making crude fiber determinations to transfer the last portions of the insoluble residue from the flask to the Gooch crucible or funnels. The use of a beaker instead of a flask has many advantages, and accordingly a device was developed which makes this possible.

"It consists of a specially constructed glass cone and rubber ring which prevents appreciable loss of water vapor during the boiling and thereby any increase in the concentration of the acid and alkali solutions. The inverted cone is attached to a Hopkins condenser with rubber tubing and the ring is snapped on the lower edge of the cone. The condenser, cone, and ring are then lowered over a 400 cc. lipless beaker and adjusted until the connection between the rubber ring and beaker is tight. The entire apparatus is fastened in place by the clamp which holds the condenser. The glass cone is provided with a side-tube attachment which is so constructed that when air is drawn through the apparatus gently the tendency to foam is greatly retarded."

The estimation of the acid content of flour, farina, and bread, with especial reference to bacterial and enzym action, O. RAMMSTEDT (*Ztschr. Angew. Chem., 26 (1913), No. 91, Aufsatzteil, pp. 677–680*).—In some work with maize and malted maize products the author concluded that the acidity determinations made by the methods of Kreis-Arragon (E. S. R., 12, p. 823), Planchon, Schindler, and Hilger and Günther were unsatisfactory. The least satisfactory results were obtained with the last-named method. A method was therefore devised which is a combination of the Kreis-Arragon and Lehmann methods and which excludes the influence of bacteria and enzyms.

The determination of acid in flour, H. KREIS and C. ARRAGON (*Ztschr. Angew. Chem., 27 (1914), No. 16, Aufsatzteil, p. 120; abs. in Chem. Ztg., 38 (1914), No. 35, Repert., p. 157*).—The opinion of Rammstedt (see above) that the Kreis-Arragon method gives results which are too high on account of the enzyms and bacteria, was not found tenable by the experimental data secured. On the other hand, it was found that in handling the residue with alcohol according to Rammstedt's recommendation an amount of acid remains behind which is equivalent to the differences observed by Rammstedt between the two methods.

The determination of lecithin-phosphorus in macaroni and farinaceous articles, H. C. FULLER (*Abs. in Science, n. ser., 39 (1914), No. 1017, p. 952*).—"The macaroni is thoroughly softened with hot water, the mass treated with a large excess of alcohol, the liquid filtered, and the solid substance treated with further portions of alcohol; the combined alcoholic solutions are evaporated and the residue extracted with ether, which dissolves the lecithin. Phosphoric acid is determined in the latter by ignition [with] calcium acetate and finishing in the usual way with ammonium molybdate and magnesium mixture."

The analysis of maple products.—IV, The composition of maple sugar sand, J. F. SNELL and A. G. LOCHHEAD (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 301, 302*).—In this investigation analyses of six samples of washed air-dried Quebec maple sand are reported. "This material contains from 65 to 80 per cent of normal calcium malate, from 6 to 18.5 per cent of silica, minor quantities of manganese, magnesium, and phosphorus, traces of iron, and from 10 to 17 per cent of undetermined material." See also a note by Warren (E. S. R., 25, p. 803).

Determination of benzoic acid in chopped meats, A. KRÜGER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26 (1913), No. 1, pp. 12–20; abs. in Chem. Ztg., 38 (1914), No. 44, Repert., p. 203*).—The procedure is as follows:

Dissolve 50 gm. of the chopped meat in a round-bottomed, one-half liter flask with 45 cc. of 70 per cent sulphuric acid by heating gently and then distill with steam, using precaution that not more 500 cc. is obtained. Then filter the distillate, make slightly alkaline, evaporate to a small bulk in a 100 cc. disk, and treat with a saturated solution of potassium permanganate until a permanent red color remains. Remove the excess of permanganate with sodium sulphite solution and condense the solution to a bulk of 10 cc. After cooling, place in a cylindrical separatory funnel, acidify, and rinse the evaporating dish with sodium sulphite solution and sulphuric acid. Then shake the benzoic acid solution, which should amount to from 15 to 20 cc., several times with ether-petroleum ether, wash the combined ethereal solution several times with 3 cc. of water, and shake with a little (as much as will go on the tip of a knife) powdered gum tragacanth. Allow the etheral solution to evaporate spontaneously in a weighed dish, dry the residue over soda lime, and weigh. As a control the residue is dissolved in a little neutralized alcohol and titrated, or any benzoic acid still present may be isolated by sublimation in the Polenske apparatus (E. S. R., 27, p. 715).

A shorter method consists in shaking out the benzoic acid from the steam distillate with several portions of benzol containing equivalent amounts of soda solution. The extracts must also be treated with potassium permanganate to remove the fatty acids.

A note on the quantity of benzoic acid contained in prunes and cranberries, M. J. RADIN (*Jour. Indus. and Engin. Chem., 6 (1914), No. 6, p. 518*).—For the estimation of benzoic acid Krüger's method was employed with a charge of 50 gm. of fruit. From several duplicate analyses in each instance it was found that prunes, as obtained in the market, contained approximately 0.05 per cent benzoic acid and cranberries 0.06 per cent.

"These results were furnished from the weight of sublimed benzoic acid and by titration, the data in each instance agreeing closely."

Determination of Prussian blue in tea, G. W. KNIGHT (*Jour. Indus. and Engin. Chem., 6 (1914), No. 11, pp. 909, 910*).—The method consists of decomposing the Prussian blue in the tea with 85 per cent phosphoric acid and collecting the hydrocyanic acid in a 10 per cent sodium hydroxid solution. The hydrocyanic acid is then reconverted into Prussian blue and weighed as such. "By means of it one part in 200,000, and sometimes even one part in 300,000, can be detected. A man inexperienced in the manipulation can run four determinations in a day easily, and doubtless with experience could run many more. Two operators working independently on the same sample obtained 0.0019 and 0.0016 per cent of Prussian blue."

Several samples of uncolored China and Japan teas were examined by the method, but no Prussian blue was found.

The detection of cotton-seed hulls in cotton-seed meal, C. GRIMME (*Chem. Ztg., 38 (1914), No. 13, pp. 137–139, fig. 1*).—It is stated that the difficulties encountered in the Fraps method (E. S. R., 20, p. 908) may be obviated if 2 gm. of the meal after being freed from fat is digested for 30 minutes from the time of boiling with 200 cc. of a 1 per cent hydrochloric acid solution, diluted to 1,000 cc. with hot water and filtered through asbestos. The residue on the filter is washed acid-free with hot water, three times with alcohol, and once with ether, dried at from 105 to 110° C. to constant weight, ignited, and the amount of ash deducted from the first weighing. The percentage of hulls is calculated by the formula $x=\frac{(y-11)\,100}{59}$ in which y represents the amount of ash-free residue. The results agree well with those given by the Fraps method.

Note on the precipitation of lactalbumin in cow's milk, W. O. WALKER and A. F. G. CADENHEAD (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, pp. 573, 574*).—The official method for estimating lactalbumin in milk, i. e., precipitation with a 0.3 per cent acetic acid solution from a neutral solution from which casein has been removed, was found unsatisfactory.

Sebelien's method[a] gave more satisfactory and uniform results and was quite as convenient, both from the standpoint of time and manipulation. The reagent, which was Almen's, was composed of 4 gm. of nitrogen-free tannic acid, 190 cc. of 50 per cent alcohol, and 8 cc. of 25 per cent acetic acid. The best results were obtained with from 10 to 12 cc. of the reagent for a 10 gm. sample of milk. "The clear filtrate, with washings from the casein—which was precipitated according to the official method—was neutralized with sodium hydroxid with the addition of a few drops of phenolphthalein. The pink color was then discharged with one drop of 10 per cent acetic acid, the filtrate, about 200 to 250 cc. in volume, was heated to 40–45° C., and the reagent added, the mixture stirred continually for two minutes and then allowed to stand for half an hour before filtering, when the albumin was precipitated in a very fine flocculent form. When filtered immediately after precipitation, some of the precipitate invariably passed through the paper. The precipitate and the paper was then treated according to the official Kjeldahl-Gunning method, the nitrogen determined, and the result multiplied by 6.34 for the albumin. The protein in the filtrate from the above operation was determined in each case and was found to show an average of 0.1 per cent."

Comparison of methods for the estimation of fat in cream with special reference to Sichler's "alcohol sin-acid" method, E. BLANCK (*Milchw. Zentbl., 43 (1914), No. 12, pp. 316–325*).—The Sichler alcohol sin-acid method (E. S. R., 16, p. 506) gave good results, which agreed with those yielded by the Gerber and Vieth methods. The results by the Röse-Gottlieb method with the same milks were slightly lower.

The alkali method for the determination of fat in ice cream and condensed milk, C. M. BRADBURY (*Va. Dairy and Food Div. Circ. 42 (1914), pp. 4*).—An adaptation of the Short method[b] for determining fat in milk and cream to the determination of fat in ice cream and condensed milk.

A rapid method for the determination of sodium chlorid in butter and its substitutes, T. M. RECTOR (*Abs. in Science, n. ser., 39 (1914), No. 1017, p. 952*).—Sodium chlorid is determined by titration with silver nitrate with a chromate indicator, in a water solution of a weighed sample of butter in the presence of

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[a] Hoppe-Seyler's Ztschr. Physiol. Chem., 13 (1889) No. 1–2, pp. 135–180.
[b] Wisconsin Sta. Bul. 16 (1888), pp. 14, pl. 1.

the butter fat. Some results are given to show that the fat does not interfere with the accuracy of the method.

A rapid method for the determination of unsaponifiable matter in fats and oils, T. M. RECTOR (*Abs. in Science, n. ser., 39 (1914), No. 1017, p. 952*).—"The sample is saponified in the usual manner and the alcoholic soap solution diluted to an alcohol content of 55 per cent. The solution is then extracted with light petroleum spirit, the solvent evaporated, and the residue dried in vacuo and weighed."

Method of varnish analysis, R. W. DARNER (*North Dakota Sta. Paint Bul., 1 (1915), No. 6, pp. 108–111*).—"The analysis of oil varnishes is one of great difficulty, and it is almost impossible with the present methods in use (McIlhiney's, Scott's, and Twitchel's) for separation of gum and oil to get better than an approximate estimate of the ingredients in a varnish." The following method is suggested for long oil varnishes:

"Three to four gm. of varnish are spread out on an Adams filter coil which has been dried and weighed along with an extractive thimble. The coils absorb water rapidly, and for this reason the coils and thimble must be weighed in a weighing bottle. The varnish is best weighed and added to the coil from a dropping bottle. The coil is then held in the mouth of a 300 cc. weighed Erlenmeyer flask, and 100 cc. of petroleum ether, 0.67 specific gravity, added slowly. A large percentage of the varnish will be washed out of the coil by this treatment. The coil is then placed in the extraction thimble and extracted for 36 hours [in a Caldwell extractor with the bottom cut out], or until extraction is complete, when 150 cc. of petroleum ether, 0.67 specific gravity, is added to the flask and the flask cooled to 3° C., until the gums settle and the liquid is clear.

"The liquid containing the oils and rosin is poured off the gums and the flask washed several times with petroleum ether and the washings added to the original petroleum ether extract. The Erlenmeyer flask and thimble are then dried at 105°, to constant weight. The increase in weight of the flask and thimble minus the weight of the metallic driers represents the weight of hard gums in the varnish. The extract from the gums is freed of the petroleum ether, saponified with half-normal alcoholic potash, and the unsaponifiable matter extracted with ether. The rosin and fatty acids are then released with half-normal hydrochloric acid and extracted with ether. The acids are then freed of the ether and the rosin determined by Twitchel's method."

Some results of tests with the method are included.

Analyses of mixed paints, E. F. LADD and W. F. WASHBURN (*North Dakota Sta. Paint Bul., 1 (1915), No. 6, pp. 85–108*).—Analyses are reported and discussed of about 70 paints, the results being interpreted in the light of the paint law of North Dakota.

The curing of meat and meat products on the farm, K. J. SEULKE (*New York Cornell Sta. Circ. 27 (1915), pp. 13*).—This circular gives practical directions for keeping fresh meat, curing meat, and the preparation of meat products (sausage, lard, head-cheese, blood pudding, etc.) on the farm.

Preliminary notes on the curing of cucumber pickles, H. N. RILEY (*Abs. in Science, n. ser., 39 (1914), No. 1017, p. 954*).—"The activities manifest in a curing tank of cucumber pickles seem all to depend upon the growth of certain bacteria, known as 'lactic-acid bacteria.' These seem to govern the rate of fermentation, or giving off of gas, and the production of acid. The rate of fermentation mechanically governs the rate of absorption of salt, which is also influenced, to some extent, by the size of the pickle. The growth of mold and yeast seems destructive, as they destroy the acid which is the principal keeping factor in the brine."

Canning fruits and vegetables on the farm, C. C. Vincent (*Idaho Sta. Bul. 82 (1915), pp. 24, figs. 6*).—The purpose of this bulletin is to demonstrate to the farmers of Idaho how they can increase the earning capacity of their farms and orchards through the cannery. The subject is dealt with under the following headings: Plan of work, equipment, accessories, labels, labor, crops for canning, steps involved in handling products, directions for canning fruits and vegetables, quality of canned products, cost of canning, and profits.

A practical treatise on the manufacture of vinegar, edited by W. T. Brannt (*Philadelphia: H. C. Baird & Co., 1914, 3. ed., rev., pp. XXIV+543, figs. 101*).—This work has been largely rewritten. In addition to a detailed description of the manufacture of vinegar, special consideration is given to wood vinegar and other by-products obtained in the destructive distillation of wood; the manufacture of cider and fruit wines; the preservation of fruits and vegetables; and the preparation of fruit butters, jellies, marmalades, pickles, and mustards. The preservation of meat, fish, and eggs is also given consideration.

Handbook for the chemical laboratories of tanneries, G. Grasser (*Handbuch für Gerberei-chemische Laboratorien. Leipsic: Schulze & Co., 1914, XIII+395, figs. 49*).—This book, intended for tanning chemists and those concerned in the examination of tannery products, is divided into a general and special part. The general part has to do with the examination of acids and salts, dyes, organic preparations of formaldehyde, glycerin, blood albumin, mineral oil, oils, fats, and waxes, soaps, resins, coal-tar dyes, and natural-plant dyes. The special part has to do with the examination of water and sewage, chemistry of tanning materials and their examinations (including tanning materials), examination of leathers tanned by various methods, chemical control of the tannery, and the equipment of a chemical laboratory for the tannery.

Oils of the Coniferæ.—I, The leaf and twig oils of Cuban and long-leaf pines and the cone oil of long-leaf pine, A. W. Schorger (*Jour. Indus. and Engin Chem., 6 (1914), No. 9, pp. 723–727, figs. 5*).—Data relative to the composition of oils and their distillation are given at the beginning of the article.

The several oils of the two species examined were practically identical in composition, as shown below. "The combined borneol in the leaf and twig oil of the Cuban pine probably occurs as the esters of caproic and caprylic acids; that in the leaf oil of long-leaf pine as the esters of caprylic, heptoic, and caproic acids.

"The rotation of the cadinene as given must be accepted with certain reservations. While the sesquiterpene fractions were *d*-rotatory, their dihydrochlorids were all *l*-rotatory. The only oil containing *d*-rotatory cadinene whose dihydrochlorid was likewise *d*-rotatory, as recorded in the literature, is that of Atlas cedar and possibly also West Indian sandalwood oil.

"In Cuban pine the percentage composition of the leaf and twig oils is as follows: Furfurol trace; *l*-α-pinene 4 per cent; *l*-camphene 10; *l*-β-pinene 35 to 36; dipentene 8; bornyl ester (as acetate) 3.5; free alcohol (as *l*-borneol) 11.4; *d*-cadinene 18 to 19; and losses by polymerization, etc., 9 per cent. In long-leaf pine the leaf and twig, leaf, and cone oils contain, respectively, furfurol trace; *l*-camphene 13 to 14, 12 to 13 and 12 per cent; *l*-β-pinene 44, 50, and 25; dipentene 5, 5, and 6 to 7; bornyl ester (as acetate) 2.4, 2, and 1.4; free alcohol (as *l*-borneol) 10, 9.8, and 7.6; *d*-cadinene 10 to 11, 11, and 1 to 2; and losses by polymerization, etc., 6, 7.5, and 6.5 per cent. The leaf and twig and leaf oil of long-leaf pine contain 8 to 9 and 2 per cent *l*-α-pinene respectively, while cone oil contains 39 to 40 per cent *d*-α-pinene."

Chemistry of pine oil, M. TOCH (*Jour. Indus. and Engin. Chem., 6 (1914), No. 9, pp. 720–723, fig. 1*).—A discussion of the various uses to which pine oil can be put and its production and chemistry. Analyses are included.

METEOROLOGY.

Agricultural meteorology, F. E. DE A. FIGUEIREDO (*Rev. Agron. [Portugal], 10 (1914), No. 5–8, pp. 241–247, fig. 1*).—The observations which are especially needed from the agricultural standpoint are indicated.

Terrestrial temperature and solar changes, E. HUNTINGTON (*Bul. Amer. Geogr. Soc., 47 (1915), No. 3, pp. 184–189, figs. 2*).—This is a critical review of Köppen's views regarding the relation of temperature changes to the sun-spot cycle and Arctowski's pleion and antipleion theory of temperature variations (E. S. R., 31, p. 717).

The formation of ozone in the upper atmosphere, and its influence on the optical properties of the sky, J. N. PRING (*Sci. Prog. Twentieth Cent., 9 (1915), No. 35, pp. 448–470, figs. 2*).—This article discusses some factors which determine the optical properties of the atmosphere, chemical determination of constituents of the atmosphere, the action of ultraviolet light on air, the determination of ozone in the atmosphere at high altitudes, and the influence of ozone on the nature of light from the sky.

It is stated that "the optical properties of the atmosphere must lie in the precise determination of the presence of such bodies as ozone, hydrogen peroxid, and nitrogen peroxid," and methods for such determinations are described. Although the methods used were designed to detect very minute amounts of the substances named, they failed to show the presence of appreciable amounts of oxids of nitrogen or hydrogen peroxid resulting from the action of ultraviolet light on air, and they also failed to show the presence of detectable amounts of these substances in the air from high altitudes.

While the tests do not preclude the possibility of the formation of these substances they show that the quantity formed is negligibly small when compared with ozone.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 2 (1915), Nos. 1, pp. 246, pls. 2, figs. 7; 2, pp. 234, pls. 2, figs. 7*).—These volumes contain, respectively, brief summaries and detailed tabular statements of climatological data for each State for January and February, 1915.

Meteorological observations, J. S. STEVENS (*Maine Sta. Bul. 234 (1914), pp. 295, 296*).—A monthly and annual summary of observations at the University of Maine on temperature, precipitation, cloudiness, and wind movement during 1914 is given. The mean temperature for the year was 43.35° F., as compared with an average of 42.66° for 46 years; the precipitation was 35.04 in., as compared with an average annual precipitation of 42.75 in. for 46 years; the snowfall was 66.5 in., as compared with 88.19 in. as the average of 46 years; the number of clear days was 204; the number of cloudy days 97; the number of rainy days was 78; and the total movement of wind was 48,809 miles.

Salton Sea water, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1914, pp. 364–366*).—This is the eighth annual report on the composition of Salton Sea water (E. S. R., 32, p. 511), comparing analyses of samples collected June 12, 1914, with previous analyses.

During the 359 days from June 18, 1913, to June 12, 1914, the total solids increased from 1,002.56 to 1,179.6 parts per 100,000, an increase of 17.5 per cent. The construction of the total saline matter has been fairly regular during each year of the period of observation. "The percentages of concentration for the separate constituents, however, show some variation from the general rate of concentration, due, undoubtedly, to the disturbing effects of drainage and seepage water received by the lake. Three constituents—calcium, potassium, and carbonic acid—are showing variations clearly not due to these causes. Calcium and carbonates, as in previous years, have not concentrated as much as the other constituents, carbonates again showing an actual decrease. It is now well established that this loss of calcium carbonate is due to the formation of new travertines similar to those formed when the ancient Salton Sea dried up. Potassium, however, instead of decreasing, has concentrated this year in about the same ratio as the other constituents. This may be accounted for in part by the apparent decrease in animal and vegetable organisms in the water."

The rainfall of the cotton belt of the United States and its results, B. C. Wallis (*Scot. Geogr. Mag., 31 (1915), No. 2, pp. 71–79, figs. 5*).—This is an account of a study similar to that of the rainfall conditions of the northeastern United States, which has already been noted (E. S. R., 32, p. 119).

It is shown that the rainfall of the cotton belt varies widely, the average annual rainfall being 31 in. in the west and 54 in. in the southeast. There is apparently a direct relation between rainfall and temperature, an average low-temperature meaning, as a rule, a small amount of precipitation. Correlating rainfall with crop growth, the conclusion is reached "that the best conditions for growing cotton occur about latitude 32° N. in an area where the total annual rainfall is about 50 in. per annum, where the temperature is normal and therefore almost entirely a function of the latitude, and where the crop rainfall depends upon the rising temperature and upon the slacking effect of oceanic influences, so that an average rainfall of 20 in. can readily be obtained during the five or six months required for the growth of the cotton plant."

The relation of rainfall to other crops grown in the cotton belt is also briefly considered.

Isomeric rainfall maps of the British Isles, H. R. Mill and C. Salter (*Quart. Jour. Roy. Met. Soc. [London], 41 (1915), No. 173, pp. 1–44, figs. 19; abs. in Geogr. Jour., 45 (1915), No. 6, pp. 520–522*).—A series of isomeric maps based upon rainfall records at 283 places, in most cases covering 35 years (1875 to 1909) and in no case less than 30 years, is given and their significance explained.

Seasonal distribution of rainfall in the British Isles (*Geogr. Jour., 45 (1915), No. 6, pp. 520–522*).—The character of the seasonal variation of rainfall in the British Isles is described as bi-phase; "for whereas on the one hand there is a percentage excess in the wet, hilly, western parts of the country during the winter half of the year (October to March), with maximum in December and January, and a percentage excess in the dry, flat, eastern parts during the summer half (April to September), with maximum in July, on the other hand, throughout the country the isomeric values are lower during the spring half-year (January to June), with minimum in April, than during the autumn half (July to December), with maximum in October."

Atlas of agricultural meteorology.—I, Probability of droughts in European Russia, P. I. Brounov (*Atlasy po Selskokhozíaĭstvennoĭ Meteorologīi. Vypusk I. Skhematicheskīia Karty Vieroíatnosti Nastuplenīia Zasushlivykh Dekad V Evropeĭskoĭ Rossīi. St. Petersburg: Met. Bur., 1913, pp. 7, pls. 21; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 6, pp. 663, 664*).—The atlas consists of a brief explanatory text with 21 maps characterizing European Russia according to drought periods during the growing season, April to October, inclusive.

A dry period is defined as one during which not more than 5 mm. of precipitation falls. The probability of such periods is computed in percentages denoting the ratio of the number of years with the given dry periods to the total number of years during which the observations were made, viz, sixteen,

Data from 390 meteorological stations were utilized in the preparation of the maps. The maps show, in general, that the rainfall gradually increases from April to June then diminishes to the end of the growing period.

SOILS—FERTILIZERS.

Soils of the cut and burned over areas of north Idaho, J. S. Jones and C. W. Colver (*Idaho Sta. Bul. 81 (1915), pp. 20, figs. 5*).—This survey deals with the general characteristics, physical and chemical properties, crop adaptations, and fertility requirements of the soils of the cut and burned over areas of the panhandle of Idaho, which are included mainly in Bonner, Kootenai, and Latah counties and to a less extent in Clearwater and Shoshone counties.

The soils vary from river and lake bottoms to bench lands and level open prairies. The red sandy and silt loams are the predominating soil types. It is stated that the lowlands are rich in plant food, but that they need drainage. The bench and other highlands are rich in mineral plant food, but are usually acid in reaction and deficient in nitrogen and active organic matter. The open prairies, while not deficient in nitrogen, are usually acid and need treatment to make the native supply more readily available. "Unquestionably in the management of the cut and burned over lands the key to immediate and permanent success is a thorough understanding of practicable means of getting the element nitrogen into them and of making it available as plant food."

Data showing the amount of the various soil constituents are appended.

Bond County soils, C. G. Hopkins et al. (*Illinois Sta. Soil Rpt. 8 (1913), pp. 58, pl. 1, figs. 9*).—This is the eighth 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 some of the prevailing types.

Bond County lies in the lower Illinois glaciation. The soils of the county are divided into four classes, as follows: (1) Upland prairie soils, (2) upland timber soils, including those zones along stream courses over which forests once extended, (3) ridge soils, including those on morainal ridges most of which have been forested, and (4) bottom-land soils, including the flood plains along streams. The timber lands are divided into level, undulating, and hilly areas. The ridge soils are divided into pervious and almost impervious types.

The gray silt loam on tight clay of the upland prairie soil occupies nearly 33 per cent of the area of the county, while the brown-gray silt loam on tight clay, the yellow silt loam, and the yellow-gray silt loam are in their order next in extent, covering about 16.5, 16, and 13 per cent of the area respectively.

The total quantities of some of the necessary elements of fertility "are extremely limited when measured by the needs of large crop yields. . . . The variation among the different types of soil in Bond County with respect to their content of important plant-food elements is also very marked. Thus the richest prairie land (black silt loam on clay) contains about twice as much phosphorus and nitrogen as the common upland timber soils, and the bottom lands are still richer in phosphorus. The most significant facts revealed . . . are the lack of limestone and the low phosphorus content of the common upland types, which cover nearly 90 per cent of the entire county."

The reclamation of an unproductive soil of the Kankakee marsh region. Soil acidity, nitrification, and the toxicity of soluble salts of aluminum, J. B. ABBOTT, S. D. CONNER, and H. R. SMALLEY (*Indiana Sta. Bul. 170, popular ed., pp. 2–8, figs. 3*).—This is a popular edition of Bulletin 170 (E. S. R., 30, p. 518).

Soils, J. C. BRÜNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1913–14, pp. 63, 68–85*).—Chemical and mechanical analyses of a large number of samples of soils from ten different districts of Queensland are reported. Many of the samples were tested for sulphur, and it was found "that the amount of total sulphur in a soil amounts on an average to about 0.08 per cent calculated as sulphur trioxid (SO_3), that the majority of samples do not vary greatly from this average figure, and that there seems to be ample sulphur in most of [the] soils to supply the requirements of crops for many years." It is stated that the grass soils analyzed as a rule showed high fertility.

Chemical studies of soils, S. TIJMSTRA (*Meded. Deli Proefstat. Medan, 8 (1914), No. 8, pp. 244–265*).—Studies of the chemical composition and physical properties of the soils of eight plats lying adjacent in two rows but subjected to different cultural treatment showed that the plats varied decidedly in both physical and chemical properties in spite of their apparent uniformity. These variations are not attributed altogether to the differences in cultivation, but are thought to be due largely to previously existing conditions in the soil. The plowing under of the ashes of burnt weeds on two plats which had not been previously cultivated was accompanied by a decrease in the content and solubility of phosphoric acid, a decrease in magnesium and iron, and an apparent increase in potash and chlorin.

It is thought that such variations should be given special consideration in judging the fertilizer and cultural requirements of a particular soil. The average of analyses of samples from different plats may not be a safe guide for such judgment.

Further studies along this line are in progress.

The sphere of adsorption phenomena in the soil, A. N. SOKOLOVSKIĬ (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 2, pp. 67–117, figs. 3; abs. in Zentbl. Agr. Chem., 44 (1915), No. 1, pp. 10–13*).—Studies of adsorption phenomena in the different layers of chernozem and podzol soils, with particular reference to their nature and the factors conditioning them, are reported.

The adsorptive power for bases was found, with one or two exceptions, to bear a close relation to hygroscopicity, and the activity of both factors decreased at higher temperatures. With reference to hygroscopicity, it is pointed out that water content, excluding the influence of salts, is a function of the so-called specific surface of the soil and increases with it. Absorption appeared to bear no relation to the amount of zeolitic constituents or the amount of silt present.

It was found that the amount of ammonia absorbed from ammonium chlorid varied with the soil layers according to the quantity of displaced bases. Adsorption with exchange of bases occurred to a rather low limit beyond which the exchange of bases ceased. The absorption of ammonia varied with the amount of dry residue obtained by displacing the soil solution with 96 per cent alcohol.

It is pointed out that the soil components which determine absorption are characterized by a great specific surface and a susceptibility to thermal and chemical influences, and the absorption phenomena beyond a certain limit are not accompanied by exchange reactions. The maximum specific surface and the maximum susceptibility to thermal influences are found in the upper soil sections in which the colloid formation processes are most intensive, thus showing a specific relation between absorption and the soil colloids.

On the assumption that the thickness of the water film on the soil particles remains constant, the following conclusions are drawn: The absorptive power of the absorbing medium decreases with a decrease in its effective surface. The absorption of calcium in the different layers of chernozem soil depends on the content of calcium which is already absorbed and is displaced by ammonium chlorid solution and not on its total calcium content. The podzol soil, on account of its extremely leached out condition and poverty in absorbed matter, shows a series of concordant results for phosphoric acid as well as for bases. Chernozem, on the other hand, on account of its complex formation, produces a regular series of results only for ammonia.

Removal of humus by oxidation with acid-free hydrogen peroxid showed that for chernozem, humus, even in the layers rich in it, did not appear to be an exclusive factor of absorption. In podzol soil the decrease in ammonia absorption due to this treatment amounted to 65 per cent of the original amount.

Influence of radio-activity of the air on exposed drop cultures of microorganisms, A. TRILLAT and FOUASSIER (*Compt. Rend. Acad. Sci.* [*Paris*], *159* (*1914*), *No. 24, pp. 817–819*).—It is shown that the growth of cultures of microorganisms may be influenced to a marked extent by the radio-activity of the atmosphere, and that the latter may vary with the nature of the soil.

Studies of the microfauna of soils from rice localities, A. CAUDA and G. SANGIORGI (*Centbl. Bakt.* [*etc.*], *2. Abt., 42* (*1914*), *No. 15–16, pp. 393–398, figs. 6*).—Studies of the microfauna of different soils and of the same soil under different cultural treatments are reported, and incidentally a comparison of culture media is made.

It was found that the composition of the culture medium exerted a definite influence on the development of protozoa. With the Omelianski and Giltay solutions the development was more marked than with the other solutions used. The development of protozoa began usually on the sixth or eighth day of incubation, proceeded until the fourteenth to eighteenth day, and then gradually subsided. The amœbæ were the prevailing forms and were present in all cases. In only one case were the flagellates more numerous than the amœbæ, and the flagellates and ciliates were sometimes entirely absent. The different soils showed marked variations in number and kind of protozoa. Soils widely separated but subjected to the same cultural treatment showed the same individual protozoan development.

It is thought that, aside from the physical, chemical, geological, and biological factors, certain other factors related to the nature of the vegetation exist in the soil which have a special influence on the vitality of the small-animal life of the soil.

Contribution to the knowledge of the physiology and distribution of denitrifying thiosulphate bacteria, A. GEHRING (*Centbl. Bakt.* [*etc.*], *2. Abt., 42* (*1914*), *No. 15–16, pp. 402–438*).—The author briefly reviews work of others bearing on the subject, and reports studies of the anaerobic denitrifying sulphur bacteria found by Lieske (E. S. R., 28, p. 35) with reference to their physiology and distribution in soils.

These bacteria were found in different kinds of silt, in compost, cultivated soil, beech forest soil, and upland moor peat. The numbers were constant at different depths in peat and cultivated soil but varied greatly in the different soils examined, increasing with an increasing carbon content of the soil. Different races of these organisms showing great variations in virulence were distinguished in the different soils. It is stated that the races found in compost, beech forest soil, and peat may be combined into one great group in contrast to the race found in cultivated soil, and that the respective powers of transformation of these two groups stand in the ratio of 4:1.

Nitrate destruction increased in both soil and nutritive solution with an increasing thiosulphate content or increasing nitrate content. Nitrate could not be replaced as a source of oxygen by other compounds containing oxygen. It was possible to replace thiosulphate as a source of energy for the bacteria in question by other sulphur compounds but not by compounds not containing sulphur. Carbonate and bicarbonate were equally effective as sources of carbon.

The addition of thiosulphate to soils caused a strong denitrification, which was not, however, as strong as that caused by the addition of organic matter. The thiosulphate bacteria, by nitrate destruction, showed the same effect upon the physical condition of the soil as is attributed to the heterotrophic denitrifying bacteria by Koch and Pettit (E. S. R., 23, p. 123).

It is thought that the results obtained in these studies will serve to explain the results of a previous work of Thalau on the effect of sulphur compounds on plant growth (E. S. R., 29, p. 521).

The formation of leaf mold, F. V. Coville (*Ann. Rpt. Smithsn. Inst., 1913, pp. 333–343*).—This is a revision of an article which has already been noted from another source (E. S. R., 28, p. 814).

Soil tank experiments, S. E. Collison (*Florida Sta. Rpt. 1914, pp. LXXVII–LXXIX*).—Experiments with fertilizers for citrus trees were continued as in previous years (E. S. R., 31, p. 723), the data for composition of the drainage water obtained being tabulated.

It is stated that the losses of potash have continued to increase, being considerably larger than for the same period of the previous year. The opposite is noted with reference to nitrogen and the lime losses continue large. "The presence of comparatively large amounts of ammonia as such, in the water from tanks 1 and 2, indicates that a portion of the sulphate of ammonia applied leached through without being nitrified."

The origin, composition, and fertilizer value of the bat guanos of Cuba and the Isle of Pines, C. N. Ageton (*Modern Cuba, 3 (1915), No. 2, pp. 48–59*).—On the basis of analyses of samples from Cuba, Porto Rico, and Haiti it is stated that average bat guano contains from 3.5 to 7 per cent of phosphoric acid, 1.5 to 3 per cent of potash, and 8 to 11 per cent of nitrogen but varies widely in composition, depending upon the stage of decomposition, moisture content, leaching, admixture of foreign substances, and other conditions. "The fresh, friable bat excrement, which usually occurs as a thin covering over the floor of the cave, may easily be distinguished from the other classes of material. A light colored deposit may be expected to contain considerable quantities of calcium carbonate or gypsum, or both, the phosphoric acid content being quite variable but usually higher than in the fresh guano. The reddish or chocolate colored deposits or parts of deposits which have much the same appearance as a red or 'mulatto' soil, contain more phosphoric acid than the others, and usually they contain but very little, if any, nitrogen."

The use of the guano as a fertilizer is discussed.

The utilization of the nitrogen and organic matter in septic and Imhoff tank sludges, C. B. Lipman and P. S. Burgess (*California Sta. Bul. 251 (1915), pp. 287–295*).—Analyses of a number of samples of the sludges are reported showing nitrogen varying from 1.23 to 2.66 per cent and phosphoric acid from 0.77 to 1.82 per cent. An attempt was made to judge of the availability of the nitrogen of the sludges by determining its rate of nitrification when mixed with soils of different types. It was found that the different sludges behaved differently in any one soil, and that the different soils showed decidedly different capacities for rendering the nitrogen of the sludge available as measured by nitrates formed. The rate of nitrification, however, was generally higher than that of such high-grade materials as dried blood, tankage, fish guano, and cotton-seed meal.

The economic importance of utilizing sludge is discussed and suggestions as to the best methods of using it alone and with other fertilizers are given.

Peat, C. A. DAVIS (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1913, pt. 2, pp. 383–392*).—This is a review for 1913 of data relating to the production and use of peat in the United States and abroad.

[Utilization of prickly pear as a fertilizer], T. H. JOHNSTON and H. TRYON (*Rpt. Prickly-Pear Travel. Com., Queensland, 1912–1914, pp. 25, 26*).—The use of prickly pear as a fertilizer as practiced in Madras, Mysore, and the Bombay Presidency, of India, is briefly described.

The action of liquid manure as a nitrogenous fertilizer, B. SCHULZE (*Ztschr. Landw. Kammer Schlesien, 18 (1914), No. 44, p. 1630*).—Comparative tests on potatoes, beets, and oats of equal amounts of nitrogen in the form of nitrate and of liquid manure are briefly reported, indicating that the utilization of the nitrogen of the nitrate was about 60 per cent, while that of the liquid manure was about 41 per cent.

The manufacture of nitrates from the atmosphere, E. K. SCOTT (*Ann. Rpt. Smithsn. Inst., 1913, pp. 359–384, pls. 3, figs. 7*).—This is a reprint of an article which has already been noted from another source (E. S. R., 27, p. 420).

The action of certain new nitrogenous fertilizers on sandy and upland moor soils, B. TACKE (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 32 (1914), No. 23, pp. 411–424*).—Comparative field tests on oats, rye, and potatoes grown on sandy and moor soils of different kinds showed that ammonium nitrate, calcium nitrate, urea, and superphosphate prepared with synthetic nitric acid were, as a rule, as effective as sodium nitrate and ammonium sulphate and may be substituted for them if the price permits this to be profitably done. The Schloesing nitrate was apparently less effective on the well-limed moor soils than the other fertilizing materials tested.

[Some chemical and agricultural effects of fertilizer mixtures containing calcium cyanamid], C. J. KING (*Com. Fert., 10 (1915), No. 1, pp. 14–16*).—Continuing previous work by Brackett (E. S. R., 30, p. 26), the author studied changes in the soluble phosphoric acid and nitrogen content in mixtures of acid phosphate, calcium cyanamid, and muriate of potash, and also the effect of such mixtures on the growth of cotton.

The results confirm those of previous experiments in showing that there was a considerable reversion of phosphoric acid in the mixtures after standing a few months. After six months of storage the amount of insoluble phosphoric acid had increased from 0.4 to 2.01 per cent. There was no appreciable loss of nitrogen in that time. The field tests of the mixtures on cotton indicated a depreciation in their fertilizing effect within one month after the mixtures were made.

The kelp industry (*Rpt. Bd. Agr. Scot., Home Indus. Highlands and Islands, 1913, pp. 118–131; abs. in Jour. Franklin Inst., 179 (1915), No. 2, p. 260*).—Attention is called to the marked increase in the production of kelp in the British Isles since 1905 and a brief account is given of methods of utilization employed, especially in Scotland, and of the products which may be obtained.

It is stated that Scotch seaweed is much richer in iodin than Pacific coast kelps or Japanese seaweeds and is, therefore, especially valuable as a source of supply of this substance, particularly in view of the present shortage of the supply derived from Chilean nitrate. A brief account is also given of progress in the utilization of seaweed in the United States, particularly of the Pacific coast kelps.

The new potash deposits in Spain (*Abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 11, pp. 1423, 1424; 6* (*1915*), *No. 1, pp. 53–55*).—Various reports and articles on this subject are reviewed showing (1) the Government's plan of regulating the exploitation of the deposits, (2) the acquisition of a concession by an American company, (3) the views of Schmidt and others of the German Geological Society on the nature and value of the Spanish deposits, and (4) the prospect of the Spanish potash salts appearing in commerce.

It is stated that "the deposits of potash salts are found in the Tertiary strata of the Ebro basin, i. e., in the same region as the large mass of rock salt at Cardona, known since antiquity. The discovery was made by a small contractor who came across layers of carnallite and sylvin whilst boring in the neighborhood of Cardona. Prospecting made up to the present shows that there is a deposit 260 ft. in thickness, containing 70 ft. of beds of carnallite with 20 per cent potassium chlorid, and 33 ft. of sylvin with 95 per cent potassium chlorid. Later explorations will establish the extent of these deposits. In origin they are analogous to those of Alsace, i. e., they are not primary formations resulting from the evaporation of sea water but secondary formations derived from more ancient saline deposits, probably from Triassic saline deposits of the Pyrenees and the coast ranges of Catalonia." The opinion of a French technical expert is cited to the effect that these deposits compare in richness and quality with the best German deposits and have the advantage of being more easily accessible.

Potash deposits in Catalonia (*Zentbl. Kunstdünger Indus., 19* (*1914*), *No. 16, pp. 338, 339; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 11, pp. 1423, 1424*).—This is a brief discussion, by K. Schmidt and others, of the German Geological Society, of these deposits as noted above.

Lime in agriculture, F. T. Shutt (*Canada Expt. Farms Bul. 80* (*1914*), *pp. 16*).—This is a popular discussion of the nature of lime and limestone, agricultural functions of lime and its compounds, comparative values and methods of application of lime compounds, and the use and misuse of lime.

Ground limestone for acid soils, J. F. Barker and R. C. Collison (*New York State Sta. Bul. 400* (*1915*), *pp. 145–163, pl. 1*).—The first section of this bulletin discusses briefly the chemical composition of limestones, with a table showing the carbonate content and calcium carbonate equivalent of the ground limestones produced in the various quarries of New York and of the principal ones brought in from outside. Following sections discuss the practical use of ground limestone on acid soils and give compiled data showing the returns from the use of limestone on various crops and soils.

It is stated that three-fourths or more of the farm lands of New York would be greatly benefited by a liberal application of lime in some form. Limestone is considered likely to produce better results than burned lime and is safer and more convenient to apply. The relation of magnesium in limestone to its practical use is pointed out.

Theoretical considerations and experiments in the use of ground limestone are reviewed to show that fineness greater than is necessary to allow all the material to pass through a 10-mesh sieve is not required for satisfactory use.

Gypsum, R. W. Stone (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1913, pt. 2, pp. 355–372*).—This is a review for 1913 of data relating to the sources, production, and use of gypsum.

Analyses and valuations of commercial fertilizers, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 274 (1914), pp. 3–63*).—Analyses and valuations of 935 samples of fertilizers and fertilizing materials offered for sale in New Jersey during 1914 are reported. The average composition, valuation, and selling price of the 608 mixed fertilizers examined were as follows: Total nitrogen 2.66 per cent, total phosphoric acid 9.24, available phosphoric acid 7.75, potash 6.91, station's valuation $22.40, and selling price $29.51. Of the 608 mixed fertilizers 420 were found to be as guarantied. The reported tonnage for the year ended October 31 was 155,414 tons.

Fertilizer registrations, C. S. CATHCART (*New Jersey Stas. Bul. 275 (1915), pp. 3–34*).—A list of brands, with guarantied composition, of mixed fertilizers and fertilizer materials offered for sale in New Jersey during the fiscal year ended October 31, 1915, is given.

AGRICULTURAL BOTANY.

Applied and economic botany, H. KRAEMER (*Philadelphia: Author, 1914, pp. VI+806, pls. 2, figs. 420*).—This book is designed to meet the needs of students in technical schools and in agricultural, pharmaceutical, and medical colleges, also to serve as a book of reference for chemists, food analysts, and students in the morphological and physiological study of plants. The facts and illustrations presented are intended to give the latest information regarding morphology, origin, and distribution, also chemical nature, of the plants studied. On account of the contamination of the materials on the market, especially with lower plant forms, a more or less succinct treatment of the principal groups of lower and higher forms is given. The several chapters deal with the principal groups of plants, cell contents and forms of cells, outer and inner morphology of the higher plants, botanical nomenclature, classification of angiosperms yielding economic products, cultivation of medicinal plants, and microscopic technique and reagents.

The vegetation of Nantucket, J. W. HARSHBERGER (*Reprint from Bul. Geogr. Soc. Philadelphia, 12 (1914), No. 2, pp. 70–79, pls. 5, fig. 1*).—Giving a brief description of the vegetation on the island of Nantucket, the author states that the two main factors in producing the present almost treeless condition of the island are the evaporating action of the wind and the nature of the soil.

The character of the tubers of Batatas edulis, Z. KAMERLING (*Ber. Deut. Bot. Gesell., 32 (1914), No. 5, pp. 352–360, figs. 8*).—From work as carried out with *B. edulis* to determine whether its tubers are to be regarded as roots or stems, the author concludes that the significance of these bodies lies in their relation to the vegetative propagation of the plant.

The structure of clover blooms, V. FOMINYKH (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 5, pp. 395–400, figs. 4*).—The author describes the nectary of *Trifolium pratense*, which, it is claimed, has not been adequately done heretofore.

Studies of Camptosorus rhizophyllus, F. L. PICKETT (*Proc. Ind. Acad. Sci., 1913, pp. 129, 130*).—Studies on this plant show it to possess two important adaptive factors, namely, an unusual power of promiscuous growth in the prothallial cells and ability to resist extreme desiccation.

The sexuality of rust fungi, F. RAWITSCHER (*Ber. Deut. Bot. Gesell., 32 (1914), No. 5, pp. 310–314, figs. 4*).—This is a brief report of some preliminary observations, noting more particularly the copulation of sporidia in *Tilletia tritici* and the subsequent behavior of the resulting binucleate hyphæ.

Recent aspects of mutation, R. R. GATES (*Nature [London], 94 (1914), No. 2350, pp. 296–299*).—This is mainly a review of recent publications regarding cytological and morphological characters and inheritance, particularly as noted in species of Œnothera and their mutants.

Growth and variation in maize, R. PEARL and F. M. SURFACE (*Proc. Nat. Acad. Sci., 1 (1915), No. 4, pp. 222–226, fig. 1; abs. in Maine Sta. Bul. 234 (1914), pp. 290, 291*).—The investigation reported in this paper is an attempt to analyze the normal variation of maize from the standpoint of its development. The authors tried, by studying the growth of the individual, to analyze the adult variation curve into its component elements as a beginning at an understanding of the developmental physiology of the genes concerned in the production of the characters studied. Measurements were made twice a week of the height of each individual of three series of plants of a variety of sweet corn.

The evidence indicates that the observed differences in the manner of growth of individual plants and groups of plants can not be explained as the effect of external environmental factors, but are rather to be looked upon as the effect of internal factors. The distribution of the average relative size of individual plants is such as to suggest the random distribution of these factors among the plants. The simplest method of explaining these facts is believed to be to regard the differences in the manner of growth as due to independent Mendelian factors which are distributed at random in any population of open fertilized maize plants. By assuming the presence of two independent growth factors and weighing each with the proper value, the authors consider it possible to obtain a theoretical distribution which agrees very closely with the observed distribution. The interpretation of the growth of these plants by Mendelian factors is said to be strongly supported by the distribution of the standard deviation of the plants with different relative sizes.

The causes of growth in plants, III, G. A. BOROWIKOW (*Kolloid Ztschr., 15 (1914), No. 1, pp. 27–30*).—Having noted (E. S. R., 29, p. 420) that the hydration of plasma colloids appears to be one of the most important factors in plant growth, at least in case of *Helianthus annuus*, and that an exception to this rule may be observed to result from the presence of the respiratory product carbon dioxid in the nutritive solution, the author has carried out further investigations which are here briefly discussed.

It was found that concentration of the cell sap and rapidity of growth bear an inverse rather than a direct relation to each other, slight alterations in the one often corresponding to great changes in the other, the possible bearings of this fact being discussed. It is thought that the periods of growth through which each cell passes may be related to stages in the rapidity of hydration of the cell colloids.

Further studies on the colloidal and physical chemistry of the cell, W. RUHLAND (*Jahrb. Wiss. Bot. [Pringsheim], 54 (1914), No. 3, pp. 391–447*).—The author has continued work previously noted (E. S. R., 30, p. 28), detailing results and inferences from a study of carbohydrates, alkaloids, glucosids, and acids, also those from a study of the physicochemical properties of the cell in general and of the cell as an ultra-filter in particular. It is stated that the function of an ultra-filter is exercised by the plasma membrane and not by the cell wall.

The influence of ultraviolet rays on chlorophyll-containing cells, J. STOKLASA (*Ztschr. Pflanzenkrank., 24 (1914), No. 4, pp. 193–204*).—In the course of numerous experiments here reported, dealing with a number of plants, it appears that the briefer exposures (two hours) to ultraviolet rays (of wave lengths 300 to 500$\mu\mu$) generally cause rapid development of chlorophyll in etiolated leaves, while longer exposures either produce results not much greater than those from ordinary sunlight, or else tend toward destruction of the vitality of the superficial leaf cells, resulting in discoloration and death of the foliage without, however, injuring the rest of the plant or decreasing its power of foliage reproduction. These results largely confirm those reported by Maquenne and Demoussy (E. S. R., 22, p. 436). Plasmolytic tests show that in some cases at least the upper surface of the stomatal guard cells is most readily affected. The discoloration of the leaves is explained by the chemical changes in the dead protoplasm. Flower petals are more quickly altered than are leaves by the ultraviolet rays, both flowers and leaves of indoor plants being more readily affected than are those of outdoor plants, and the species being more significant in this connection than the flower color.

It is regarded as established that ultraviolet rays exert a great influence on the development of chlorophyll-forming organs as well as upon the activity of these organs, but that prolonged action of such rays disturbs profoundly the life processes in the leaf cells.

The relation of chlorophyll formation to light wave length, A. SCHMIDT (*Beitr. Biol. Pflanz., 12 (1914), No. 2, pp. 269–294, pls. 2*).—Noting briefly studies of other authors as cited on the relations of light, chlorophyll, and assimilation, the author gives an account of his own investigations, employing *Zea mays*, in regard to the influence of different wave lengths of light on the synthesis of chlorophyll.

The results are said to present analogies to those noted by Kniep and Minder (E. S. R., 22, p. 229) and by Lubimenko (E. S. R., 25, p. 431) regarding the assimilation of carbon dioxid, inasmuch as for chlorophyll formation, as well as for assimilation, there are two maxima, the blue rays possessing a greater significance than was formerly ascribed to them in this regard.

A bibliography is appended.

A simple apparatus for the study of phototropic responses in seedlings, G. N. HOFFER (*Proc. Ind. Acad. Sci., 1913, pp. 93–96, figs. 4*).—This apparatus, made up chiefly of the microscope with a micrometer eyepiece attached to the side of its carrying case used as a dark chamber, is employed to observe minute responses of seedlings and fungi to filtered solar rays.

Irritability as related to plasmatic conditions, A. HEILBRONN (*Jahrb. Wiss. Bot. [Pringsheim], 54 (1914), No. 3, pp. 357–390, fig. 1*).—In a study of *Vicia faba* and *Avena sativa* the author found the viscosity of living substance to have a minimum of 9 times and an average of 24 times that of water. It is concluded also that cell plasma opposes not only chemical but physical properties to influences tending to limit motion therein.

A bibliography is given.

Transpiration of Silphium laciniatum, L. A. GIDDINGS (*Plant World, 17 (1914), No. 11, pp. 309–328, figs. 10*).—This is a detailed account of experiments already reported (E. S. R., 30, p. 726).

The physiology of germination, G. MÜLLER (*Jahrb. Wiss. Bot. [Pringsheim], 54 (1914), No. 4, pp. 529–644, figs. 35*).—The author states, among other findings, that the causes of pressure noted as tending to burst the seed coats are imbibed water and growth of endosperm, cotyledons, or rootlets. The structural arrangements favoring escape of the embryo are described as belonging to five different types. Pressures found to develop during changes in the cotyledons and endosperm are given. The resistance of dehiscence lines in seed coats is said to be lessened by the presence of water.

A bibliography is appended.

The germination of seeds of Arisæma, F. L. PICKETT (*Proc. Ind. Acad. Sci., 1913, pp. 125–128, figs. 6*).—Seeds of *A. triphyllum* gave a high percentage of germination, and it is noted that some germinate blindly, that is, the embryo grows, a corm and roots are produced, and food is transferred from seed to corm without the formation of leaves or other photosynthetic organ. At the end of the growing season the connection with the seed is broken off, leaving the new plant independent. Some corms are from three to six times as large as others under apparently the same conditions.

A similar set of experiments with *A. dracontium* showed that in this species the formation of leaves is a somewhat rare exception. Other evidence of incomplete response to seasonal changes was observed, and the suggestion is made of a definite periodicity requiring more than the usual rest season for this plant.

The longevity of submerged seeds, G. H. SHULL (*Plant World, 17 (1914), No. 11, pp. 329–337, figs. 2*).—The appearance of more than 140 species of plants on the dried bed of an old mill pond that had been drained suggested additional tests on the viability of seeds of some of these species. It was found that under laboratory conditions a number of seeds germinated after a submergence of more than four years, and some seeds are said to have been viable after seven years of continual submergence.

The assimilation of atmospheric nitrogen, and the reaction of albuminoid material contained in specialized hairs of plants cultivated in oxygen without nitrogen, F. KÖVESSI (*Rev. Gén. Bot., 25 bis (1914), pp. 405–415*).—The author cites recent studies claimed to have been very carefully carried out and to confirm his conclusions previously announced (E. S. R., 32, p. 327).

Biochemical influence of manganese, A. PUGLIESE (*Atti R. Ist. Incoragg. Napoli, 6. ser., 65 (1913), pp. 289–315*).—Detailing investigations regarding the antagonism between iron and manganese in nutritive solutions for wheat, etc., the author agrees with Masoni (E. S. R., 26, p. 226) in claiming that such antagonism exists, and he states that the optimum ratio for these two materials seems to be in the neighborhood of 1:2.5.

The action of antimoniacal salts on the respiration of plants, W. PALLADIN and G. COHNSTAMM (*Rev. Gén. Bot., 25 bis (1914), pp. 539–555*).—The authors found that the respiration of etiolated shoot tips of vetch is stimulated by 1 per cent of antimony tartrate, as by other poisons (E. S. R., 23, p. 629), presumably as a defensive reaction against the poison, while the respiration of germinating peas is decreased by that solution. The difference is ascribed to the deficiency of respiratory chromogens in peas, and the consequent lessened absorption of oxygen by them. The normal coefficient of respiration is but little affected in seeds of peas and shoots of vetch by this poison, but in young rootlets of sprouting peas, which normally show the coefficient $CO_2:O_2=1:2$, the coefficient becomes $CO_2:O_2=1$, corresponding to a decrease in growth rate. The action of this salt decreases the respiration of dead cells. Seeds poisoned with antimony after freezing give off a decreased amount of carbon dioxid.

Volatile acids in fermentation products of some anaerobic bacteria, G. SELIBER (*Rev. Gén. Bot., 25 bis (1914), pp. 589–598*).—Giving details and results of work according to the method of Duclaux, as formerly noted (E. S. R., 24, p. 120), and using cultures of *Bacillus butyricus*, *B. perfringens*, and *B. putrificus*, the author states that the first of these produces butyric and acetic acid and the second produces acetic and formic acid (propionic acid also being noted in some of the cultures). For *B. putrificus* it is difficult to ascertain the exact nature of the volatile acids produced. It is said to have been shown that under constant conditions of culture the same acids are produced constantly by a given species of the organism.

Fatal temperatures for some diastases of animal or vegetable origin, E. C. TÉODORESCO (*Rev. Gén. Bot., 25 bis (1914), pp. 599–627*).—Giving further details (E. S. R., 28, p. 803) of tests made with diastases heated to varying degrees, the author states that when dried these support for a short period (one-half hour) temperatures above 100° C., and in some cases much higher. Some suggestions as to the nature of these bodies are also offered.

Excretion of toxic substances by roots, D. PRIANICHNIKOV (*Rev. Gén. Bot., 25 bis (1914), pp. 563–582, figs. 11*).—This is mainly a discussion of the work done by Periturin (E. S. R., 30, p. 426), the results of which agree in part with those of American investigators named.

Alterations in the forms of antagonism curves, W. J. V. OSTERHOUT (*Jahrb. Wiss. Bot. [Pringsheim], 54 (1914), No. 4, pp. 645–650, fig. 1*).—The author, reporting an extension of work previously noted (E. S. R., 26, p. 823; 29, p. 627), shows by tables and curves how the antagonism between given percentages of sodium chlorid and calcium chlorid may vary from time to time in the course of a given experiment. This is held to be due to progressive alterations in the permeability toward each salt of the living material employed, which in this case consisted of portions of *Laminaria saccharina*. It is thought that these two salts act in different ways to influence permeability.

The influence of X-rays on vegetation, E. MIÈGE and H. COUPÉ (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 4, pp. 338–340, pl. 1*).—Reporting experiments with seedlings of *Raphanus sativus* and *Lepidium sativum* subjected for about 38 days after planting to strong and frequent applications of X-rays, the author claims that this preliminary study shows that these rays exert a favorable influence upon the foliage, but more upon the underground portions of these plants. The effect increases with the frequency and strength of the application (even within limits dangerous to animal tissues), and the rays affect the morphology and structure of these plants when grown under their influence.

FIELD CROPS.

Plant breeding, G. F. FREEMAN and J. C. T. UPHOF (*Arizona Sta. Rpt. 1914, pp. 343–348*).—In variety tests reported with alfalfa it is noted that Peruvian alfalfa has demonstrated its excellence for the region. In physiological studies as to the nature of drought resistance, the results suggest a distinct relation between the transpiration rate and the number of stomata on a given leaf surface.

It is noted that the sweet corn breeding experiments have resulted in producing a variety that is hardy and drought and heat resistant from a few grains originally found among the native corn grown by the Papago Indians.

Cultural work with tepary beans and variety tests with wheats are also reported.

[Field experiments], A. M. MCOMIE (*Arizona Sta. Rpt. 1914, pp. 330–333, 334–337*).—Cultural tests being carried on at Phoenix and at the dry farms at Sulphur Spring Valley, Prescott, and Snowflake with wheat, oats, rye, Indian beans, millet, Sudan grass, corn, sugar beets, sugar cane, sorghums, potatoes, legumes for cover and forage crops, millets, flax, and teosinte, and breeding work with alfalfa are briefly reported.

[Field-crop trials], J. M. SCOTT (*Florida Sta. Rpt. 1914, pp. XXII–XXIX*).—This gives results of cultural trials of Sudan grass, teff, Wakulla bean, Yokohama bean, Alachua bean, Florida velvet bean, soy beans, cowpeas, sweet potatoes, Chinese velvet bean, and kudzu bean.

Sudan grass yields ranged from 1,245 to 4,960 lbs. of cured hay per acre in 1913. "The sowings made in March produced only one cutting during the year, while the later [April and May] sowings gave two cuttings."

In fertilizer trials with Japanese cane results showed that "potash gave a decided increase in yield; ammonia gave an increased yield; sulphate of ammonia produced a little better yield on the average than did dried blood; acid phosphate apparently gave no increase in yield; sulphate of potash produced a little better yield than did muriate of potash."

[Field-crops experiments], J. B. GARRETT and F. C. QUEREAU (*Louisiana Stas. Rpt. 1914, pp. 22–26, 28–30*).—At the North Louisiana Station it is noted that in rotation experiments little difference was produced by the use of raw rock phosphate at the rate of 2,700 lbs. per acre every third year and acid phosphate applied at the rate of 300 lbs. per acre. "On the raw rock phosphate plat 1,207 lbs. per acre of seed cotton were produced and 27.9 bu. of corn, and on the acid phosphate plat 1,228 lbs. of seed cotton and 27.7 bu. of corn."

Sudan grass yielded 5.43 tons of hay per acre in two cuttings on the red type of soil. Of cowpeas, "the New Era, Groit, and Iron varieties produced 32.3, 26.35, and 20.96 bu. per acre, respectively. Two pickings were secured from each of these varieties. The Whippoorwill, which is the standard variety in this section, only produced 10.2 bu. per acre. Ordinarily, 10 or 12 bu. of peas per acre is a good crop here."

Yields are also reported for sorghum, feterita, Kafir corn, milo maize, ribbon cane, and Japanese cane.

In regard to fertilizer experiments with rice at Crowley, it is stated that "it is likely that 16 per cent acid phosphate is our best and cheapest source of phosphorus. The results of the past five years indicate that a 200-lb. per acre application will give the best and the cheapest returns. Kainit when applied to old rice land seems to make considerable increase in yield the first year, but in succeeding years the yield is but little better than the yield on the check plats, where no fertilizer has been used. Applications of phosphate and kainit in equal parts do not make increase in yield over the plats where phosphate is used alone.

"It is indicated by these experiments that cotton-seed meal may profitably be applied to Honduras rice, but that the returns are not so great with Blue Rose or Shinriki, this especially marked in the case of the former. It is not believed that it is profitable to use cotton-seed meal or other nitrogenous fertilizer on Blue Rose rice. Water crab grass is observed to grow on all plats fertilized with acid phosphate. This was especially noticeable last year (1914). On plats fertilized with kainit and where there was no fertilizer there was little if any crab grass. On the phosphate plats there was a heavy stand of grass which could not be checked with water and which caused considerable decrease in the yields of rice in these plats.

"As these results clearly indicate that phosphate promotes the growth of grass as well as the growth and yield of rice, it would seem that the fertilizer should be placed as close to the rice plant as possible. In other words, the fertilizer should be placed in the row with the seed, but not in contact with it. In this way the rice would get the benefit of the fertilizer first and would have a better chance to get away from the grass. It is good practice to drain the land fifteen days from the time of the first flooding. This will check the activity of the 'root maggot,' and it is believed that the drying out of the land at this time is a good thing for the rice. Where it is possible to do so, the land should be drained twice during the irrigating season."

Rotation trials are also summarized, the results indicating that highland crops will, if continued long enough, eliminate red rice. It is believed that less than a six-year rotation will not be profitable.

Field experiments, C. D. WOODS (*Maine Sta. Bul. 236 (1915), pp. 41–51, 63, 64*).—Yields in 1914 of variety tests of commercial varieties of oats are given ranging from 76 to 105 bu. per acre, and of new varieties originated at Highmoor Farm ranging from 81.5 to 120 bu. per acre.

In testing rates of seeding for oats, 16 pk. per acre gave better yields than 8, 10, 12, 14, or 20 pk. per acre in 1914 in Aroostook County. An experiment comparing sulphate of ammonia and nitrate of soda as sources of nitrogen for potato fertilizers is noted as in progress, the first year's trial being favorable to the latter. Experiments comparing different methods of applying fertilizers to potatoes are also noted as in progress, with no marked differences thus far.

It is noted that spraying potato fields with iron sulphate to kill wild mustard, in 1914, did not give as satisfactory results as previously noted (E. S. R., 31, p. 133).

In a rotation experiment to test the effect of sweet corn on a succeeding grass crop no injurious effect has been shown thus far.

Experiments with farm crops in southwest Missouri, C. B. Hutchison and T. R. Douglass (*Missouri Sta. Bul. 123* (*1915*), *pp. 163–185, figs. 3*).—This bulletin gives results of several years' work with field crops on a red limestone soil classed as Crawford silt loam. Variety tests included corn, oats, barley, and wheat. A 4-year rotation experiment included corn, oats, wheat, and cowpeas and soy beans.

In an average of three years, drilling oats gave an increase of 2.8 bu. per acre over broadcasting. The greatest increase occurred in the most favorable oat season. Winter oats seemed to be an unreliable crop for this section. Drilling cowpeas at the rate of 4 pk. per acre gave 4,475 lbs. of cured hay, a larger amount than broadcasting or planting with a corn planter.

In alfalfa experiments the use of lime 4,500 lbs., manure 27,000 lbs., and bone meal 300 lbs. per acre gave better yields than limestone alone or than limestone and manure. The yields of hay are given as 11,698, 4,085, and 7,455 lbs. respectively, with 778 lbs. per acre with no treatment.

Under miscellaneous cultural experiments were included rape, crimson clover, and hairy vetch.

Recommendations for the management of crops in this region and possible cropping systems are given.

Soil fertility problems, E. B. Stookey (*Washington Sta., West. Wash. Sta. Mo. Bul., 2* (*1914*), *No. 8, pp. 2–6, fig. 1*).—This reports results of a one-year soil fertility test on "rather sandy muck soil." From the yields of mangels, corn, potatoes, and thousand-headed kale in field plats the following conclusions have been drawn:

"The yields of all four crops clearly show that potash is the limiting factor on this muck soil. Potash alone or in combination has produced about the same results. Lime has increased the yield of three of the four crops, probably because it helps to liberate potash. Nitrogen and phosphorus alone have not increased the yield. Finally, manure has increased the yield more than any other single fertilizer or combination of fertilizers used."

Pot tests with oats on this soil, a new "shot clay," and fine sandy loam indicated the great value of manure.

[Cultural and fertilizer experiments], E. B. Stookey (*Washington Sta., West. Wash. Sta. Mo. Bul., 2* (*1915*), *No. 10, pp. 7–10*).—This reports variety tests, for the seasons 1913–14, of oats, barley, wheat, peas, vetch, navy beans, soy beans, cowpeas, corn, kale, marrow cabbage, mangels, sugar beets, swedes, turnips, red clover, alfalfa, millet, and buckwheat; cultural tests with tangier pea, clovers, espersette, serradella, Italian rye grass, meadow fescue, orchard grass, Kentucky blue grass, and other grasses, rape, penicillaria, teosinte, and sorghums. Pot experiments in fertilizing upland "shot clay," valley "fine sandy loam," and muck soils are noted as in progress.

The growing of succulent feeds for fall and winter use.—I, Root crops, E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1913), No. 4, pp. 9–13, figs. 12*).—This reports yields in variety tests of mangels, carrots, ruta-bagas, and turnips grown as stock feed, with brief cultural notes.

The growing of succulent feeds for fall and winter use.—II [Winter forage and miscellaneous crops], E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1914), No. 5, pp. 8–10, figs. 2*).—Cultural methods are given for kale, marrow cabbage, rape, cabbage, and potatoes as grown for succulent feed for stock, and yields are reported for the three first-named crops.

Summary of results [with] cereals, 1914, C. E. SAUNDERS ET AL. (*Canada Expt. Farms Bul. 81 (1914), pp. 31*).—This gives results of variety tests and describes recommended varieties of wheat, oats, emmer, spelt, barley, rye, field peas, beans, flax, and buckwheat for the maritime Provinces, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia.

Report of assistant botanist, J. BELLING (*Florida Sta. Rpt. 1914, pp. LXXXI–CVI, figs. 5*).—This reports a continuation of work previously noted (E. S. R., 31, p. 734) in regard to the inheritance of pubescence of pods and plants in crosses between the Florida velvet bean and the Lyon bean to the fifth generation, and between Florida and Yokohama, and Florida and China, to the third generation.

The inheritance and segregation of characters, stinging, downy, velvet, and black are discussed and noted as following closely the Mendelian calculations. In a study of the inheritance of partial sterility in the first generation hybrids of these bean crosses, the author believes that the discovery of empty pollen grains and of aborted embryo sacs shows a segregation of genetic differences, for in the partially sterile progeny certain corresponding paternal and maternal chromosomes have apparently not been correspondingly paired. See also a previous note (E. S. R., 32, p. 725).

Corn crosses are also briefly noted.

Corn, J. R. RICKS and C. T. AMES (*Mississippi Sta. Bul. 170 (1915), pp. 3–15*).—This bulletin gives results of experiments with corn, consisting of variety tests, cost of growing, dates of planting, fertilizers, cultural methods, subsoiling, spacing, suckering, and the production of silage corn.

In tests of 32 varieties from 1911 to 1914, inclusive, yields ranged from 21.9 to 59.4 bu. per acre at Agricultural College. The cost of production of corn per acre was $12.50 and per bushed 26.3 cts. Commercial fertilizers do not seem to have been successful. "A crop of cowpeas gives us better returns than commercial fertilizers." Subsoiling was deemed to be of no value in increasing the yield of corn. Early (March) planting showed better results than late (June) planting, and flat cultivation better yields than ridge cultivation. Cultivation continued until tasseling of the corn began showed better yields than early cultivation only. Corn spaced 1 ft. in the row gave better yields than when spaced 2, 3, or 4 ft. for early planting, but in late planting 2 and 3 ft. spacing gave the best results. Breaking the sucker when the corn was 4 or 6 ft. high was found to be injurious. Ten tons of barnyard manure per acre always gave an increase in the yield.

Silage corn yielded from 6.3 to 10.9 tons per acre. "For 3 years the average cost per ton of silage at this station has been $1.92. This includes everything from the rent on the land up until the silage is in the silo."

Tests of 19 varieties of corn at the Holly Springs substation show yields ranging from 30.5 to 92.2 bu. per acre in 1908, 1912, 1913, and 1914.

Methods of treatment for weevils in stored grain by the use of carbon bisulphid, by R. W. Harned, are appended.

Corn experiments, C. G. Williams and F. A. Welton (*Ohio Sta. Bul. 282 (1915), pp. 71–109, figs. 8*).—This bulletin gives results of experiments with corn that have been running for various lengths of time, in some cases covering over 20 years. Data are presented in 36 tables.

"Comparing a 5-year rotation system with the continuous growing of corn, the former has given an increase of 13 to 14.79 bu. per acre, in spite of the heavier use of manure and fertilizers under continuous culture. Comparing a 5-year with a 3-year rotation, the latter has given an increase of 6 to 8.39 bu. per acre. Comparing a 3-year rotation with continuous cropping, no fertilizers used in either case, the yield of corn from the former is 127 per cent greater than the latter.

"The use of phosphorus, alone, in the form of acid phosphate, has increased the yield of corn 8.28 bu. per acre. The use of manure alone has increased the yield 31.27 bu. per acre as an 8-year average. The use of acid phosphate and manure has increased the yield 40.58 bu., thus leaving 9.31 bu. to be credited to the acid phosphate.

"On such acid soils as are found on the station farm at Wooster, 1 ton of burned lime or 2 tons of ground limestone, applied once in 5 years, has increased the yield of corn on an average 7.35 bu. per acre on the fertilized plats, and 8.25 bu. per acre on the unfertilized plats. Taking into consideration all the crops of the rotation the application of lime has been worth, on the average, $14.21 per acre per rotation. The cost of the lime has been $5.

"Comparing very deep plowing with ordinary plowing and with subsoiling, the 5-year average gain for subsoiling has been 2.32 bu. per acre, and for the deep plowing 0.43 bu. per acre.

"Plantings of corn made at Wooster from May 4 to 10 have given larger yields of shelled corn per acre than the plantings of other dates, though the moisture content and the shrinkage have been lower from the plantings made from April 24 to 29. Of the plantings of the latter dates, 78.62 lbs. of ears as weighed in November have been required to equal a bushel of shelled corn in April, while of the plantings of June 2 to 6, 91.95 lbs. of ears have been required. The variety of corn and all the conditions of growth except date of planting have been the same.

"Where the distance between rows and the number of plants per acre have been the same, one plant every 12 in. has outyielded 3 plants every 36 in. by 4.55 bu. per acre. With hills 42 in. apart each way, the maximum yield of shelled corn, as a 10-year average, has been secured from 4 plants per hill, or 14,220 plants per acre.

"Nine years' tests of deep (4 in.) as compared with shallow cultivation (1½ in.) show an average gain of 4 bu. per acre in favor of shallow cultivation. Two years' tests of late cultivations of corn with a one-horse cultivator, after two-horse implements had to be discarded, show an average gain of 3.44 bu. per acre for late cultivation.

"A 10-year average variation of 6.25 bu. per acre has been found in varieties of corn well acclimated to the locality where tested. A variation in yield of 34.29 bu. per acre has been found in varieties grown and sold for seed within the State.

"A comparison of ears varying 2.44 in. in length, on the average, shows a difference in yield of only 1.39 bu. per acre, as a 10-year average—a difference no greater than might have been expected had the seed used been identical. While there is a slight decrease in length of ear in the short-eared strain, it has not materially affected the yield. As a 9-year average, tapering ears have excelled cylindrical ears in yield by 1.65 bu. per acre.

"Eight years' continuous selection for bare, as compared with filled tips, shows an average difference of 0.34 bu. per acre in favor of filled tips. Comparing rough with smooth dented ears, the 7-year average yield favors the smooth type by a gain of 1.76 bu. per acre.

"Seed ears averaging 88.16 per cent grain have given a 6-year average yield of 64.64 bu. of shelled corn per acre, as compared with a yield of 65.06 bu. from ears averaging 76.38 per cent of grain. A comparison of kernels from the butt, middle, and tip portions of ears shows only 0.57 of a bushel difference in yield, as a 9-year average, and no difference in maturity or any important character. Seed ears having 14, 16, and 18 rows of kernels have been compared for 5 years. The 14-rowed ears have led slightly in yield at Wooster and Germantown, the 16-rowed ears at Carpenter.

"While the height of plant and ear varies with the season, selecting for high and low ears within a variety has resulted in changing very materially the relative height of ear and also the time of maturity. Low ears are associated with earliness. The comparative yield has not been reduced by selection for low ears.

"Seed corn grown on rich, as compared with poor soil, and one plant per hill, as compared with five, though larger and apparently of better quality, has not given any larger yield, on the average, than the smaller ears grown under the poorer conditions. The principal causes of barren plants are variations in season, in fertility, and in time and rate of planting. Such variations in conditions of growth have increased the amount of barrenness 200 to 2,000 per cent. Ear-row tests and subsequent crossing of the best ears in isolated breeding plats show possibilities of increasing the yield of corn 5 to 10 bu. per acre, but it seems difficult to go much beyond this amount. Of 13 first-generation crosses grown beside both parents, only two exceeded in yield the better parent variety by more than 2 bu. per acre.

"A 4-year average gain of 3.9 bu. of shelled corn per acre has resulted from the use of the individual ear germination test. At 50 cts. per bushel for corn, this is a return of $6.50 per hour for testing. Experiments in thinning corn show a 4-year average gain of 8.47 bu. per acre in the case of untested seed and 6.31 bu. for tested seed. The average time required for thinning an acre of corn has been 5.7 hours.

"As an average of 6 years' tests corn reached its maximum shrinkage August 1. Based on shrinkage alone, 62.47 cts. for 70 lbs. of ear corn August 1 is equivalent to 50 cts. November 1. While mid-season and late varieties had 24, 29, and 31.04 per cent of moisture, respectively, November 1, on August 1 they carried 10.08 and 10.69 per cent, respectively."

Fertilizer experiments with corn on Piedmont Cecil sandy loam soil, and varieties, culture, and fertilization of corn on Piedmont Cecil sandy loam, red clay, and valley soils, C. B. WILLIAMS, B. W. KILGORE, and A. R. RUSSELL (*North Carolina Sta. Bul. 229 (1915), pp. 50*).—In this bulletin experimental plats with their treatments are described and the weather conditions are also given for the years 1902 to 1909, inclusive.

A general summary of the results of fertilizer experiments with corn on the Cecil sandy loam and clay loam for this period is given as follows:

"The use of a mixture carrying normal amounts of phosphoric acid and nitrogen gave an average increased yield of shelled corn per acre of 69 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 $6.60 per acre.

"Where a normal amount of potash was used with phosphoric acid in place of the nitrogen there was an average decrease in yield of 8½ per cent of shelled corn. The average profit for the P K application over cost of fertilizer was $6.17 per acre.

"On an average a fertilizing mixture carrying normal amounts of nitrogen and potash was used with only a very small gain in yield and at a loss of 86 cts. per acre. Nitrogen, phosphoric acid, and potash combined in a complete fertilizer yielded on an average slightly less than when the potash was left out of the mixture. The experiments, as a whole, show that phosphoric acid and nitrogen are the predominant or controlling plant food constituents for increasing yields and adding to profits in growing corn on this soil."

Lime alone was used at a very small profit, while in a complete fertilizer the gain in yield was equal to a profit of 86 per cent. "Taking all the results as a whole, the indications are that in growing corn on this soil under similar conditions to those obtaining in these experiments, lime will generally be needed for the largest yields and greatest profit per acre."

The amount of nitrogen in the normal fertilizer applied was 3 per cent or 9 lbs. to the acre. When this amount was varied so as to give 4½, 9, 18, and 27 lbs., the larger the amount of nitrogen the greater was the yield and profit per acre. The average yield of corn during eight years on the plats receiving three times the normal quantity of nitrogen with normal quantities of phosphoric acid and potash (N_3P K) was 24.4 bu. per acre and the average increase over unfertilized plats 15.2 bu. This fertilizer application cost $7.35 per acre, making the cost of fertilizer per bushel of increase of corn 48 cts.

The amount of potash in the normal fertilizer used was 1½ per cent or 4½ lbs. per acre. This amount was varied so as to apply 2¼, 9, and 13½ lbs., respectively. The results for the two fields were not in agreement, since in one the half-normal potash and in the other the twice-normal application of potash were indicated to be the most profitable amounts of this constituent to use.

The amount of phosphoric acid in the normal fertilizer used was 7 per cent or 21 lbs. of phosphoric acid per acre. This quantity was varied so as to apply 10½, 42, and 63 lbs., respectively. The results show the largest yields, increases, and profits per acre from the use of 42 and 63 lbs.

Varying the amounts of the normal fertilizer application from 150 to 900 lbs. per acre gave increased yields and profits for all the applications, the most profitable returns on an average resulting from 150 lbs. of fertilizer per acre. After paying for the fertilizer itself the following respective profits were obtained: With 150 lbs., $7.88 for corn and stover; with 300 lbs., $5.21; with 450 lbs., $6.94; with 600 lbs., $6.49; and with 900 lbs., $5.64.

In comparisons of dried blood and nitrate of soda as sources of nitrogen, the total yields and increased yields over unfertilized plats were quite uniform in showing a slight advantage in favor of the latter. Better profits were secured when the nitrate was divided, applying one half at planting with the acid phosphate and manure salt and reserving the other half and applying as a side dressing about July 1. Stable manure showed up particularly well on this soil as a source of nitrogen for corn.

When 300 lbs. of fertilizer was applied in the drill at the ordinary depth; in the drill about 4 or 5 in. below the seed; broadcast before planting; and, divided into two equal parts, one half being applied in the drill before planting and the other as a side dressing about July 1, the deep application and dividing the applications gave the largest yields and profits per acre.

Our soil analyses of the various soils of the State indicate that these results will apply to the red (Cecil) clay loams, red (Cecil) clays, and valley soils of the Piedmont, and in like manner the soil analyses and experiments on the mountain soils indicate that the results will apply to this section of the State also.

Saving hay crops, H. L. Blanchard (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1914), No. 3, pp. 6–8*).—This gives directions for curing and harvesting a hay crop under western Washington conditions.

The importance of thick seeding in the production of milo in the San Antonio region, S. H. Hastings (*U. S. Dept. Agr. Bul. 188 (1915), pp. 21, figs. 9*).—This bulletin reports and discusses experiments conducted to determine the effect of planting milo maize in rows at different distances apart and of thinning the plants to different distances within the rows on the tillering, branching, uniformity, date of ripening, and yield of grain.

The results obtained in 1913 and 1914 show that "no marked differences resulted in the number of tillers or the number of heads per plant from varying the distance between rows. In the plats where the rows were uniformly 4 ft. apart, but where the plants were thinned to different distances within the rows, the number of heads per plant decreased and the yield increased as the plants were crowded, the thicker stands producing the higher yields. Counts made of the number of tillers per plant on May 15 and of the number of mature heads per plant at harvest showed that a large number of tillers on the wide-spaced plants failed to produce heads.

"The close-spaced plants ripened their grain in 1913 about one week earlier than the wide-spaced plants. This early maturity is particularly important in that it permits the crop to escape the sorghum midge. Increasing the number of plants per row does not necessarily mean a proportionate increase in the total number of heads or stalks per row. The weather conditions influence very markedly the number of tillers and branches produced, although the total number of branches and tillers produced in 1914 about equaled the total number of tillers alone in 1913, when there were but few branches.

"In practice, the stand is controlled by varying the rate of seeding rather than by thinning the plants; thick stands are secured by thick seeding. Thicker seeding than is ordinarily practiced appears to be desirable, in that it results in smaller and more easily handled plant stumps, gives better stands, insures earlier and more uniform maturity, and produces better yields. A rate of 5 to 6 lbs. per acre, where the rows are 4 ft. apart, is recommended. It would appear that the close spacing of the plants can be practiced in sections of low rainfall. To offset this increase in the number of plants per row it is necessary only to increase the distance between the rows. The time the plants are thinned does not seem to be an important factor in suppressing tillers and branches. If the thinning is delayed sufficiently to reduce tillering, there seems to be a tendency for the plants to increase the number of branches."

Studies on oat breeding.—II, Selection within pure lines, F. M. Surface and R. Pearl (*Maine Sta. Bul. 235 (1915), pp. 40, figs. 2*).—This gives results of work with oats, the varieties having been previously described (E. S. R., 31, p. 832).

"The present study attempts to analyze the results of three successive years of selection within pure lines of oats. Twenty-eight pure lines representing 13 varieties have been used in this work. In the four years 621 garden rows have been grown, involving over 12,500 plants. The characters studied were weight of grain, weight of plant and of straw, height of plant, and the number of culms. Only two characters, yield of grain and height of plant, are analyzed in detail in this paper. The remaining characters show essentially the same things.

"It is pointed out that the oat flower is practically always self-fertilized. It is shown that if this is true every oat plant must be regarded as homozygous for all of its characters. Consequently the oat plant fulfills all the requirements in the original definition of a pure line.

"The characters studied are subject to rather wide fluctuations, due to environment. For this reason it is not possible to compare the absolute values of these characters from year to year. Instead the deviations of the plants and rows from the mean of their pure line in the given year have been used. As a first approach to the problem in hand we have determined the number of rows, grown from plus selections, which deviated in the plus direction and likewise the number deviating in the minus direction. The same thing has been done for rows grown from minus selected plants. Thus for each selection there are four classes of rows. Also the sum of the deviations of the rows in each class has been determined and likewise the average deviation in each class.

"From these data for the yield of grain it is pointed out that usually in the next year following a given selection there is an excess deviation in the direction of the selection. This apparent effect of a given selection is very much less noticeable or not at all in the later years. It is probable that the effect in the first year is due to physiological rather than genetic causes. Considering the effect of two and of three successive selections in the plus direction it is seen that there is an excess deviation in the direction opposite to the selection. However, with two and three selections in the minus direction there is an excess in the direction of the selection. These results balance each other so that it appears safe to conclude that neither were due to the effect of the selection.

"The methods of analysis described above leave out of account two factors, viz, the difference in the variability of the different pure lines, and, second, the size of the deviation of the selected plant. The first of these factors can be partially taken into account by expressing each deviation as a percentage of its mean. The second factor can be accounted for by expressing the deviation of each plant as an index:

$$I=\frac{Dm-Dd}{Dm}$$

where Dm is the deviation of the mother plant from its mean and Dd is the deviation of the daughter row from its mean. If there is no effect of the selection, as Johannsen claims, then this index should on the average equal 1. If regression takes place within these pure lines, as claimed by the Galton-Pearson theory of ancestral heredity, the index would on the average approach 0.33. In general if the index is significantly less than 1 it indicates some effect of the selection.

"For the yield of grain, these indexes have been calculated for the effect of each selection upon the rows grown in each of the following years. The average index for each class of selection and for all the selections are given in [tabular form]. As shown in their probable errors these mean indexes are not significantly different from 1. This indicates that there is no effect of the selections within these pure lines. The mean indexes showing the effect of two or three successive selections in the same or in different directions are shown in [tabular form]. These indexes are also significantly equal to 1, with the possible exception of the successive minus selections. These latter indexes are consistently less than 1. Whether they really indicate an effect of the selections or not can not be determined from the present data. The values are not very far below 1, and in view of the other evidence we are inclined to regard them as random fluctuations.

"It is pointed out that where selections are made which are only slightly above or below the mean of their pure line, spurious values of this index are sometimes obtained. This is especially true if a relatively small number of rows are grown from such a selection. The reason for this is that the means of some rows may deviate much farther from the mean of the line than did the mother plant. This will produce indexes very large either positive or negative. A priori there is no reason for excluding such small selections. They ought, on the selection theory, to result in rows which would deviate less from the mean of the line than rows grown from large selections. Only one such 'small' selection is included in the present data. The analysis of the selections for height of plant shows essentially the same results as found for yield of grain. Analysis by the method of deviations shows that in only one instance is the excess in the direction of the selection large enough to have any possible significance. For reasons discussed in the text it is probable that this one large deviation is not significant in connection with the selection. Indexes of selection for height of plant have been calculated for several of the selections. Since they show nothing essentially different from those for yield they have not been included in the present paper.

"On the whole the results obtained in this study give no evidence that selection for three years has modified any of the characters studied. The one or two apparent exceptions discussed in the paper might very easily arise in chance distributions where so small a number of years are considered. The weight of the evidence against an effect of selection far outweighs the evidence for such an effect. It must be concluded that in the present material and for the characters studied, selection for three years has produced no effect which can be detected by the methods used. It is proposed to continue a portion of these selections and later to attempt an individual analysis rather than the statistical one presented in this paper."

Peanut growing in the cotton belt, H. C. THOMPSON (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1915, Apr. 12, pp. 8*).—Cultural methods and uses of the crop are described.

Marketing Maine potatoes, C. T. MORE and G. V. BRANCH (*U. S. Dept. Agr., Off. Sec. Circ. 48 (1915), pp. 7*).—This reviews existing market conditions among the Maine potato producers. As factors in causing unsatisfactory prices, lack of comprehensive and efficient marketing systems and of established grades and brands as a basis for advertising are noted. As suggestions for improvement, the establishment of uniform grades and brands, the exercise of greater care in handling, thorough inspection, and the adoption of seed types, standards, and guaranties, are offered. Rules for grading are also suggested.

Potato growing in western Washington, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1914), No. 6, pp. 2–6, figs. 2*).—This gives cultural directions and methods of storage and marketing, together with descriptions of seven varieties that have given the best results in western Washington.

Lime-sulphur v. Bordeaux mixture as a spray for potatoes, III, M. T. MUNN (*New York State Sta. Bul. 397 (1915), pp. 95–105, pls. 2*).—The experiments described in this bulletin are in the main repetitions of those previously noted (E. S. R., 28, p. 433).

"The results agree essentially with those previously obtained. They show that lime-sulphur is harmful rather than beneficial to potatoes. Bordeaux mixture prevented tipburn to a considerable extent, made the foliage darker green, prolonged the period of growth, and increased the yield. Lime-sulphur, on the contrary, aggravated tipburn, dwarfed the plants, shortened the period of growth, and reduced the yield. As neither early blight nor late blight appeared in the experiment field during the season, nothing was learned concerning the comparative value of the different spray mixtures for the control of these diseases."

Lime-sulphur injurious to potatoes, F. H. HALL (*New York State Sta. Bul. 397, popular ed. (1915), pp. 2, fig. 1*).—A popular edition of the above.

Sudan grass, B. YOUNGBLOOD and A. B. CONNER (*Texas Sta. Bul. 172 (1915), pp. 28, pl. 1, figs. 7*).—This bulletin gives directions for the production of hay and seed from Sudan grass in Texas. Experiments indicate that to obtain the best results in hay production seeding should be done from April 15 to May 1 in cultivated rows not more than 18 in. apart and with not less than 7 lbs. of seed per acre, or in close drilled rows with from 15 to 40 lbs. per acre. The selection and breeding of the various types of Sudan grass are being carried out at the station.

In experiments for methods to follow in seed production it is shown that Sudan grass should be planted in cultivated rows only far enough apart to allow easy cultivation, sowing from 14 to 22 lbs. per acre.

Seed yields reported from the various substations range from 110 to 1,026 lbs. per acre. The percentage of seed to whole plant ranged from 10.4 to 23.7, with an average of 16.7 per cent in five tests.

A map shows regions in Texas where dependable seed crops of Sudan grass can and can not be grown.

Turnips as a stock food, C. D. WOODS (*Maine Sta. Bul. 236 (1915), pp. 54–57*).—In a cooperative field trial the average yield was 782 bu. per acre and the estimated cost $59.05, or 7.6 cts. per bushel. It is concluded that rutabagas may be successfully grown to replace silage when it seems desirable to do so, although a ton of digestible dry matter can probably be grown cheaper per ton as corn.

The quality of home-grown versus imported wheat, R. STEWART and C. T. HIRST (*Utah Sta. Bul. 137 (1915), pp. 63–76*).—This bulletin gives results of tests with about twenty varieties of wheat. Analyses show the protein content of imported seed and home-grown grain, the yields and protein contents of flour, bran, and shorts, dry and moist gluten in the flour, expressed in percentages; ratio of wet to dry gluten; and the relation between the protein content of the wheat and the rainfall during the growing season.

The authors summarize the work, which covers a period from 1908 to 1912, inclusive, as follows: "As an average of five years' work it may be safely concluded that dry-farm wheat grown in Utah from imported seed does not decrease in quality. The five-year average protein content of the home-grown seed differs only by 0.1 per cent from that of the original seed, i. e., the protein content of the home-grown seed has remained practically constant, being influenced only by the varying climatic conditions from year to year. The five-year average result for the protein content of the wheat grown from the imported seed is 2.23 per cent greater than that of the original imported seed. Every variety of imported seed produced wheat the first year it was grown in Utah having a higher protein content than the original seed. In no year during the five-year period has any variety produced seed having as low a protein content as the original imported seed. . . .

"The practice of shipping in seed wheat is entirely unnecessary and wasteful. The quality of the home-grown hard wheats is really superior to the original seed. Good pure wheat seed should be selected of the kind the grower desires to raise. He should then continue to raise his own seed, and with proper selection he may rest assured that the quality of the seed will not become inferior, but he may have every confidence that his wheat is of superior quality."

Yellow-berry in wheat, its cause and prevention, W. P. HEADDEN (*Colorado Sta. Bul. 205 (1915), pp. 3–38, pl. 1*).—The author reviews in detail previous work by various investigators along this line and gives results of his own work to discover the cause of the yellow-berry.

Fertilization with nitrogen, phosphorus, and potassium in single applications in the production of three varieties of wheat during 1913 and 1914 forms the basis of the following conclusions: "The appearance of yellow or white, mealy or half-mealy, or spotted kernels in wheat, otherwise without apparent blemish and known as yellow-berry is not due to over-ripeness, nor to exposure after cutting, nor to the action of fungi, nor is it a 'tendency' heritable in the wheat, as has been claimed by different authors. We have no substantiation of the claim sometimes made that climatic conditions favorably influence the development of or cause yellow-berry. Yellow-berry can be very much lessened or entirely prevented by the application of a sufficient quantity of available nitrogen. Yellow-berry can be greatly intensified or increased by the application of available potassium. The application of available phosphorus has no appreciable effect upon its prevalance. Yellow-berry is not indicative of an exhausted soil, that is, one which will not produce abundant yields. Yellow-berry indicates that potassium is present in excess of what is necessary to form a ratio to the available nitrogen present, advantageous to the formation of a hard, flinty kernel. Yellow-berry should not be mistaken for or confused with black-ended berries or brown or other discolorations in the berries. These affections are not general affections as the yellow-berry is and are not produced by the same cause.

"Yellow-berry is under the control of the grower. If there be sufficient difference in the price of grain produced he can control it with a margin of profit. The means at his disposal for its control are (1) the judicious use of sodic nitrate. (2) the thorough cultivation of his soil with the application of nitrogenous manures, (3) a rotation of crops in which a clover and possibly other legumes precede the wheat, (4) fallow cultivation. These observations apply to all of our western soils, rich in potassium and relatively, not absolutely, poor in available nitrogen."

HORTICULTURE.

Summer treatment of greenhouse soil, W. J. and S. N. Green (*Ohio Sta. Bul. 281 (1915), pp. 53–68, figs. 7*).—This bulletin gives the results of experiments started at the station greenhouses in the fall of 1908 to determine the practical difference between various methods of treating the soil during the idle summer months. Suggestions are also given relative to sterilizing greenhouse soil, the preparation of sod compost and manure, the use of commercial fertilizers and lime, and the summer utilization of greenhouses.

The test of various methods of summer treatment was continued through six seasons. In one plat the soil was renewed each year; in another plat a manure mulch was applied after removing the spring crop; a wheat straw mulch was used on a third plat, both of the mulch plats being kept well watered during the summer; and a fourth plat was allowed to dry out. The manure mulch was worked into the soil previous to planting the fall crop, but most of the straw had to be removed as it had decayed but little. A covering of fresh manure was spaded into the dry soil previous to planting in the fall.

The new soil plat gave the best results with tomatoes followed by the manure mulch plat. The straw mulch plat showed a rapid decline in yields, and the dry plat not only gave the lowest yields but was the only one to show a seriously diseased condition of the plants.

The test of lettuce crops, however, gave different results. The weight of lettuce from new soil plats was less at any time than that grown on manure mulch and dry plats. Hence it is assumed that lettuce can be grown continuously on well-manured old soil. The straw mulch plat showed a marked decrease in yield, indicating the lack of fertility.

No test was conducted with cucumbers but the authors cite some other experiments to show that the cucumber is as sensitive as the tomato, if no more so, to conditions prevailing in old well-manured soils in the greenhouse. The authors conclude that a summer manure mulch may not obviate the necessity of summer sterilization but, in part, it appears to answer that purpose.

Onions, spinach, cauliflower, and casabas, F. GARCIA and J. W. RIGNEY (*New Mexico Sta. Bul. 92 (1915), pp. 41, figs. 9*).—In continuation of previous cultural experiments with onions (E. S. R., 27, p. 438) the results are given of fertilizer tests conducted with Bermuda and Denia onions for three seasons. Concise directions are also given for growing onions by the transplanting method, which has been found to be the best and most economical. The results to date of cultural experiments with spinach, cauliflower, and casaba melons are also reported.

The fertilizer tests with onions have shown in general the value of fertilizers, and especially of nitrate of soda, in increasing the yields. The work with spinach was conducted with a view to determining its hardiness during the winter and general adaptability for local culture, as well as to test the different varieties. Practically all the varieties were hardy except the New Zealand, which was entirely killed during the winter. A calculated yield of 2 tons per acre was secured, the crop being planted the latter part of September and harvested during the latter part of February. Notes are given on the different varieties included in the test, together with a letter by C. E. Locke relating his experience in growing spinach.

In the work with cauliflower a number of varieties were tested, with special reference to the production of a late or fall crop of cauliflower. Half of each plat of each variety was fertilized with nitrate of soda. The data secured for each variety are presented in tabular form. The Erfurt and Snowball varieties matured a heavier crop and a larger percentage of heads than any of the others. The fertilized plants developed larger and heavier heads, but they were slightly slower in maturing than the unfertilized plants. A letter by P. W. Barker giving advice on growing and selling cauliflower is included.

Tests of casaba melons which have been conducted at the station during the past three seasons indicate that they require a hot and dry condition to grow to the best advantage. Too much and continuous rainy weather, especially if accompanied by hot and sultry days, may encourage mildew on the vines. It has been found that the melons grow too large as a rule, and the future work at the station will include an attempt to produce smaller varieties of casabas.

[Report of the] horticultural department, J. L. STAHL (*Washington Sta., West. Wash. Sta., Mo. Bul., 2 (1915), No. 10, pp. 13–19*).—Notes are given on variety and demonstration tests of orchard and small fruits and vegetables which have been conducted at the station during the seasons of 1913 and 1914, including lists of varieties which have proved to be the most promising.

A test of clean culture *v.* sod is being conducted in a young mixed orchard of pears, plums, and cherries by using alternate strips or plats of trees of the same variety in sod and cultivated soil. In the cultivated sections a soil mulch is kept during summer. A vetch cover crop is grown during winter and plowed under in the spring. The results thus far, as here briefly stated, show that the trees in the clean culture plats are larger and produce almost double the amount and size of fruit, although they were of the same size when the test was started. Cherries and plums color as well in the cultivated plats, but pears color better in the sod.

In connection with the work with bush fruits a number of crosses were made of raspberry and blackberry plants in 1909 and 1910. Over 600 seedlings secured from these crosses began fruiting in 1912, and the more promising raspberry and blackberry crossbreds have been planted out for further trial. One of the original blackberry crosses is so promising with respect to earliness that it has been used as a parent in crosses made during the past two years.

Rhubarb culture, J. L. Stahl (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1915), No. 12, p. 16*).—Brief practical directions for growing rhubarb are given, consideration being given to the soil, propagation, and transplanting, tillage, forcing rhubarb, and varieties.

Recommended varieties of fruit for Idaho, C. C. Vincent and G. J. Downing (*Idaho Sta. Bul. 83 (1915), pp. 15, fig. 1*).—In this bulletin the authors divide the State into eight districts and give lists of varieties of orchard and small fruits recommended for culture in each district. The principal varieties of apples are also considered with reference to their strong and weak points.

Standard varieties of tree fruits, J. L. Stahl (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1913), No. 4, pp. 2–6, figs. 3*).—Horticultural descriptions are given of a number of varieties of apples, pears, plums, and cherries which are adapted for both the home and the commercial orchard in western Washington.

Studies in fruit bud formation, J. H. Gourley (*New Hampshire Sta. Tech. Bul. 9 (1915), pp. 80, pls. 9, figs. 13*).—This paper comprises a progress report covering a period of seven years on studies of certain factors with reference to their influence on fruit bud formation. The work was started in 1908 in a Baldwin apple orchard which is receiving various cultural and fertilizer treatments. An outline of the orchard plats, together with the practical results of the various treatments for a 5-year period as measured by growth, yield, and size of fruit has been previously noted (E. S. R., 31, p. 141). In the present report data dealing with the following factors are given and discussed: Nitrate formation, soil moisture, organic and inorganic matter content of the soil, the laying down of starch in the twigs, the relation of leaf area to buds formed, relation of rainfall to yield and growth, the influence of cultural treatments, and effect of commercial fertilizers. A résumé and bibliography is given of literature bearing on the formation of fruit buds and on the reserve food in plants, mostly in fruit trees.

Summarizing the results of soil studies which were conducted during the years 1913 and 1914, the author finds that apple trees carrying a heavy load of fruit will suffer materially when the moisture content of the soil drops to 6.5 or 7 per cent in sandy soil and 12 per cent in a loam soil. "The moisture under sod in this experiment has run a little higher than where clean culture is practiced. The moisture is higher where a green crop is plowed in annually than where clean culture is practiced.

"The formation of nitrates is greatly reduced in a sod orchard. Nitrification takes place much more rapidly where a leguminous cover crop is plowed in than where clean culture is followed. Nitrates are found in great abundance throughout the season where nitrate of soda is applied as a fertilizer, but it is entirely washed out or decomposed over winter. Calcium carbonate applied to the soil in question has augmented the formation of nitrates. It appears in this soil that nitrate formation of from 20 to 40 parts per million as an average for the growing season is essential for the maximum vigor of the trees and abundant fruit-bud formation, and that above this an excess will not of itself increase the growth of the trees or number of fruit buds formed."

With reference to the laying down of starch in the twigs, a heavier deposition of reserve food material in the storage tissues was found in the case of alternate year bearing trees when the trees had formed fruit buds. As starch, this reserve is mainly found in the medullary rays and pith. An average of about 4 per cent greater specific gravity of the twigs and branches in winter condition was found where fruit buds were formed. A much larger leaf area is produced in the "off" year than in the bearing year, amounting to 2.08 sq. in. more per leaf in the trees studied.

Measurements taken of the total twig growth of trees in the various plats show a rate and amount of growth closely commensurate with the yielding power of the trees. The growth practically ceased by the first of July or earlier on most of the trees. A second growth the latter part of the summer is common in this orchard. This is accompanied by a second period of fruit-bud formation as is evidenced by the fruit buds formed on the terminus of the second growth.

No relationship could be traced between the rainfall of the growing season and the fruit-bud formation in this experiment through a period of several years. The plats where the moisture ran the lowest during the period of fruit-bud formation, coupled with good growing conditions earlier in the season, have produced the largest number of fruit buds.

The studies here reported indicate that the yield in the "off" year of the Baldwin trees can be materially improved by good cultural methods. Trees receiving cultivation and cultivation with cover crops have greatly increased their capacity for fruit-bud formation over trees standing in sod. The use of fertilizers in addition to cultivation and cover crops has not as yet increased the fruit-bud formation.

A striking difference in the individuality of the trees as regards yield has been observed, but the percentage of healthy normal trees showing a consistently low yielding character is very low.

Fertilizer experiments on apple trees at Highmoor Farm, C. D. WOODS (*Maine Sta. Bul. 236* (*1915*), *pp. 52, 53*).—A brief note is given on some fertilizer experiments being conducted at the Highmoor Farm in orchards that had been brought into good condition before the experiments started by cultivation and fertilization for a period of three years. In one experiment a number of Baldwin trees all received the same application of standard fertilizer and a portion of them received in addition nitrate of soda at the rate of 100 lbs. per acre. As far as has been observed the additional nitrate of soda has had no effect in forcing the trees into bearing.

Another experiment was begun in 1912 in an orchard of Ben Davis trees in which one plat has received no fertilizer for a period of three years; another plat has received annually a fertilizer, at the rate of 500 lbs. per acre, carrying 4 per cent nitrogen, 8 per cent available phosphoric acid, and 7 per cent potash; and a third plat has received 1,000 lbs. of the same fertilizer per acre. Thus far no results which could be attributed to the fertilizer have appeared.

Profits from spraying twenty-five Missouri orchards in 1914, W. L. HOWARD (*Missouri Sta. Bul. 124* (*1915*), *pp. 185–285, figs. 5*).—In 1913 five cooperative apple orchards were sprayed by the University of Missouri, and in 1914 25 orchards were sprayed or the spraying was supervised. Practically 100 demonstrations were held in connection with the spraying which was conducted in 14 counties in the State. The demonstration orchards were sprayed from two to four times, and with one exception both Bordeaux and lime-sulphur were used to control diseases with arsenate of lead added to poison insects. In one orchard a comparative test was made of lime-sulphur, Bordeaux, soluble sulphur, arsenate of lead paste, Bordeaux-arsenate paste, and Pyrox, both with reference to their fungicidal value and their tendency to cause spray injury.

The spraying records secured in all the orchards are here presented in detail, special attention being given to the more extensive work of 1914.

Summarizing the results of the work as a whole, lime-sulphur and Bordeaux seem to be equally efficient in controlling apple scab, blossom end rot, and cedar rust. Bordeaux appears to be a hazardous material to use for the calyx spray, especially on varieties of the Ben Davis type and those having a light-colored skin, on account of the serious injury from spray burn which may occur. Soluble sulphur as at present found on the market is a dangerous material to use as a summer spray, since it is very apt to destroy the leaves and may kill the calyx of the apples, thus causing the fruit to decay. The injury was attributed to the setting free of a large amount of arsenic from the arsenate used in connection with the soluble sulphur for controlling insects. Two applications of soluble sulphur during the season of 1914 on Gano apples produced fruit with a luster or finish superior to that produced by lime-sulphur. At the same time fully 75 per cent of the leaves were caused to drop off. Where three applications were given from 10 to 25 per cent of the fruit was destroyed. Bordeaux-arsenate paste and Pyrox both proved to be good fungicides and insecticides but are apt to burn the fruit, especially the Ben Davis and Gano varieties. These materials are considered to be of special value where only a few trees are to be sprayed, but on a commercial scale the homemade Bordeaux is more satisfactory and less expensive. The result from spraying an acre of Jonathan trees with arsenate of lead paste alone indicates that the arsenate of lead reduced the diseases (cedar rust and scab) by one-half. At the same time the spray injury from using this material amounted to 87.8 per cent at harvest time. In view of the serious amount of spray injury recorded the author is inclined to believe that some accident, such as an admixture of Bordeaux, may have occurred when the mixture was made up. Hence the data are presented merely as a record. As an insecticide the dry or powder form of arsenate of lead appeared to give as good results as the paste when used in half the quantity of the latter by weight. The powder costs approximately twice as much per pound as the paste.

The cost of spraying with lime-sulphur and lead arsenate was 9.29 cts. per tree for each application. The cost of Bordeaux and lead arsenate was 6.67 cts. per tree per application. The total average cost of spraying with lime-sulphur and lead arsenate was \$5.56 per acre of 60 trees, while Bordeaux-lead arsenate cost \$4 per acre. Averaging all orchards and all materials used, the cost of spraying per tree for the season of 1914 was for the first application 6.6 cts., the second 13 cts., the third 9.5 cts., and the fourth 8 cts.

"Missouri orchardists are advised to spray their apple trees at least three times—before blooming, immediately after blooming, and ten days to two weeks later. For the first spray use lime-sulphur 3 gal. to 100 gal. of water or Bordeaux 6:6:100; second spray, lime-sulphur 3:100, plus 5 lbs. arsenate of lead paste; third, same as second, or Bordeaux 6:6:100, plus 5 lbs. arsenate of lead paste. Where bitter rot is bad, one or two more applications may have to be made with either lime-sulphur or Bordeaux."

Spraying and thinning notes, 1914, J. H. Gourley (*New Hampshire Sta. Circ. 17 (1915), pp. 4*).—In connection with other orchard work during the seasons 1913 and 1914 comparative tests were made of several brands of spray materials to determine their effects as summer sprays, with special reference to foliage injury. The results as here summarized show the superiority of commercial lime-sulphur and arsenate of lead as a summer spray over any other materials used. The foliage was entirely unharmed and remained clean and vigorous throughout the season. The fruit showed no burning effect whatever and was free from insect or fungus injury. The dry forms of arsenate of lead proved to be as satisfactory as a paste of arsenate of lead when used in solution with lime-sulphur. Soluble sulphur preparations, in which there appears to be no lime, caused the most injury to foliage and fruit. Some injury was also caused by Pyrox and Bordeaux. Taking the results of the two seasons as a whole, lime-sulphur and lead arsenate mixture was more successful in controlling fungus troubles and insects than either Bordeaux-lead arsenate mixture or Pyrox.

Thinning experiments were conducted in two apple orchards, four trees being thinned and two trees left unthinned as checks in each orchard. No data are given relative to financial returns from the thinning, but the results show a marked increase in percentage of number one apples. The time required for thinning each tree is given.

Spring and summer spraying for the orchard, H. L. REES (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1915), No. 12, pp. 10–16*).—A concise discussion of spraying methods, including spraying programs for spring, summer, and fall, for the control of orchard pests. Data are also given relative to the preparation of spray mixtures.

Spraying calendar, C. C. VINCENT and W. C. EDMUNDSON (*Idaho Sta. Circ. 1 (1915), folio*).—This calendar contains directions for the control of the more important insect pests and diseases of fruits and vegetables, including instructions for the preparation of spray mixtures.

Analyses of materials sold as insecticides and fungicides, C. S. CATHCART and R. L. WILLIS (*New Jersey Stas. Bul. 273 (1914), pp. 3–13*).—This bulletin contains analytic data on materials sold in New Jersey as insecticides and fungicides during the 1914 season. The materials examined included Paris green, lead arsenate, lime-sulphur solution, Bordeaux mixture, and a number of miscellaneous brands.

Systems of training berry canes, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1914), No. 7, pp. 3–8, figs. 3*).—This article describes various methods of training red raspberries, high-bush blackberries, trailer blackberries, and loganberries.

Harvesting the berry crops, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1914), No. 3, pp. 3–11*).—This article contains practical suggestions relative to picking and packing raspberries, blackberries, loganberries, and strawberries.

Varieties of strawberries and raspberries, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1914), No. 5, pp. 2–6, figs. 2*).—As a result of variety tests conducted at the Puyallup substation during the past three years horticultural descriptions are given of a number of strawberries and red raspberries adapted for culture in that region. Brief popular instructions are also given for planting strawberries and raspberries.

Strawberry growing in the South, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 664 (1915), pp. 20, figs. 11*).—A practical treatise on strawberry culture with special reference to southern conditions. Consideration is given to choice of location, propagation, soils for strawberries, fertilizers, systems of growing, planting operations, cultivation, mulching duration of plantation, renewing old beds, rotation, harvesting, packages, varieties of strawberries, cost of growing, and strawberry by-products.

Strawberry culture in Wisconsin, J. G. MOORE (*Wisconsin Sta. Bul. 248 (1915), pp. 40, figs. 12*).—A practical treatise on strawberry culture, discussing selection of site and soil, preparation of the soil, selection of plants, planting operations, and subsequent management of the plantation, including the renovation of beds after harvest and strawberry pests. Data based on the opinions of some twenty growers are given relative to fertilizers used and varieties adapted for different soil conditions and for early, late, and main crop plantings.

Fertilizer tests with red raspberries, J. H. Stahl (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1914), No. 7, pp. 6–8*).—The results of fertilizer tests with red raspberries conducted under the direction of the Puyallup substation during the past three seasons indicate that farm manures are the best fertilizers for raspberries, and that manure applied in the fall gives quicker results than when it is applied during the spring. A complete commercial fertilizer appears to be more successful than an incomplete fertilizer.

[Experiments with citrus seedlings in 1914], B. F. Floyd (*Florida Sta. Rpt. 1914, pp. XXXV–XLV, fig. 1*).—The author here presents the data for the first season of fertilizer experiments with potted grapefruit seedlings in which the soil used was a field soil with good humus content. The results are compared with those obtained in 1913 when the seedlings were grown in pure sand (E. S. R., 31, p. 742). The sand cultures were also repeated on the opposite side of the greenhouse from where the 1913 cultures were conducted. The results from the two seasons' work are compared. The experiment as a whole involves a determination of the effect of varying sources of nitrogen and phosphoric acid upon the growth of the seedlings. The results thus far secured are not considered as conclusive.

A survey of comparable data shows that in the soil experiments sulphate of ammonia gave the highest average growth among the nitrogenous materials, and that different sources of phosphoric acid showed few differences. In the 1913 sand cultures dried blood gave the highest average among the nitrogenous materials and basic slag the highest average among the sources of phosphoric acid. A curve representing the stem lengths of the plants grown in the field soil approaches much nearer a straight line than a curve representing the stem lengths of plants grown in pure sand, thus indicating much less variation from the use of the different fertilizers when used on a good soil than when used on a soil poor in humus and organic matter.

A comparison of the sand-culture results secured in 1913 and in 1914 shows that, although the individual series are not entirely duplicated, the general averages of the groups containing a common source of nitrogen or phosphoric acid are practically the same, dried blood and basic slag giving the highest average growth. Sulphate of ammonia was lowest in one series and nitrate of soda in the other. Acid phosphate used alone gave the poorest growth, but when lime was used with acid phosphate fully as good growth was obtained as from basic slag.

Citrus experimental grove, S. E. Collison (*Florida Sta. Rpt. 1914, pp. LXXV–LXXVII*).—In continuation of previous reports (E. S. R., 31, p. 742) measurements are given showing the average gain in diameter of trees from June, 1909, to June, 1914, growing on various fertilizer plats in the citrus experimental grove.

No definite conclusions are drawn from the results thus far secured.

[Report of the horticulturist], W. H. Lawrence (*Arizona Sta. Rpt. 1914, pp. 349–351*).—A brief progress report on the work for the year, including data on a test of processed fabrics as containers of heat for protecting citrus trees from frost.

In conducting the above test four trees were covered with tents of cotton fabric. The tents were constructed to inclose trees 10 ft. wide and 10 ft. high, exclusive of the trunk. Two of the tents were made of light and two of medium weight fabrics. One of the light weight and one of the medium weight tents was processed with a material claimed to make the fabric mildew-proof; gas, water, and air tight; only slightly resistant to sunlight; and both heat absorbing and heat retaining. Lamps with tin chimneys were used at first, but proved unsatisfactory. No. 2 lanterns and lamps were then substituted.

Briefly summarized, the work indicates in a general way that the heavier processed fabric employed retains heat to an extent practicable for the protection of trees at a reasonable cost for fuel. The fabrics were not found mildew resistant or gas and water tight as claimed.

[Walnut growing in Arizona], J. J. THORNBER (*Arizona Sta. Rpt. 1914, pp. 339, 340*).—The author announces that C. R. Biederman, of Garces, Ariz., has perfected a method of top-working Arizona walnut stocks which enables him to graft French and English walnuts on Arizona stocks at almost any season of the year. Several thousand native seedlings are to be grown in the plant introduction garden for testing this method, which is to be fully described in a publication soon to be issued by the station.

Tree troubles at Douglas, Arizona, J. J. THORNBER (*Arizona Sta. Rpt. 1914, p. 341*).—Preliminary results from an examination into the causes affecting the growth of ornamental trees and shrubs at Douglas, Ariz., indicate that some of the more common troubles are bad drainage and soil aeration, due to poor methods of planting, selection of varieties unsuited for local conditions, damage to foliage from smelter smoke and fumes, and also black alkali in the irrigation water. Lists are given of trees which do and do not grow well with reasonable care both at Douglas and generally throughout the State.

FORESTRY.

Annual report on the progress, literature, and important happenings in the realms of forestry, hunting, and fishing for the year 1913, H. WEBER (*Allg. Forst u. Jagd Ztg., 1914, Sup., pp. VIII+216*).—In continuation of previous reports (E. S. R., 30, p. 238), this supplement contains abstracts of the more important world literature dealing with various phases of forestry, together with notes on the principal occurrences relating to forestry, hunting, and fishing during 1913.

Pennsylvania trees, J. S. ILLICK (*Harrisburg: Pa. Dept. Forestry, 1914, pp. 231, pls. 164*).—Part 1 of this work is intended for the layman and beginner of forestry and comprises abstracts from the author's lectures on elementary forestry at the Pennsylvania State Forest Academy. Part 2 is essentially a manual of Pennsylvania trees. It comprises a discussion on the identification of trees and a description of families, genera, and species with accompanying keys.

The cypresses, A. CAMUS (*Les Cyprès. Paris: Paul Lechevalier, 1914, pp. 106, pls. 4, figs. 424*).—A monograph on the genus Cupressus. It comprises a general account of the external and internal morphology of the genus, a study of the stability of its characters, a classification of the genus, and descriptions of the various species and varieties with reference to their bibliography, synonymy, distinguishing characteristics, anatomy, habitat, geographical distribution, culture, and uses. A bibliography of cited literature is appended.

[Eucalypt yields], A. M. MCOMIE (*Arizona Sta. Rpt. 1914, p. 333*).—A comparison of clean-cutting yields from a 12-year-old and a 6-year-old grove of *Eucalyptus rudis* indicates that the increased number of ties, posts, and stove wood secured to the older grove was not sufficient to warrant the delay of six years in cutting. One hundred and thirteen 12-year-old trees yielded 16,175 lbs. of ties, 17,125 lbs. of posts, and 4,450 lbs. of stove wood, as compared with 10,145 lbs. of ties, 16,190 lbs. of posts, and 6,125 lbs. of stove wood from 91 6-year-old trees.

Some preliminary investigations with regard to the cultivation of the black locust in southeastern Indiana, G. CULBERTSON (*Ann. Rpt. Ind. Bd. Forestry, 14 (1914), pp. 67–72, figs. 5*).—Preliminary observations on several locust plantings in southeastern Indiana led the author to conclude that many thousand acres of hill lands rich in lime and subject to serious loss by erosion should be planted to locust trees, and that the profits from such plantings would prove highly satisfactory.

Rubber in Brazil, O. LABROY and V. CAYLA (*A Borracha no Brazil. Rio de Janeiro: Min. Agr., Indus. e Com., 1913, pp. V+153+XX, pls. 38, figs. 52*).—A report on the exploration, preparation, marketing, and commerce of various forms of Brazilian wild rubber, together with an account of methods employed in the culture, tapping, and preparation of plantation rubbers in tropical Asia. The introductory part contains economic considerations on the world's production of rubber and summarizes the various sources of rubber. The succeeding parts deal with Hevea, Manihot, Castilla, and Hancornia rubbers.

International Rubber Congress and Exhibition, Batavia, September, 1914.—Rubber Book, edited by C. J. J. VAN HALL (*International Rubber Congres met Tentoonstelling, Batavia, 1914. Rubber Recueil, Amsterdam: J. H. de Bussy [1915], pp. X+609, pls. 5, figs. 70*).—This work, which was prepared on behalf of the congress committee, comprises a series of papers by various authorities on the rubber-producing plants, their culture, the preparation of raw rubber, and commerce. The various articles are grouped under the general headings of botany and phytopathology, climate and soil, cultivation and tapping, preparation and chemistry of rubber, economic questions, and commerce.

Chinese forest trees and timber supply, N. SHAW (*London: T. Fisher Unwin, 1914, pp. 351, pls. 34*).—Part 1 of this work takes up the physical and climatic conditions in China, contains a general description of the forests, and discusses the forest problem of China. Part 2 contains notes on broad-leaved trees, conifers, bamboo, palms, and foreign trees with reference to their range, adaptation, and economic uses. Information relative to rafting operations and timber imports into China and notes on timber in use by Chinese railways are appended.

Production and value of Irish timber, A. C. FORBES (*Dept. Agr. and Tech. Instr. Ireland Jour., 15 (1915), No. 2, pp. 338–346*).—A statistical survey of Ireland's timber resources with special reference to the uses and markets for native timbers.

Of the total area of the country only 297,809 acres, or 1.4 per cent, is under woods. The rates of cutting and of planting during the past 10 years show a deficiency of 4,341 acres in the planted area necessary to maintain a permanently stocked acreage of woodland.

Manuring experiments on Castleton Estate, Telok Anson, M. BARROWCLIFF, B. BUNTING, and F. G. SPRING (*Agr. Bul. Fed. Malay States, 3 (1914), No. 3, pp. 111–114*).—In 1913 experiments were started with some 3,500 3-year-old rubber trees to determine the possible value of nitrogen, potash, and phosphoric acid used alone and in various combinations in stimulating growth and yield. Growth measurements for the first season as here presented show no decided influence from the various treatments. The experiments are to be continued.

Report of the director of forests, N. W. Jolly (*Ann. Rpt. Dept. Pub. Lands Queensland, 1913, pp. 47–51, pls. 3*).—A report on the administration, management, and exploitation of the state forests in Queensland during the calendar year 1913.

DISEASES OF PLANTS.

Plant diseases, E. Prillieux (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 9–12*).—This is a portion of the phytopathological report for 1912, and deals briefly with some diseases of cereals, tubers, crucifers, legumes, vines, and orchard and forest trees, as noted in various parts of France.

Plant pathology, H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1913–14, pp. 117–119*).—Notes are given on a number of plant diseases of agricultural and horticultural crops, and a synopsis is presented of the Diseases in Plants Act of 1896 and the inspection carried on under this act.

Studies on Orobanche, F. Guéguen (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 433–436*).—This is a brief preliminary study of the effects due to *O. minor*, parasitic on clover and parsnip in parts of France. The tuberous modifications of the subterranean parts in the case of parsnip are compared with those noted in rootlets of grape stocks attacked by phylloxera.

Foot rot of cereals, A. Moreau (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 437–440*).—The results are briefly reported and discussed of an inquiry circulated among grain producers requesting information regarding foot rot or stalk disease of cereals in parts of France, particularly in the Paris Basin.

Meteorological conditions seem to play an important part, particularly those permitting growth of the crop in winter or early spring. Excessive nitrification also apparently favors the activity of fungi. Early seeding (September and October) appeared more favorable to the development of the fungi than later (November to spring). Variety is significant in this connection, a degree of relationship existing among several of the varieties most susceptible to foot rot. The influence of previous croppings appears to be twofold, affecting the chemical composition of the soil and the biologcal conditions (as lateness of season, etc.).

Protective measures suggested include the choice of resistant varieties, late seeding, rotation with reference to period of the year occupied by the crops, destruction of stubble, and use of fungicides.

Smut disease in maize (*Queensland Agr. Jour., n. ser., 2 (1914), No. 6, pp. 400, 401*).—This is a brief account of the appearance of *Ustilago maydis* on Indian corn near Toowoomba in 1914, with a brief discussion of its dissemination and of its control by the removal of all affected stalks before the breaking of the smut tumors, the nonuse of such plants for feeding, and the nonuse of affected land and land over which prevailing winds or wash may carry the spores.

Winterkilling of wheat, E. Schaffnit (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, pp. 21–23*).—Studies with wheat varieties are said to have shown that the seed when subjected to different low temperatures for different periods showed an increase of injury corresponding to the increased duration and lowering. Plantlets were ordinarily injured very little at from —5 to —10° C., but considerably at —15 to —20°. The young growing points showed considerable resistance, owing presumably to the presence of bud scales and the colloidal condition of certain cell contents, this portion thus determining the fate of the plant. The fact that roots are less subject to temperature extremes than are aerial portions insures supplies to the aerial parts as soon as the temperature permits utilization thereof.

Frost is thought to influence the sprouting of the grain, but just how has not yet been determined, and this is true also of the chemical changes in chilled plants. Resistance to cold by some varieties seems to show a relation to the water content, and it also appears to be true that an increase of water content renders the plant more sensitive to outside influences. Nocturnal frosts seem to render the stems liable to breaking, and chilling affects the heads also in ways not fully understood.

Studies of club root.—II, Disease resistance of crucifers; methods of combating club root, G. C. CUNNINGHAM (*Vermont Sta. Bul. 185* (*1914*), *pp. 67–96, pls. 8*).—This bulletin is the second on club root studies (E. S. R., 31, p. 642).

In the present publication the author gives the results of observations on the susceptibility of different cruciferous plants to club root, and it was found that the great majority, if not all crucifers, were more or less susceptible. Cabbages showed variety resistance, a number of varieties being somewhat less subject to attack than others

Radishes showed a wide range of susceptibility, and in case of turnips and rutabagas the rate was even greater than in cabbages or radishes. In this wide range of susceptibility the author believes that satisfactory means of combating the disease may be found.

An examination of many thousands of plants, including 28 genera and 104 species, led the author to describe 6 types of hypertrophy which are more or less characteristic of certain crucifers.

For the control of the disease the application of lime, preferably air-slaked lime, at the rate of 150 bu. to the acre, greatly increased the production of marketable cabbage. The lime to be effective should be thoroughly worked into the soil to a depth from 6 to 9 in. In 1912 experiments showed that hilling up about cabbage stalks caused the formation of adventitious roots and materially increased the crop, but in 1913 no beneficial results were obtained, possibly on account of the dry season.

A bibliography is given.

Studies on potato anatomy, VON TIESENHAUSEN (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, pp. 23–25*).—A brief discussion is given of studies in progress, the results of which thus far as related to phloem necrosis in the potato are said not to be in complete agreement with the conclusions announced by Quanjer (E. S. R., 29, p. 347).

Diseases of potatoes, II, III, H. L. REES (*Washington Sta., West. Wash. Sta. Mo. Bul., 1* (*1914*), *Nos. 6, pp. 9–16, figs. 7; 7, pp. 14–16*).—Popular descriptions are given of Rhizoctonia or little potato disease, potato wilt or dry rot, blackleg, silver scurf, scab, powdery scab, internal brown spot, and internal cracking of the potato, with suggestions for their control.

The spindling-sprout disease of potatoes, F. C. STEWART and F. A. SIRRINE (*New York State Sta. Bul. 399* (*1915*), *pp. 133–143, pls. 3; abs. in Phytopathology, 4* (*1914*), *No. 6, p. 395*).—Attention is called to the fact that Long Island potato growers in 1914 who planted their fields with home-grown seed secured a poor stand, many of the plants being small and weak. The seed pieces did not rot prematurely and there was no spotting, rolling, or curling of the leaves, or other pathological symptom. The tubers used for seed purposes were small, but otherwise normal in appearance.

Examination of unsatisfactory stands showed that weak plants and missing hills were in most cases due to using, for seeds, tubers which produced slender thread-like sprouts. This trouble is considered due to a weakened or debilitated condition of the seed tubers and is thought to be a result produced by the excessively hot weather in the summer of 1913.

It is suggested that Long Island potato growers using home-grown seed should make a sprouting test of their seed potatoes.

Morphology and cytology of the sexual organs of Phytophthora erythroseptica, P. A. MURPHY (*Ann. Bot.* [*London*], *28* (*1914*), *No. 112, pp. 735, 736*).—A preliminary account is given of morphological and cytological studies on *P. erythroseptica*, recently described as causing a disease of potatoes (E. S. R., 29, p. 550).

The physiology of Phoma betæ, W. FISCHER (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, p. 28*).—Experimentation showed that *P. betæ* can sustain a temperature of —20° C. for 48 hours. Cultures subjected daily during two or four weeks to temperatures ranging from 0 to —10° were not killed by the cold. Tests with preparations in use as sprays showed that while copper sulphate, formalin, and carbolic acid in the concentrations and durations usually employed are ineffective as against *P. betæ*, corrosive sublimate and chinosol quickly show strong fungicidal action against this fungus, checking growth in concentrations as low as 1:10,000, but having no injurious effects on the beet seed under treatment.

Black spot of the tomato, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 25* (*1914*), *No. 12, pp. 1069, 1070*).—According to the author the black spot of tomato is widely spread in New South Wales, probably causing more loss than any other tomato disease.

A study of the trouble has led him to believe that both bacteria and fungi are concerned in the black spot. The sequence of events in the production of the spots would appear to be injury to the skin, entrance of bacteria, and infection by Macrosporium. There is believed to be evidence that the fungus alone is capable of producing typical black spot. The disease is considered largely dependent upon drought conditions, and where tomato plants are adequately shaded and watered the trouble may be very much reduced. If it is considered desirable, in addition to providing an adequate water supply, the plants may be sprayed with Bordeaux mixture or lime-sulphur solution, the application of the fungicide assisting in checking the tomato leaf spot due to *Septoria lycopersici*.

Black hearted turnips, C. D. WOODS (*Maine Sta. Bul. 236* (*1915*), *pp. 57–59*).—The attention of the station was called to a serious trouble of turnips, in which the roots were perfect on the outside, skins bright and smooth, but when cut the flesh had large patches of a dull-brown color, the discoloration extending nearly to the skin. An examination of diseased material showed that the black heart was not produced by fungi or bacteria, but was apparently a condition arising from some factor or factors in the growth of the plant. A demonstration experiment was carried on to determine the relation of fertilizers and varieties to this disease.

The results obtained are not considered definite, but they indicate that there is a difference in varieties in regard to their susceptibility to the disease and that the plants to which stable manure was added had less of the trouble than the others.

Fire blight of pear and apple, H. L. REES (*Washington Sta., West. Wash. Sta. Mo. Bul., 1* (*1913*), *No. 4, pp. 6–9, figs. 7*).—A popular description is given of the bacterial blight of pears and apples, with suggestions for its control.

Blight resistance in pears and pear stocks, F. C. REIMER (*Mo. Bul. Com. Hort. Cal., 4* (*1915*), *No. 3, pp. 145–149, fig. 1*).—Attention is called to the resistance of certain species and varieties of pear-tree stock to pear blight.

Among the species reported upon it is said that Japanese pear stock (*Pyrus sinensis*) and stock of a species from China (*P. betulæfolia*) have been successfully grown and seem to be resistant to blight, and their use is recommended in combating this disease. In addition the author suggests the top-working of blight resistant trees on the stocks mentioned above, on Kieffer, or on some other varieties which are superior to Kieffer, as a means for combating this trouble, which is exceedingly destructive in the orchards of the Pacific coast.

Plum diseases, E. Rabaté (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 177–185, figs. 6*).—This includes a discussion of some insect enemies found on plum trees, also of plum leaf rust (*Puccinia pruni*), plum rot (*Monilia cinerea*), and some degenerative changes in portions of the trees affected, with suggestions regarding possible control.

A parasitic disease of quinces, H. Blin (*Rev. Hort. [Paris], 86 (1914), No. 8, pp. 182, 183*).—A description is given of a disease of quinces first observed in France in 1913, and which has since been found in a number of localities.

The trouble is said to be due to *Monilia fructigena*, which attacks the leaves and young fruits. The fruits are mummified, and it is suggested that for the control of the disease all fallen leaves and mummy fruits be collected and burned and the plants sprayed with Bordeaux mixture.

Experimental spraying for blackberry anthracnose, H. L. Rees (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1914), No. 6, pp. 2–12, figs. 5*).—A preliminary report is given of spraying experiments in three fields for the control of the blackberry anthracnose.

This disease is said to be supposedly troublesome in western Washington and it is considered that it is probably caused by the same fungus as that occurring on the blackberry in the East (*Glœosporium venetum*), although this has not been demonstrated. The disease differs in some respects in that the principal damage caused by the fungus in western Washington is on the berries. The girdling and killing of the canes, which is a prominent symptom of anthracnose in the East, is said not to occur in Washington, but the fruiting stems are girdled and killed, causing considerable loss.

In 1913 experiments for the control of the disease were carried on in which it appeared that Bordeaux mixture, lime sulphur, and Burgundy mixture gave the best results. Cutting out canes as soon as the fruit is picked will also lessen the amount of disease. The author considers it doubtful whether fall spraying is advantageous. Spraying during the growing season will reduce the amount of loss, and it is considered that the most effective time for spraying is immediately after the petals have fallen.

Mulberry diseases, G. Arnaud (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 220–227, figs. 3*).—This contains a brief description of the stages of *Nectria cinnabarina* on mulberry, with recommendations regarding the control of the fungus, including selection of stock, use of sprays in early spring, and removal of portions showing attack. A second disease is also described, due to a fungus, producing a discoloration in the spring wood which it invades.

A study of chlorosis in grape stocks, P. Marsais (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 413–420*).—This is an account of a series of experiments on the development by crossing of vines resistant to phylloxera and at the same time commercially successful in the calcareous soils, which in these districts tend to produce chlorosis in stocks of foreign origin. The results obtained are thought to justify the hope that in spite of the climatic, soil, and biological obstacles existing in this region, particularly those presented to foreign stock, the problem of continuing profitable grape culture in this region may be regarded as capable of solution by employment of hybrids named as having been found best adapted to the conditions there existing.

Grape mildew, L. RAVAZ (*Min. Agr.* [*France*], *Ann. Serv. Epiphyties, 1* (*1912*), *pp. 392–398, figs. 2*).—This contribution deals with the relations between soil surface conditions and the development of *Plasmopara viticola*, reporting also some experiments with fungicides.

Some experiments in treating citrus trees for gummosis and heart rot, J. A. PRIZER (*Mo. Bul. Com. Hort. Cal., 4* (*1915*), *No. 1, pp. 7–19, figs. 7*).—A description is given of the brown rot gum disease of the lemon, due to *Pythiacystis citrophthora*, and the gray fungus gummosis, caused by *Botrytis vulgaris*.

In addition an account is given of successful experiments for the control of these diseases, which consisted in cutting out the diseased bark and painting the area over with Bordeaux paste. This has been practiced for some time for the treatment of the brown rot at an annual cost of about 7 cts. per tree in a block of over 18,000 trees. Similar results have been obtained for the control of the Botrytis disease.

Report of plant physiologist, B. F. FLOYD (*Florida Sta. Rpt. 1914, pp. XXX–XXXV, fig. 1*).—In a study of the relation of the water table to die-back of citrus trees, conditions were produced that were believed to be similar to those in groves lacking drainage. Tanks were arranged in series, in the first series of which the water table stood 7 in. from the soil surface, in the second 14 in., and in the third the soil was kept moist to the bottom of the tank without allowing saturation. Orange trees of uniform size, appearance, and thrift were planted in these tanks in 1912, and the resulting growth has been measured and analyzed.

It was found that the types of growth produced were not at all the same that characterize trees which develop physiological disturbances known as die-back. It is concluded, therefore, that the experiment did not exactly reproduce the field conditions known as lack of drainage, which is held to cause this disease.

Report of plant pathologist, H. E. STEVENS (*Florida Sta. Rpt. 1914, pp. LVII–LXXIV*).—Field studies, infection experiments, and experiments for the control of gummosis are reported upon, most attention being given to the form of gumming which is commonly known as gummosis, a brief description of which has been given (E. S. R., 19, p. 654). Two types of this disease are recognized, one of which attacks the trunks, larger branches, and smaller twigs, while the other occurs only on the trunks and larger branches.

The cause of gummosis has not been definitely established, although several fungi are found associated with it. Observations have been made on the development of diseased areas, which indicate that the development of the disease is slow and that there are active and passive phases associated with this development. Inoculation experiments were made with diseased tissue inserted in healthy trees, but no definite conclusions are drawn from the results. It is thought that probably young trees are more resistant to the disease than older bearing ones. Some control experiments are briefly reported, in which the diseased portions of the tissues were cut out and treated with antiseptics. For this purpose Bordeaux paste was found fairly effective.

The investigations with melanose were continued, and the inoculation experiments showed that *Phomopsis citri* is the cause of both the stem-end rot and melanose (E. S. R., 31, p. 750). It is stated that severe outbreaks of stem-end rot occurred in different localities during the season, and this is believed to be due to the unusual development of the fungus in dead citrus twigs.

A brief report is given on the citrus canker, a preliminary but more detailed account of which has been issued by the station (E. S. R., 31, p. 54). It is stated that a species of Phyllosticta has been isolated from infections on grapefruit leaves.

Die-back of citrus trees in the northern districts, G. WILLIAMS (*Queensland Agr. Jour., n. ser., 3 (1915), No. 1, pp. 22, 23*).—Attention is called to the prevalence of die-back of citrus trees in the northern districts of Queensland and to the fact that spraying has failed to control the trouble.

The author suggests that among the causes of the disease are unsuitable soil conditions and that trees may be kept in a healthy condition by sufficient depth and drainage of the soil, with an even supply of moisture, obtained principally by systematic cultivation.

Diseases of the peony, H. H. WHETZEL (*Amer. Florist, 44 (1915), No. 1401, pp. 609–612, figs. 7*).—In this paper the author presents a summary account of diseases of the peony, describing their symptoms, causes, and methods of control.

Although this plant is frequently reported as free from disease, the author describes root gall, due to *Heterodera radicicola*, and root rots, the cause of which is not known; mosaic disease; anthracnose, which is considered due to a fungus as yet unidentified; leaf blotch, caused by *Cladosporium pæoniæ;* Sclerotinia stem rot, due to *S. libertiana;* and Botrytis blight, which has been referred to a number of species, but which the author's studies indicate is due to at least two distinct species of Botrytis causing identical symptoms.

Diseases of oak and chestnut in Brittany, V. DUCOMET (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 87–105*).—This is a somewhat detailed account of studies with Oïdium and other fungi on oak, also of *Melanconis modonia* and other fungi on chestnut.

Chestnut disease in France, L. MANGIN (*Min. Agr. [France], Ann. Serv. Épiphyties, 1 (1912), pp. 80–86*).—A recent increase of injury by *Melanconis modonia* in parts of France is noted. *Diaporthe parasitica*, where it exists in Europe, is said to be neither so abundant nor so formidable as in America. Iron sulphate and copper sulphate have been proposed as means of protection against *M. modonia*.

Air and wind dissemination of ascospores of the chestnut blight fungus, F. D. HEALD, M. W. GARDNER, and R. A. STUDHALTER (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1915), No. 6, pp. 493–526, pls. 3, figs. 3*).—A detailed account is given of investigations on the dissemination of the ascospores of the chestnut blight fungus (*Endothia parasitica*) by air and wind. All the experiments carried out point to air and wind transportation of the ascospores of the chestnut blight fungus as one of the very important methods of dissemination.

After every warm rain ascospores are scattered from diseased trees in large numbers, having been collected from 300 to 400 ft. from the source of supply. The authors believe that they have been carried much greater distances. During dry periods wind dissemination of ascospores does not occur at all, or only to a very slight extent.

Witches' brooms on British willows, M. CHRISTY (*Jour. Bot. [London], 53 (1915), No. 628, pp. 97–103, pl. 1*).—The author gives a description of witches' brooms on willow trees which have appeared within recent years. The trouble seems to be spreading, although confined to a rather limited area about London. The abnormal growth is attributed to the gall mite, *Eriophyes triradiatus*, and the witches' brooms seem to be produced originally from female flowers which have become excessively hypertrophied.

Estimating nematodes, BAUNACKE (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, pp. 28–30*).—A modification is described of methods formerly employed, according to which these organisms are separated from soil taken at desired depths, stained, and fixed for counting at convenience.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Revision of the American marmots, A. H. Howell (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 37 (1915), pp. 80, pls. 15, figs. 3*).—The American marmots, more often called woodchucks or ground hogs, are naturally divided into three distinct groups: (1) The woodchucks (*Marmota monax* group) of eastern United States and Canada; (2) the yellow-footed marmots (*M. flaviventris* group) of western United States and southern British Columbia; and (3) the hoary marmots (*M. caligata* group), chiefly restricted to the higher mountains of western North America.

Following the introduction the author discusses their history and nomenclature, vernacular names, habits, economic status, external characters, material examined, the genus Marmota, etc. Descriptions are given of 26 forms, together with a series of maps which show their geographic distribution. In many localities they are a decided pest to agriculture, especially in the East, both because of their destruction of crops and because of their burrows which seriously interfere with farming operations. In addition, they are known to carry the germs of Rocky Mountain spotted fever and other diseases.

Bird migration, W. W. Cooke (*U. S. Dept. Agr. Bul. 185 (1915), pp. 47, pls. 4, figs. 20*).—This is a discussion of the many phases of the subject, including causes of migration, relation of migration to weather, day and night migrants, distance of migration, migration routes (direct and circuitous, eccentric, wide and narrow), slow and rapid migration, casualties during migration, variations in speed of migration, etc. A large number of maps are given which graphically illustrate the data presented.

Entomology, A. W. Morrill (*Arizona Sta. Rpt. 1914, pp. 359–362*).—In continuation of work against the harvester ant (*Pogonomyrmex barbatus rugosus*) previously noted (E. S. R., 32, p. 549) tests were made of a high pressure pump which volatilizes the carbon bisulphid in an attempt to force the fumes into the insects' underground tunnels, but thus far the results have been unsuccessful. The principal work of the season against this pest consisted in a large scale experiment with London purple, conducted with a view to determining the cost of material and labor and to perfect the methods of this treatment. In the vicinity of Phoenix a 10-acre field, containing 168 nests with bare areas estimated to average 330 sq. ft. each, or a total of approximately $1\frac{1}{4}$ acres, was practically cleared of the ants by a series of five applications of this poison, at a total cost per acre of $1.17.

A considerable quantity of London purple sold by certain druggists in Salt River Valley during the summer of 1913 proved ineffective, and upon analysis by the station chemist was found to contain but 0.35 per cent arsenious oxid (As_2O_3), whereas London purple that was effective contained 27.81 per cent.

The western green June beetle (*Allorhina mutabilis*) is said to be a troublesome pest of nearly all kinds of fruit at the lower elevations in Arizona, peaches, figs, and grapes being the principal crops that suffer. Brief reference is made to investigations of insects that attack the Arizona wild cotton plant (*Thurberia thespesioides*), an account of which by W. D. Pierce of this Department and the author has been previously noted (E. S. R., 30, p. 56).

Fourteenth report of the state entomologist of Connecticut for the year 1914, W. E. Britton (*Connecticut State Sta. Rpt. 1914, pt. 3, pp. VIII+113–198, pls. 16, figs. 6*).—The first part of this report consists of a statement of finances and organization; reports of inspection of nurseries, nursery stock, and apiaries; and a discussion of gipsy moth control work and of suppression work with the brown-tail moth.

A summarized account of The Cabbage Root Maggot, by Q. S. Lowry (pp. 142–152), is followed by a report on Field Experiments in Controlling the Cabbage Root Maggot in 1914, by W. E. Britton and Q. S. Lowry (pp. 152–157). The results indicate that tarred paper disks and carbolic acid emulsion are about equally effective in preventing damage from maggots and that sludge (residue from the manufacture of lime-sulphur mixture) is fairly satisfactory. In a discussion of the Outbreak of the Army Worm (pp. 157–173) the author presents a summarized account of the pest with a list of the more important literature relating to it. Experiments in Controlling the White Pine Weevil are described by B. H. Walden (pp. 173–176). The pest continues to do much damage to white pine plantations in the State. Experiments made in controlling the pest by collecting the weevils on pine leaders with a net indicate that at least six collections may be made at an expense not to exceed $1.50 to $2 per acre. In work at Portland and Rainbow in which four and five collections were made, respectively, the percentage of injured leaders where the net was used was less than half the percentage of those injured on the checks. Experiments in Controlling a Mite (*Tarsonemus pallidus*) Injuring Snapdragon Plants in the Greenhouse are reported by W. E. Britton, B. H. Walden, and Q. S. Lowry (pp. 176–179). In addition to snapdragon, the leaves of which were badly curled and the entire season's crop threatened as a result of attacks by this mite, chrysanthemum and cyclamen were also injured. The tests indicate that blackleaf 40, used at the rate of one teaspoonful to a gallon of water with the addition of soap and "Fir-tree Oil" (4 to 6 oz. in 2 gal. of water) will control this mite on snapdragon if four applications in the form of a spray are made at intervals of about a week. A Tent Caterpillar Egg Contest (pp. 179, 180), arranged for school children, is briefly described, as is Mosquito Work in Connecticut in 1914 (pp. 181–183). Caterpillars of a noctuid moth (*Hadena turbulenta*) are reported to have attacked wild smilax or "greenbriar" (*Smilax rotundifolia*) at Kidds Island, off Stony Creek, Branford. Tests made of a commercial preparation, known as "Corbin," to protect seed corn, show that it reduces the percentage of germination and retards development, where the vitality is not impaired, to such extent that its value is questionable.

The report concludes with a discussion of miscellaneous insect pests, including pink grasshoppers (*Scudderia furcata*), *Polygonia interrogationis* on elm, cherry or pear slug (*Caliroa limacina*), two rare lady beetles (*Harmonia similis* and *Anisocalvia 12-maculata*), the tulip tree scale (*Toumeyella liriodendri*), the strawberry white fly (*Asterochiton* [*Aleyrodes*] *packardi*), the chinch bug, the saddle-back caterpillar, the hickory leaf stem gall louse (*Phylloxera caryœcaulis*), injury by bill bugs (*Sphenophorus sculptilis*), the four-lined leaf bug (*Pœcilocapsus lineatus*), the grape plume moth, the Colorado potato beetle and zinc arsenite, pupæ of *Macrosargus cuprarius*, the walnut caterpillar (*Datana integerrima*), leaf hopper (*Gypona flavilineata*) injuring Japanese barberry, controlling green apple aphis, mites on California privet, harlequin cabbage bug in Connecticut, European pine shoot moth (*Evetria buoliana*), the oak pruner (*Elaphidion villosum*), pear psylla, the stalk borer, injury to geraniums by white ants (*Termes flavipes*), false apple red bug in Connecticut (*Lygidea mendax*), and the hickory bark borer (*Scolytus quadrispinosus*).

Report of entomologist, J. R. Watson (*Florida Sta. Rpt. 1914, pp. XLVI–LVI*).—A brief account is given of entomogenous fungi, studies of which by Rolfs have been previously noted (E. S. R., 30, p. 55), and of the occurrence of white fly fungi in observation groves. Experiments with sprays in the control of the Anticarsia caterpillar on velvet beans, commenced in 1912, were continued during the summer of 1913, and it was found that a mixture of commercial lime-sulphur 1 qt,, lead arsenate paste 8 oz., and water 50 gal., may be safely used to control this pest in August and September. Through the use of lime-sulphur in the solution it was possible to double the amount of arsenical previously used without burning the plants, and this mixture satisfactorily controlled the caterpillars. Observations showed that the severity of the damage by the caterpillar was directly proportional to the lateness of the variety. It is stated that if Chinese or other earlier varieties are planted near Florida velvet or other late varieties, the former will largely escape the ravages of Anticarsia. By planting Florida velvet beans about the edge of a field in which the main crop is China or other early beans, the caterpillars can be largely concentrated and readily destroyed by spraying with the arsenical.

A brief statement is given of control measures for the bollworm on tomatoes, a more detailed account of which has been previously noted (E. S. R., 32, p. 652). The cottony cushion scale continued to spread with increasing rapidity, the infestation at Key West being a severe one. Miscellaneous insects noted include the sweet potato root borer; *Hemichionaspis minor*, found at the station grounds infesting *Asparagus plumosus;* the chrysomelid beetle *Trirhabda brevicollis*, which was found at Tallahassee damaging pecans; and *Aleyrodes mori* found at Gainesville infesting *Euonymus americanus*.

Insects affecting vegetable crops in Porto Rico, T. H. Jones (*U. S. Dept. Agr. Bul. 192* (*1915*), *pp. 11, pls. 4*).—This article reviews the literature relating to the subject and reports observations made by the author of the more important insect enemies of vegetable crops in Porto Rico.

The control of apple insects in Clinton County, C. R. Crosby and A. J. Mix (*New York Cornell Sta. Bul. 356* (*1915*), *pp. 115–130, figs. 24*).—This is a brief discussion of the more important insect pests of apples and means of control in Clinton County, including the codling moth, the apple maggot, green fruit worms, plum curculio, eye-spotted bud moth, apple-tree tent caterpillar, forest tent caterpillar, oyster-shell scale, woolly apple aphis, etc.

Insects destructive to grain and grain products stored in bins and granaries, G A. Dean (*Kansas Sta. Circ. 47* (*1915*), *pp. 4*).—A popular account.

House fumigation, C. W. Woodworth (*California Sta. Circ. 127* (*1915*), *pp. 4, figs. 2*).—A popular account.

How to control the grasshoppers, E. D. Ball (*Utah Sta. Bul. 138* (*1915*), *pp. 79–116, figs. 15*).—A detailed account, particularly as relates to Utah conditions.

Cockroaches, C. L. Marlatt (*U. S. Dept. Agr., Farmers' Bul. 658* (*1915*), *pp. 15, figs. 5*).—A revision of Circular 51 of the Bureau of Entomology, previously noted (E. S. R., 14, p. 374).

List of the Hemiptera-Heteroptera of Maine, H. M. Parshley (*Psyche, 21* (*1914*), *pp. 139–149; abs. in Maine Sta. Bul. 234* (*1914*), *p. 294*).—Records of 175 species are included.

The chinch bug, F. M. Webster (*U. S. Dept. Agr., Farmers' Bul. 657* (*1915*), *pp. 28, figs. 9*).—A popular account based upon investigations previously noted (E. S. R., 19, p. 452; 26, pp. 347, 454).

Spraying for the grape leaf-hopper, H. J. Quayle (*California Sta. Circ. 126* (*1915*), *pp. 6, figs. 2*).—This circular gives directions for spray work against the grape leaf hopper, a detailed account of which pest has been previously noted (E. S. R., 20, p. 557).

The woolly white fly (Aleurothrixus [Aleyrodes] howardi), J. R. Watson (*Florida Sta. Bul. 126* (*1915*), *pp. 79–102, figs. 12*).—A summarized account of the woolly white fly, studies of which by Back (E. S. R., 23, p. 257) and others have been previously noted.

The author states that the pest is rapidly spreading and will soon be found over all the citrus section of Florida. While it usually does little damage, it is capable of causing an almost total loss of the year's crop and is a severe check to growth. "Unless preventive measures are taken, a severe attack will be followed by a marked rise in the amount of purple scale, which will inflict equal or greater damage. The miscible oils are effective against the early stages of the larvæ of the woolly white fly. Both the red and brown fungi have been found growing sparingly on the woolly white fly. A species of Cladosporium probably sometimes kills up to 80 per cent. The woolly white fly is heavily parasitized by a minute hymenopteron, which sooner or later controls an outbreak. Because of this it probably will never develop into as permanently serious a pest as is the common citrus white fly. The parasite apparently does not control the late winter brood."

Recent Illinois work on the corn-root aphis and the control of its injuries, S. A. FORBES (*Illinois Sta. Bul. 178 (1915), pp. 405–466, figs. 18*).—This bulletin reports the results of work with the corn-root aphis carried on from 1907 to 1910 in continuation of that of 1905 and 1906 (E. S. R., 21, p. 57). A circular relating to this work has been noted (E. S. R., 28, p. 855).

"The principal measures of protection against the corn-root aphis are rotation of crops; an early and deep plowing, followed by the repeated deep disking, of corn ground heavily infested by ants or known to have borne a crop injured by the root aphis; and the use of repellent substances at planting time, not by direct application to the seed (which is dangerous to germination and early growth) but by previous mixture with chemical fertilizers or other powdered substances, to be dropped with the seed by means of a fertilizer dropper attached to the corn planter. . . .

"Experiments of 1907 show that wet weather at planting time may either result in serious injury to the seed if repellents have been applied to it direct, or in such washing away of the repellent substances that they produce no effect, either on the seed or on the ants and aphids, the character of the effect apparently depending on the amount of rainfall and on its relation to the time of actual planting. Comparative experiments show that the injurious effects reported were not due, as at first surmised, to differences in the quality of the repellents used in different operations. Laboratory experiments with a considerable variety of repellents applied by uniform methods to colonies of the cornfield ant in a special cage showed that oil of tansy, oil of lemon, anise oil, tincture of asafetida, apterite, and vermicide were very strongly repellent; that kerosene, camphor, and coal tar were less effective repellents; and that a considerable number of other substances tested were, if repellent at all, too slightly so to make them practically useful.

"Additional field experiments made in 1908, in a spring season which proved to be very wet, resulted in no injury to the seed, and on the other hand in no benefit to the crop, flooding rains apparently washing away the repellents before they could take effect upon either the seed corn or the insects.

"Experiments made in 1910 with tincture of asafetida and oil of lemon, applied first to bone meal which was then dropped with the corn by means of a fertilizer dropper attachment to the planter and tested by the yield at corn husking, showed a gain of 5.6 bu. per acre by the use of asafetida and 10.8 bu. per acre by the use of oil of tansy, the first gain being obtained at a cost for materials and additional labor of 34 cts. a bushel, and the second gain at 27 cts. a bushel. This result was the more encouraging since a very unfavorable spring caused an unusually poor stand and reduced greatly the general yield of corn. In a good corn season the gain would have been greater for the same cost.

"Additional experiments with deep plowing and repeated disking made in 1909 showed in one case a decrease, due to the treatment, of 43 per cent in the number of hills infested by ants and 18 per cent in the number of ants in the infested hills, and a decrease of 27 per cent in the number of hills infested by root lice and of 9 per cent in the number of the root lice themselves. In another case the number of hills infested by ants was reduced 71 per cent and the number of ants in the infested hills 83 per cent, the number of hills infested by root lice 86 per cent and the number of root lice in the infested hills 61 per cent. The same experiment showed that deep disking with a 20-in. disk was much more effective in diminishing the number of ants and root lice than was the comparatively shallow disking of a 16-in. disk, the difference between the two methods of treatment being 34 per cent and 48 per cent in the number of hills infested by ants and aphids, respectively, and 13 per cent and 35 per cent in the number of these insects themselves. It was incidentally shown by this experiment that plowing to a depth of 4 in. does not sufficiently break up the nests of the ants, but that about 85 per cent of them may be broken up by plowing 6 in. deep, the remainder being at least broken into.

"Observations made at night upon the movements of colonies of ants out of plats treated as above, and across furrows surrounding them, showed nearly two and a half times as many migrations from the plats deeply stirred as from the check plat. Migration lines across furrows plowed through the center of each of the plats a week after planting showed the amount of normal underground movements of the ants at this time. Making due allowance for this, it appears that the migration movement caused by the disturbance of the ants in treated plats was more than five times as great as is normal.

"Plowing to a depth of 6 in. in a Galesburg field in 1910 dispersed 55 per cent of the ant colonies in this field, and one disking after plowing dispersed 15 per cent more. Plowing 6 in. deep, disking three times, and rolling once increased the yield of the plat nearly 25 per cent, at a cost of 22 cts. a bushel. One 20 in. disking followed by rolling gave all the advantages obtainable by additional diskings. Fall plowing and one spring disking are much more effective than spring plowing with no disking, the latter containing about three times as many ants and four times as many aphids as the former.

"Change of corn ground to oats for one year and fall plowing of the oats stubble gave a larger yield by 25 per cent than adjacent ground kept continuously in corn, this difference being accompanied by a root louse infestation of young corn on the oats stubble about one-tenth that found in corn on old corn ground."

The gipsy moth, W. E. Britton (*Connecticut State Sta. Bul. 186* (*1915*), *pp. 24, figs. 16*).—A summarized account of this pest, particularly as relates to Connecticut.

Studies of the codling moth in the central Appalachian region, F. E. Brooks and E. B. Blakeslee (*U. S. Dept. Agr. Bul. 189* (*1915*), *pp. 49, pl. 1, figs. 23*).—This is a report of studies of the codling moth, commenced in the spring of 1911 and continued for three successive years, which form part of the investigations of this insect that have been carried on by the Bureau of Entomology throughout the United States, including Arkansas (E. S. R., 21, p. 455), Pennsylvania (24, p. 256), California (25, p. 154; 28, p. 558), Michigan (28, p. 60), and New Mexico (31, p. 252). The work was conducted at several points in Virginia, West Virginia, and Maryland, comprising a difference in latitude of 1° 40′ and in altitude of about 3,100 ft., the most southerly and least elevated station being at Charlottesville, Va., the most northerly at Hagerstown, Md., and the most elevated at Pickens, West Va.

In this work particular attention was given to the time of appearance of the different broods at various altitudes and latitudes. The work was conducted by selecting for banding from 10 to 15 unsprayed bearing apple trees of the late-ripening varieties in each of the several localities in the States above mentioned. Bands applied to the trees in the spring before the first brood larvæ commenced to leave the fruit were removed and examined at intervals of a week or 10 days and the larvæ taken from them, counted, and placed in rearing jars and records kept of their transformation. During the course of the work more than 20,000 larvæ were collected and placed in jars for rearing, examinations being made every week or 10 days. Much of the data relating to these investigations are presented in tabular and diagrammatic form.

During a single year the codling moth in the region covered by the present studies produces one full brood of larvæ and a partial second brood, the size of the second brood depending more or less on the latitude and altitude of the locality. There seems, however, to be no constant rate of difference between the earlier and later localities, due largely to the responsiveness of the species during its metamorphic changes to local and transient weather conditions.

"During the time of the investigations the first brood larvæ began entering the fruit at Charlottesville from April 28 to May 15, and second-brood larvæ from June 25 to July 1. At Pickens first-brood larvæ began entering the fruit from June 20 to July 1, and second-brood larvæ about August 10. Between these two localities there is a greater difference in the time of the regular periodical changes of the insect that occur late in the season than of those that occur early in the season. This is probably due to the cumulative retarding effect of the more frequent unfavorable weather conditions at the higher point. . . . Records of the numbers of larvæ collected from trees on which bands were placed around the trunks and also around the bases of the larger branches indicate that 41.49 per cent drop to the ground and then ascend the trunk to pupate and 58.51 per cent crawl down the branches from the infested fruit to pupate. . . .

"Two specimens of ants (*Solenopsis molesta* and *Lasius niger americana*) were found in several localities devouring codling-moth larvæ. Larvæ and adults of the beetle *Tenebroides corticalis* were found frequently feeding on codling-moth larvæ and pupæ. Six species of hymenopterous and one of dipterous parasites were reared in the jars. Of these the most destructive to the codling moth were *Ascogaster carpocapsæ* and *Itoplectis marginatus*. Hairworm parasites (*Mermis* sp.) were abundant in one locality and very materially reduced the number of wintering larvæ in the year 1911."

The spring cankerworm situation in Kansas, G. A. DEAN (*Kansas Sta. Circ. 46* (*1915*), *pp. 7. figs. 7*).—This circular describes methods of control for the spring cankerworm, the ravages of which in Kansas have extended over a period of several years. This pest is said to have killed more apple trees in Kansas in a single season than the San José scale has killed during its entire history as a pest in the State.

The true clothes moths, C. L. MARLATT (*U. S. Dept. Agr., Farmers' Bul. 659* (*1915*), *pp. 8, figs. 3*).—A reprint, with slight revision, of Circular 36 of the Bureau of Entomology, previously noted (E. S. R., 10, p. 655).

The root maggot pest, E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul., 2* (*1915*), *No. 12, pp. 2–8, figs. 6*).—The damage caused by the root maggot is said to have been so great in the State of Washington during the past few years that many growers have almost given up growing radishes, cabbages, and like plants. A brief report of treatments in the experimental control of the pest is given, the results of which agree in general with those obtained at other stations. The report of work prior to 1913 has been previously noted (E. S. R., 28, p. 555).

Work with stomach and contact poisons in combating the maggot after it has started working on the plant gave negative results. As a result of work with repellants the only remedy recommended for transplanted plants is the use of 3-inch tarred felt disks.

The huisache girdler (Oncideres putator), M. M. High (*U. S. Dept. Agr. Bul. 184 (1915), pp. 9, pls. 4*).—The huisache tree (*Acacia farnesiana*), used as a shade and hedge tree in the Southwest, has a number of insect enemies, of which the girdler (*O. putator*) is the most injurious. This insect often damages the young trees through completely severing them a few inches above ground. The species first came under the author's observation in the lower Rio Grande Valley during the summer of 1910. It is said to saw with ease branches 1¾ in. in diameter, as many as 63 girdled branches of one tree having been observed by the author.

The species has been recorded from Arizona, New Mexico, and Texas, and from Mexico. In addition to huisache, it has been found feeding and ovipositing upon mesquite (*Prosopis glandulosa*), huajilla (*Acacia berlandieri*), ratama (*Parkinsonia aculeata*), and *Mimosa lindheimeri*. The adults begin to appear early in September and continue to emerge until the latter part of November. No statement is made as to the incubation period of the egg. The duration of the larval period is said to be approximately 42 weeks under ordinary conditions. No pupæ were observed until August, the first adult beetle observed emerging September 15. The duration of the pupal stage is approximately four weeks with an average mean temperature of 72.5° F. There is only one generation of this beetle each year, approximately 12 months being required for the life cycle from egg to adult.

Several parasitic enemies of the egg and larva were reared, including *Chrysocida inopinota*, *Eurytoma* sp., *Cœnophanes* sp., a pteromalid, and *Meteorus* sp. Since this insect spends at least 10 months in the severed branches, it may be controlled by collecting and burning the pruned branches.

The spotted click beetle (Monocrepidius vespertinus), H. C. Eagerton (*South Carolina Sta. Bul. 179 (1914), pp. 3–8, pls. 2*).—During the course of studies of the corn and cotton wireworm (*Horistonotus uhlerii*), a brief reference to which has been previously noted (E. S. R., 30, p. 545), it was found associated with the spotted click beetle, here dealt with, which the author estimates is responsible for 45 per cent of the damage formerly attributed to *H. uhlerii*.

The larvæ of the spotted click beetle apparently prefer cotton seed and young cotton roots to seed or young roots of corn, but in the absence of cotton they attack corn, often doing serious damage. Unlike the larvæ of *H. uhlerii*, those of *M. vespertinus* seem to be abundant on almost any type of soil, occurring on light sands and heavy silt soils, although the greater injury occurs generally on sandy upland.

In a study of its life history the author found from 9 to 10 days to be required for the eggs to hatch during July and about 20 days for eggs deposited September 8. As with *H. uhlerii*, oviposition appears to take place in the evening or night. The eggs are not deposited more than 1 in. beneath the surface of the soil. During the winter of 1913–14 the larvæ were found about 3 to 3.5 in. below the surface and were never found deeper except during dry weather in the spring of 1914, when they occurred 5 to 6 in. below the surface. Their food appears to consist mainly of decaying vegetable matter and ground larvæ, but when these are not abundant they do not hesitate to attack the roots or planted seed of corn, cotton, and other plants. During June and July the pupal stage, which is found from 3 to 5 in. below the surface, is said to last from 10 to 12 days. The life cycle of a specimen reared from an egg deposited July 28, 1913, required 330 days—12 for the egg, 305 for the larva, and 13 for the pupa. To this may be added 10 days from emergence to oviposition, which represents the maximum period.

A night hawk, probably *Chordeiles virginianus*, is said to feed upon the adult beetles. Since the larva seldom burrows deeper than 4 in., fall and winter plowing are recommended as an aid in its control. In a rotation of cotton, corn, and oats, the oat stubble should be left undisturbed after harvest until September 15, as the adults do not frequent such fields for egg laying. Where the species is injurious to tobacco, it is recommended that a handful of cotton seed be placed halfway between plants to attract the wireworms away from the young plants until the young tobacco is sufficiently strong to withstand the attack.

FOODS—HUMAN NUTRITION.

Acidity in wheat flour, L. A. Fitz (*Oper. Miller, 20 (1915), No. 1, pp. 36–38*).—Analyses made by J. W. Calvin and Leila Dunton at the Kansas Experiment Station are reported. Judging by the results with different millings of the same grain, high acidity is apparently an unreliable test for unsoundness in flour. The acidity is in part at least attributed to phosphates and amino acids normally occurring in flour.

Accidental poisoning due to flour containing barium carbonate, L. Hugounenq (*Ann. Falsif., 7 (1914), No. 63, pp. 54–56*).—Several cases of poisoning are reported in which the cause was stated to be flour which contained barium carbonate.

Feterita, J. C. Summers (*Oper. Miller, 20 (1915), No. 1, pp. 42–44, figs. 4*).—Some baking tests are reported which were made upon doughs prepared with feterita flour alone; a mixture of feterita flour and soft wheat flour 1:1; feterita flour and hard spring wheat flour 1:1; soft wheat flour alone; and hard spring wheat flour alone.

It is stated that the feterita flour is soft and breaks up badly in scouring and milling. The flour is of a dark red color and contains no gluten, which accounts for the poor volume of the loaves made from it. The bread made from feterita flour alone was heavy and had a poor texture and color. The bread made from feterita and wheat was somewhat better in quality, but also somewhat heavy and poor in texture. Pancakes and gems made from feterita flour alone were heavy and had a flat taste, while those made from the feterita flour and wheat flour were of good quality and had only a slightly flat taste, which was easily overcome by the use of sirup and spices.

Some data on peanut butter, C. A. A. Utt (*Jour. Indus. and Engin. Chem., 6 (1914), No. 9, pp. 746, 747*).—Chemical and microscopical examinations were made of a number of samples to determine whether oils other than peanut oil were incorporated in the product. In the samples examined no foreign starch or oil was detected.

[The utilization of prickly pears as human food]. Report of the Prickly-pear Traveling Commission, 1st November, 1912–30th April, 1914, T. H. Johnston and H. Tryon (*Brisbane: Govt., 1914, pp. XX+131, figs. 66*).—Information is given regarding the use of the fresh ripe fruit of the prickly pear as food in South Africa, the Mediterranean regions, Central and South America, and Mexico. To a slight extent it is also used in the United States as food. In countries where this fruit forms an important part of the food supply it is either dried, converted into preserves, or, as is sometimes the case, used in making jams, jellies, alcohol, vinegar, molasses, or sugar. Analyses of the dried leaves of different varieties indicate a fuel value of between 1,400 and 1,500 calories per pound.

Data pertaining to its use in stock feeding are noted on page 70.

Mushrooms and other common fungi, Flora W. Patterson and Vera K. Charles (*U. S. Dept. Agr. Bul. 175* (*1915*), *pp. 64, pls. 38, fig. 1*).—This bulletin is intended to furnish the amateur with means for identifying some of the more common species of mushrooms and for distinguishing between poisonous and edible varieties. The general morphological structure of mushrooms and other fungi is discussed, and botanical descriptions are given of selected species from each of the most familiar genera, with special reference to the distinctive features. These are also illustrated by a number of photographic reproductions. The bulletin contains a few tested recipes for cooking mushrooms and a list of reference books is appended.

Analyses of human milk, O. Spindler (*Apoth. Ztg., 29* (*1914*), *No. 16, pp. 235–240*).—Results of analyses are given from which it is concluded that human milk, unlike normal cows' milk, contains a large amount of catalases and that no definite relation exists between the density of the serum, total solids, and fatty matter. The catalases are found partly dissolved in the serum and partly occluded in the fat globules, and are thought to play an important part in the nutrition of infants.

Mother's milk of the first period of lactation and the influence of calcium and phosphorus additions on its composition, F. Zuckmayer (*Pflüger's Arch. Physiol., 158* (*1914*), *No. 3–5, pp. 209–218; abs. in Chem. Zentbl., 1914, II, No. 5, p. 415*).—An examination of mothers' milk during the first 10 days of the lactation period showed in 26 cases large variations in the calcium and phosphorus content, and these variations still existed after the addition of calcium and phosphorus compounds to the diet of the mother. The use of these compounds during the advanced stages of pregnancy produced a normal milk, but the calcium content increased from 10 to 72 per cent, and the values for phosphorus pentoxid, nitrogen, and ash were also greater.

What every ice cream dealer should know (*Schenectady, N. Y.: Daly Bros. Manufacturing Corporation, 1914, pp. 228, pls. 17, figs. 4*).—This is a general treatise on ice cream manufacture, intended for the use of the ice cream trade. A number of suggestions are given, together with standard recipes, and considerable information regarding the sanitation of ice cream factories, the proper selection and storage of raw materials, and the handling of the finished product. A number of modern ice cream plants located in various parts of the country are described. One section of the book is devoted to soda fountain hints. This also contains a number of recipes and suggestions to proprietors of soda fountains.

The preparation of pure sucrose and dextrose caramels, G. D. Beal and H. F. Zoller (*Jour. Amer. Pharm. Assoc., 3* (*1914*), *No. 4, pp. 495–497*).—From the results of these experiments the authors draw the following conclusions:

"Caramel is best prepared by heating cane sugar or glucose at 210° for 30 minutes. A somewhat higher yield is obtained by longer heating, but some insoluble matter is formed at the same time. The best method of purification is found to be dialysis in a collodion membrane."

Harmful effect of certain sugar cane products, R. Blosser (*Jour. Amer. Med. Assoc., 63* (*1914*), *No. 6, pp. 481, 482, fig. 1*).—A preliminary report of experiments with laboratory animals (dogs) carrried out to determine whether or not the use of cane sugar is deleterious. The effect of ingestion of large amounts of cane sugar was considered negative, but it is stated that general disturbances and abnormal development were produced by the continued consumption of a cheap grade of sirup.

Lime juice, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 295 (1914), pp. 17*).—In the examination of 30 samples of lime juice purchased throughout Canada only 5 were found to meet the requirements of the departmental standards.

Leavening agents, R. N. Hart (*Easton, Pa.: The Chemical Publishing Co., 1914, pp. 90+[3], figs. 13*).—This book is intended to give the baker a knowledge of the principles of fermentation as applied to baking, and deals with yeasts, leavening agents, salt-rising fermentation, baking powders, aerated bread, and milk powder. The nature and characteristics of yeasts, together with their selection, keeping, and tests, are considered somewhat at length. The manufacture of compressed yeast is described and the chemistry of yeast fermentation is discussed. The chemical properties and the use of baking powders are also considered, together with their manufacture.

The blanching of canned goods, R. Berg (*Ztschr. Angew. Chem., 27 (1914), No. 20, Aufsatzteil, pp. 148–152*).—The large amount of analytical data reported shows that a very considerable loss of organic matter and mineral constituents occurs when meat, fish, and especially vegetables, are boiled preliminary to canning, particularly if the blanching water is thrown away. The author concludes that a more nutritious and tasteful product can be obtained without the preliminary blanching.

Packing tea in foil containing lead, Bordas (*Ann. Falsif., 6 (1913), No. 60, pp. 566–569*).—Although analyses of a number of samples of the foils used for this purpose showed them to consist of over 90 per cent of lead, the opinion is given that the tea is sufficiently dried in the curing process to preclude any danger of plumbic solvency.

The toxicity of caffein, K. Brauer (*Ztschr. Öffentl. Chem., 20 (1914), No. 14, pp. 270, 271; abs. in Chem. Zentbl., 1914, II, No. 12, pp. 797, 798*).—The author is of the opinion that the toxicity of coffee is influenced both by the time of roasting and the chemical nature of the caffein compounds.

Preservatives and other chemicals in foods: Their use and abuse, O. Folin (*Cambridge [Mass.]: Harvard University Press, 1914, pp. 60*).—A critical summary and digest of the general question of the use of preservatives in foods. A number of suggestions are made as to work which, in the opinion of the author, is needed to settle this important question.

[Analyses of foods, drugs, and beverages], R. F. Kolb (*Ala. Dept. Agr. Bul. 61 (1914), pp. 65–85*).—Definitions and general and analytical data are given regarding a number of miscellaneous foods, drugs, and beverages.

Special food and drug analyses, 1914, R. E. Rose and L. Heimburger (*Ann. Rpt. State Chem. Fla., 1914, pp. 138–167*).—Tabulated data are presented regarding analyses of 146 samples of miscellaneous foods, beverages, and drugs.

Thirteenth annual report of the state food commissioner of Illinois, A. F. Jones (*Ann. Rpt. State Food Comr. Ill., 13 (1912), pp. 454, figs. 12*).—The work carried on under the state food law during the year 1912 is reviewed and information given upon a number of pure food topics. In the report of T. J. Bryan, state analyst, the results are given of the examination of 6,523 samples of various foods and food products of which 2,091 were found to be illegal. The reports of the state bacteriologist and of the district food and stock food inspectors are given, also records of prosecutions brought under the state food law, court decisions, the texts of 24 bulletins issued by the commission, tentative food standards adopted by the commissioner, rules for labeling, and the texts of several food, stock feeding, and cold storage laws.

Fourteenth annual report of the state food commissioner of Illinois, W. S. MATTHEWS (*Ann. Rpt. State Food Comr. Ill., 14 (1913), pp. 135, figs. 2*).—The work carried out by the commissioner under the state food laws during the year 1913 is briefly reviewed, and the report of J. C. Johnstone, state analyst, gives the results of the examination of 6,038 samples of miscellaneous foods, of which 2,034 were found to be illegal, and extended tabulated data regarding these samples. The text of standards adopted by the state food standard commission are given, the legal work of the commission is reviewed, and the text of three bulletins issued by the department is given.

[Food and drug inspection and analysis], W. F. COGSWELL ET AL. (*Bien. Rpt. Bd. Health Mont., 7 (1913–14), pp. 79–170*).—The work of the department during the years 1913 and 1914 is reviewed. This includes the inspection of dairies, hotels and restaurants, meat markets, slaughterhouses, bakeries, etc., as well as analyses of 433 samples of miscellaneous food products, and the reports of the inspectors.

[Food analyses and pure food topics], J. FOUST (*Penn. Dept. Agr., Mo. Bul. Dairy and Food Div., 12 (1914), No. 10–11, pp. 135*).—Information upon a number of miscellaneous pure food topics and the results of the examination of a large number of samples of dairy and food products are given.

Sixth annual report of the food and drug commissioners, F. A. JACKSON, F. W. COOK, and F. N. STRICKLAND (*Ann. Rpt. Bd. Food and Drug Comrs. R. I., 6 (1914), pp. 21*).—A review and summary of the work carried out during the year ended December 31, 1914, is given, which includes general information regarding a number of pure food and drug topics.

Fourteenth annual report of the food and drug commissioner of South Dakota, G. G. FRARY (*Ann. Rpt. Food and Drug Comr. S. Dak., 14 (1914), pp. 351*).—The work of the department as carried out covers the inspection and analysis of foods, drugs, beverages, paints, and feeding stuffs, and the inspection of hotels and public buildings. In addition to the financial statements, extended data regarding the analyses and inspections made are reported. In part of the report are reproduced a number of the bimonthly bulletins of the department which contain information upon a number of miscellaneous food and drug topics.

[Pure food topics and food and drug inspection], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul. 3 (1915), No. 16, pp. 265–288*).—This bulletin presents the results of the inspection of 678 grocery stores, the score of each place inspected being given. A list of beverages registered for the year 1915 and information regarding several proprietary medicines examined conclude the publication.

Department rulings relative to food and dairy products and their labeling (*[Columbus]: The F. J. Heer Printing Co., 1914, 1. ed., pp. 30*).—The text is given of the rulings of the Ohio Agricultural Commission.

The food inspector's handbook, F. VACHER (*New York: D. Van Nostrand Co., 1913, 6. ed., rev. and enl., pp. 311, pls. 19, figs. 77*).—This is the sixth edition of a publication previously reviewed (E. S. R., 17, p. 576). It is stated that the publication has been greatly revised and enlarged and the number of illustrations increased.

The commercial aspect of electric cooking and heating, T. P. WILMSHURST (*Jour. Inst. Elect. Engin. [London], 51 (1913), No. 220, pp. 180–201, pl. 1, figs. 6*).—Electric cooking and heating are considered in detail and data are given to show the increased efficiency of electric over coal- or gas-fired ovens. The loss in weight of different kinds of meat was apparently less with electric cooking and the flavor of the product claimed to be vastly superior.

A specially shaped kettle for heating water is described in which it is stated that 3 pt. of water can be boiled in six minutes with an efficiency of over 98 per cent. Other pieces of electrical apparatus are described which tend to show the economy of electric cooking.

The questions of heating water and house heating are also taken up to some extent. The paper is followed by a discussion.

Electric cooking on a large scale, W. SCHULZ (*Elektrotech. Ztschr., 34 (1913), No. 29, pp. 821–825, figs. 13*).—Two large electric kitchens, each capable of providing food for 200 to 300 people, are described in detail. Efficiency experiments were conducted in one of these from which it was determined that the energy consumption per meal (½ pt. soup, 6¼ oz. meat, 5½ oz. potatoes, 2½ oz. other vegetables, 0.075 pt. milk, and 0.42 pt. coffee) averaged 0.394 kilowatt hour.

In addition to the large electrically heated ovens, it is a noticeable feature that the saucepans or boilers are one-piece nickel-plated utensils provided with bottom and also side heating elements. The heating elements are inclosed in an outer nickel-plated shell provided with an air valve to prevent excessive pressure.

The usefulness of nickel cooking utensils, V. GHEORGHIU (*Ber. Deut. Pharm. Gesell., 24 (1914), No. 6, pp. 303–308; abs. in Chem. Zentbl., 1914, II, No. 15, p. 945*).—Pickled cucumbers and beef, after boiling two hours in a nickel dish, gave on analysis the following amounts of nickel: Pickles, 107.4 mg.; liquid from pickles, 135.6 mg.; and cooked beef no nickel per package of the original weight of foods.

Kitchen ventilation for a modern hotel (*Heating and Ventilating Mag., 12 (1915), No. 1, pp. 13–18, figs. 5*).—A detailed description of the ventilating system of a modern hotel, with special reference to the kitchen, is given.

Dollar luncheons to serve four people (*Springfield, Mass.: The F. A. Bassette Co., 1914, pp. 34*).—A menu appropriate to each month of the year, together with recipes and cost data, is given. It is stated that these luncheons can be served for 25 cts. per person or less, under some conditions.

Feeding of Arab soldiers, J. AMAR (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 24, pp. 811–814*).—Information is given regarding the rations of the soldiers. The relationship between food and muscular activity with reference to troops is also discussed.

Studies of the protein minimum, M. HINDHEDE (*Skand. Arch. Physiol., 30 (1913), No. 1–3, pp. 97–182, figs. 4*).—In this paper a summary and digest of the literature regarding the protein requirement of the body is given and the author reports the results of a large number of metabolism experiments. From these results and those of observations made upon members of his own family who received a low protein diet for several years he concludes that the need of protein increases almost directly with the energy consumption. He recommends a low-protein diet.

Studies of unbalanced diets, P. TACHAU (*Biochem. Ztschr., 65 (1914), No. 3–4, pp. 253–272, figs. 4; abs. in Zentbl. Biochem. u. Biophys., 17 (1914), No. 13, pp. 479–480*).—The results are reported of experiments in which laboratory animals (mice) were maintained for some time upon an exclusive diet of rye bread, during which period their weight curves showed only slight variations. The addition of fats and carbohydrates to the diet in such amounts as to give an unbalanced ration resulted in a decline in the weight and general nutritive condition of the animals. Similar results were obtained by feeding an excessive amount of inorganic salts.

The influence of restricted rations on growth, E. B. Hart and E. V. McCollum (*Jour. Biol. Chem., 17 (1914), No. 2, Proc., pp. XLIV, XLV*).—Feeding experiments with laboratory animals (rats and swine) have shown that a ration limited to the wheat kernel and distilled water is insufficient to maintain growth. Considerable growth was obtained when a salt mixture consisting of potassium phosphate, potassium citrate, and calcium lactate was added to the wheat ration, though after a time growth ceased and the animals began to lose weight. These results seem to harmonize with the theory that the wheat kernel contains a toxic substance the injurious character of which is greatly diminished during the germinating process, and that failure to grow is not due entirely to the incomplete nature of the wheat protein.

Constancy of the content of phosphorus lipoids in the total organism—lipoid content during growth, A. Mayer and G. Schaeffer (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 1, pp. 102–105; abs. in Chem. Zentbl., 1914, II, No. 17, p. 1058*).—Experiments with a large number of warm- and cold-blooded animals indicate that the lipoid phosphorus content for organism of the same species is very constant, and that both lipoid phosphorus and cholesterol vary but little during growth.

Constancy of the content of fatty acids and cholesterol in the total organism.—Estimation of fatty reserves, E. F. Terroine (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 1, pp. 105–108; abs. in Chem. Zentbl., 1914, II, No. 17, p. 1058*).—Analytical data show that the fatty acid content of normal animals is variable while that of animals of the same species dead of starvation is very constant. The difference between these two values is the fatty acid reserve. The amount of cholesterol contained per kilogram of body weight of starving animals is also constant.

Fat intoxication, O. Weltmann (*Wiener Klin. Wchnschr., 27 (1914), No. 27, p. 971; abs. in Zentbl. Physiol., 29 (1914), No. 1, p. 42*).—Continued experimental feeding of fats produced hemolysis and the presence of a lipoidlike substance in the blood. As this did not occur with the incorporation of fatty acids, such as from 1 to 2 gm. of oleic acid, it is concluded that the mechanical digestion of fats in the intestinal tract produces hemolytically active end products which under certain conditions, such as injury to the intestinal membrane, may pass into the blood.

Observations on creatin and creatinin, P. A. Shaffer (*Jour. Biol. Chem., 18 (1914), No. 3, pp. 525–540*).—From a large number of analyses of muscle, the results of which are here reported, the author draws the general conclusion that the creatinin of the urine is derived from the creatin of the muscles.

The effect of salts and other ions upon oxidative processes in the body.—I, Introductory statements, N. Zuntz (*Ztschr. Balneol., Klimat. u. Kurort Hyg., 6 (1913), No. 12, pp. 333–336*).—The work of other investigators having shown that the salt content of water very decidedly influences the oxidative processes in the embryo cell qualitatively and quantitatively with respect to the respiratory quotient and the oxygen consumption, experiments were undertaken by the author and his associates to determine whether a similar influence on cell life of higher organisms could be brought about by concentration and mixing of ions in the cell contents.

The experimental data accumulated made it clear, according to the author, that the increased respiratory quotient observed is not due to the increased work of digestion but to the direct metabolic effect of the circulating salts.

Experimental studies of the effect of salts upon respiratory metabolism, II, W. Mäder (*Ztschr. Balneol., Klimat. u. Kurort Hyg., 6 (1913), No. 13, pp. 363–375*).—The problem studied was to determine whether or not certain changes in the mineral content of the body and the food would bring about changes in the normal relation of the oxidative processes of carbohydrates and fat.

Experiments which were made with a dog weighing 18 kg. and extending over 6 months showed that while there were variations in the different tests they were neither large nor uniform enough to predicate a specific effect on the combustion processes in the animal body and the extent of such processes ascribable to the specific action of one or the other of the metal ions under consideration. In the different periods, sodium chlorid, meat ash, potassium chlorid, calcium chlorid, and magnesium chlorid, were given and the respiratory quotient studied.

The details are reported in full.

On the average composition of the alveolar air and its variations during the respiratory cycle, A. Krogh and J. Lindhard (*Jour. Physiol.*, *47* (*1914*), *No. 6, pp. 431–445, figs. 7*).—A new method is described for determining the average composition and the variations in composition of alveolar air taking place during an expiration. A discussion of the accuracy of the method in its practical application is included.

Respiratory exchange in dry and humid atmospheres with and without ventilation, E. Socor (*Compt. Rend. Soc. Biol.* [*Paris*], *76* (*1914*), *No. 19, pp. 873–875; abs. in Zentbl. Biochem. u. Biophys., 17* (*1914*), *No. 11–12, p. 415*).—Metabolism experiments with tubercular laboratory animals (guinea pigs) showed a decreased output of carbon dioxid when the animals were maintained in a warm, humid, unventilated atmosphere. Ventilation increased the carbon dioxid production.

ANIMAL PRODUCTION.

Utilization [of prickly pear] as fodder for stock, T. H. Johnston and H. Tryon (*Rpt. Prickly Pear Travel. Com., Queensland, 1912–1914, pp. 35–37, 52, 53, 89, 113, pl. 1*).—A review of the work of experiment stations in South Africa, southern Europe, Mexico, and Australia on the feeding value of prickly pear.

It appears that cattle, horses, goats, hogs, and ostriches can be maintained on a ration of pear and can thrive on it if supplemented by grain or alfalfa. It is said that unless care be exercised, purging of animals frequently occurs. Also the small spines from the fruit penetrate the tongue and jaws and give rise to inflammation, which may extend even to the stomach and cause death. It is stated that the attempt to ensile prickly pear has not been satisfactory, although it is thought better results could be obtained if the fruit was mixed with alfalfa, hay, or oat chaff.

Analyses are given for both the fresh and the dried fruit of six different varieties of the pear.

Chemical composition of weeds as feed and fertilizer material, M. Kling (*Landw. Vers. Stat., 85* (*1914*), *No. 6, pp. 433–470*).—Analyses are given of *Convolvulus arvensis*, *Chenopodium album*, *Stellaria media*, *Cirsium arvense*, *Sonchus oleraceus*, and *Mercurialis annua*, together with a brief discussion of their feeding value.

Manufacture of fodder from waste sulphite-cellulose lyes, J. König (*French Patent 469,768, March 19, 1914; abs. in Jour. Soc. Chem. Indus., 34* (*1915*), *No. 1, p. 47*).—"Waste sulphite lye is mixed with the residual liquid obtained in the treatment of wood with dilute alkalis and acids, with the aid of heat and pressure, and the mixture is evaporated, neutralized, and freed from sulphurous acid; the product can be used as a cattle feed. The sulphite lyes may be submitted to a preliminary treatment with acid or alkali, which enables them, after neutralization and separation of sulphurous acid, to be evaporated separately; this product also can be used as a feed by itself. The residual liquid obtained from the acid and alkali treatment of cellulose may be treated for the extraction of resins, tannin, sugar, etc., before being mixed with the sulphite liquor."

Commercial feeding stuffs, B. B. Ross (*Ala. Dept. Agr. Bul. 61* (*1914*), *pp. 5–61*).—Analyses are reported of cotton-seed meal, shorts, bran, screenings, molasses feed, middlings, ship stuff, dried-beet pulp, alfalfa meal, and various mixed and proprietary feeds. There is included the text of the state feeding-stuffs law and definitions for the various feeding stuffs.

Commercial feeding stuffs, J. P. Street et al. (*Connecticut State Sta. Rpt. 1914, pt. 4, pp. 199–226*).—Analyses are given of the following feeding stuffs: Cotton-seed meal, linseed meal, bran, middlings, corn gluten feed, corn gluten meal, hominy feed, corn, corn meal, buckwheat middlings, malt sprouts, dried brewers' and distillers' grains, dried-beet pulp, molasses feed, fish scrap, shredded alfalfa, cacao shells, soy beans, soy-bean fodder, silage corn, and various mixed and proprietary feeds.

The breeding and improvement of domestic animals, P. Diffloth (*Zootechnie Spéciale. Élevage et Exploitation des Animaux Domestiques. Paris: J. B. Baillière & Sons, 1914, 3. ed., pp. 610, figs. 183*).—This volume, which is one of the series entitled *Encyclopédie Agricole*, is a general treatise on the breeding, feeding, care, and management of cattle, sheep, goats, swine, and horses.

The Argentine live-stock industry in the principal production centers, Pfannenschmidt (*Ber. Landw. Reichsamte Innern, No. 33* (*1914*), *pp. 164*).—A complete statistical review of the live-stock industry in Argentina.

[Animal production], E. G. E. Scriven and T. Weedon (*Ann. Rpt. Dept. Agr. and Stock* [*Queensland*], *1913–14, pp. 36–39, 148–160, pls. 8*).—A statistical and general review of the live-stock situation in Queensland.

Judging of live stock, J. Ginieis (*Zootechnie Spéciale. La Connaissance du Bétail. Paris: Libr. Sci. Agr., 1912, pp. XIX+332, figs. 36*).—A general treatise on the desired points of conformation to be sought in judging horses, cattle, sheep, and swine, together with information on the characteristics of the dentition of each and methods of determining age.

The problem of early maturity in breeding from the biological standpoint, R. Müller (*Deut. Landw. Tierzucht, 18* (*1914*), *No. 1, pp. 2–5; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 5, pp. 654–656*).—From the observations of the author and other investigators it appears that early maturity is not entirely dependent upon nutrition, which is its principal determining factor, but is also influenced to a great extent by the activity of the internal secretory glands. While there seems to be no relation between increase in weight or volume of the digestive organs and early maturing, there appears to be a connection between the physiological activity of the digestive organs and early maturity. It appears that the early maturity of the sexual organs and that of the body in general may be independent of each other, for example the combination of high milk yield and early maturity in the same animal seen in the Bates strain of Shorthorns. The effect of early maturity on the length of life of the animal and the period of certain physiological functions has not been fully determined.

Experimental studies in artificial fecundation, A. Pirocchi (*Indus. Latt. e Zootec., 12* (*1914*), *No. 20, pp. 307–309*).—Successful experiments are reported in which cows were artificially impregnated with from 5 to 14 cc. of sperm from 15 minutes to 8½ hours old and at temperatures varying from 20 to 35° C.

Net energy values of feeding stuffs for cattle, H. P. Armsby and J. A. Fries (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1915), No. 6, pp. 435–491, figs. 2*).—In this paper are reported the results of 76 experiments at the Pennsylvania Institute of Animal Nutrition in cooperation with this Department, using the respiration calorimeter and 9 steers in which the balance of matter and of energy was determined. These experiments were carried out during the years 1902–1912, inclusive, and those to the end of 1907 have been previously reported in full from other sources (E. S. R., 15, p. 799; 17, p. 579; 19, p. 866; 25, p. 872; 28, p. 68; 30, p. 268).

It is said that the losses of feed energy from the animal are of two classes, (1) losses of unused chemical energy in the feces, urine, and methane; and (2) losses in the form of heat due to the increased metabolism consequent upon the ingestion of feed. As to the first class it was found that "the losses of energy in methane and urine were relatively greater on light than on moderately heavy rations. Neither the losses of energy in the feces nor the total losses showed a distinct relation to the amount of feed consumed. Individual differences between animals had no very material influence on the losses of chemical energy. The losses of energy in methane may be computed approximately from the amount of total carbohydrates digested. The metabolizable energy per kilogram of digested organic matter showed but slight variations within the same class of feeding stuffs."

As to the second class it was found that "the heat production is notably greater during standing than during lying, and the difference is greater on heavy than on light rations. The increment of heat production during standing is affected by the individuality of the animal and by the kind of feed consumed. An approximate partial analysis of the heat production of the animal into its principal factors is attempted. The average energy expenditure consequent upon the consumption of 1 kg. of dry matter is reported for 11 different feeding stuffs. The expenditure of energy arising from the consumption of the coarse feeds is not on the whole materially greater than in the case of the concentrates. The increased muscular work of the digestive organs appears to be a relatively small factor of the increased heat production. A scrub steer showed a somewhat greater increment of metabolism consequent upon feed consumption than did a pure-bred beef animal."

A summary of the average net energy values obtained in these experiments for the following feeding stuffs is given as timothy hay, 1,072 calories; red clover hay, 1,039; mixed hay, 934; alfalfa hay, 752; maize stover, 887; maize meal, 1,893; wheat bran, 1,334; grain mixtures, 1,737 and 1,848; and hominy chop, 2,157 calories per kilogram of dry matter.

A method is outlined for computing net energy values, in the absence of direct determinations, from metabolism experiments or from the data of ordinary feeding tables.

Related experiments of others are reviewed, and a bibliography of cited literature is appended.

Feeding experimental animals on grass tree, C. J. Pound (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1913–14, p. 112*).—Two 12-month-old calves were fed chopped grass tree varying in amounts from 3 to 6 lbs. per day, mixed with a small quantity of bran, without deleterious effects. The calves gained in weight.

Origin of the Aberdeen-Angus and its development in Great Britain and America (*Chicago: American Aberdeen-Angus Breeders' Assoc. 1914, pp. 36*).—A history of this breed of cattle, together with notes on the principal families. A bibliography of literature on the breed is included.

The story of the Herefords, A. H. Sanders (*Chicago: The Breeder's Gazette, 1914, pp. 1087, pl. 1, figs. 278*).—An account of the origin and development of the breed in Herefordshire, and a sketch of its early introduction into the United States and Canada and subsequent rise to popularity in the western cattle trade, with sundry notes on the management of breeding herds.

Sheep breeding, F. W. Wilson (*Arizona Sta. Rpt. 1914, pp. 352–356, 358*).—A brief report is given of the sheep breeding experiments which have been in progress since 1906. In these experiments the Tunis, Shropshire, Hampshire, Rambouillet, Oxford, Dorset, Navajo, and native breeds have been used in various combinations. It is said that the first generation of Tunis and native half-blood is the most promising cross to date.

A table is given showing the average weights of the sheep at birth, six months, and one year, with the weight of the fleece for all crosses numbering six or more individuals. A total of 448,223 lbs. of wool shipped in February and March weighed 452,852 lbs. when sold in the Boston market, due to the gain in moisture.

Are sheep profitable in Maine? C. D. Woods (*Maine Sta. Bul. 236 (1915), pp. 59–61*).—This is a preliminary report of an experiment undertaken at Highmoor Farm for the purpose of ascertaining whether or not hay and pasturage can be profitably marketed through sheep under Maine conditions.

Production and price of wool, E. Payen (*Écon. Franc., 43 (1915), I, No. 3, pp. 70–72*).—This is a statistical review of the wool production of the world.

The value of distillers' dried grains in swine feeding operations, E. S. Good and W. V. Smith (*Kentucky Sta. Bul. 190 (1915), pp. 5–18*).—The object of this experiment was to determine the value of distillers' dried grains in swine-feeding operations as a supplement to pasture, to corn meal and pasture, and to corn meal fed in the dry lot.

Four lots of from 10 to 15 shoats, weighing approximately 68 lbs., were fed 73 days as follows: Lot 1, distillers' dried grains and pasture (oats, rape, and pigweed); lot 2, corn meal and pasture; lot 3, corn meal and distillers' dried grains 5:1, and pasture; and lot 4, corn meal and distillers' dried grains 5:1 in dry lot. They made average daily gains of 0.456, 0.931, 1.027, and 0.883 lbs. per pig, consuming 3.68, 3.44, 3, and 4.44 lbs. grain per pound of gain, at a cost of 4.97, 4.95, 4.27, and 6.32 cts. per pound of gain (corn meal costing $28.78 per ton, distillers' dried grains $27 per ton) for the respective lots. Figuring that 85 per cent of the fertilizing constituents of the different feeds passed through the animals, it is estimated that the total value of the manure was $14.72, $8.99, $12.24, and $10.40 for the respective lots, or about 41 cts. for each 100 lbs. of grain fed.

The pigs did not relish distillers' dried grains alone, as they ate on the average only 1.68 lbs. daily, although given all they would eat. As a grain supplement to pasture, however, distillers' dried grains proved of value in this experiment as a gain of nearly 0.5 lb. per head per day was obtained on an otherwise unprofitable pasture.

The value of wheat as a feed for swine, E. S. Good and W. V. Smith (*Kentucky Sta. Bul. 190 (1915), pp. 19–27*).—The object of this experiment was to determine the value of wheat alone and with a nitrogenous supplement as a feed for swine, and also to determine the form in which wheat can be fed to the best advantage.

Four lots of about 10 shoats each, weighing approximately 105 lbs., were fed 62 days as follows: Lot 1, whole wheat soaked; lot 2, ground wheat dry; lot 3, ground wheat soaked; and lot 4, ground wheat and tankage 14:1. They made 1.5, 1.72, 1.68, and 1.78 lbs. average daily gain per pig, consuming 4.26, 3.74, 3.82, and 3.59 lbs. of grain per pound of gain, costing 5.67, 5.36, 5.47, and 5.38 cts. per pound of gain, and giving a net profit per bushel of grain of 39.7, 50.1, 47, and 50.8 cts. for the respective lots. It is concluded that ground wheat fed dry gave slightly better results than ground wheat soaked; that it pays to grind the wheat; and that little profit was realized in adding tankage to the ground wheat in the proportion of 1:14. It is believed that a proportion of 1:10 would have been more satisfactory. It is estimated that for each bushel of wheat fed 21.5 cts. worth of fertilizer was produced. It is said that more economical results would have been obtained had these pigs had the run of a forage crop and the grain limited to about 2.5 per cent of their weight for two or three weeks before going to the market.

Pig feeding experiments, J. M. Scott (*Florida Sta. Rpt. 1914, pp. XIX–XXII*).—Three lots of five 87-lb. pigs each were fed 31 days as follows: Lot 1, shelled corn and Dwarf Essex rape; lot 2, shelled corn and ground velvet beans 3:1 and rape; and lot 3, shelled corn and ground velvet beans 1:1 and rape. They made average daily gains of 0.31, 0.23, and 0.2 lb. per head, consuming per pound of gain 18.35, 24.59, and 28 lbs. of feed, at a cost of 11.1, 13.4, and 12.6 cts. per pound of gain for the respective lots.

Five lots of four 63-lb. pigs each were fed 30 days as follows: Lot 1, corn alone; lot 2, corn and cracked velvet beans 3:1; lot 3, corn and cracked velvet beans 1:1; lot 4, corn and cracked velvet beans 1:1 and iron sulphate; and lot 5, corn and cracked velvet-bean meal 3:1 and iron sulphate. They made average daily gains of 0.46, 0.63, 0.56, 0.52, and 0.53 lb. per head, consuming per pound of gain 6.55, 4.8, 5.37, 5.74, and 5.63 lbs. of feed, at a cost of 11, 6.7, 5.7, 6.1, and 7.9 cts. per pound of gain for the respective lots.

Care of brood sow, W. Hislop (*Washington Sta. Popular Bul. 84 (1915), pp. 4, fig. 1*).—This gives general information on brood-sow management.

Swine husbandry in Canada, J. B. Spencer (*Canada Dept. Agr., Branch Live Stock Comr. Bul. 17 (1914), pp. 72, figs. 35*).—This is a general discussion of the methods of breeding, feeding, care, and management of hogs in vogue in Canada, with especial reference to bacon production.

Studies on the physiology of reproduction in the domestic fowl.—VII, Data regarding the brooding instinct in relation to egg production, R. Pearl (*Jour. Anim. Behavior, 4 (1914), No. 4, pp. 266–288; abs. in Maine Sta. Bul. 234 (1914), pp. 284, 285*).—This paper presents data regarding variations in the manifestations of the brooding instinct in fowls. It is shown that "broodiness normally constitutes one element in the cyclical reproductive activities of the female. It recurs with greater or less regularity following periods of laying. The degree of intensity of the brood instinct, both in respect of its objective manifestations and in respect of its physiological basis, may vary considerably at different times in the life of the same individual. Broodiness in the domestic fowl is not necessarily connected with any particular season. It may occur entirely outside the regular breeding season. While ordinarily broodiness is preceded by the laying of a 'clutch' of eggs, this need not necessarily be so. Cases are cited in which well-marked broodiness occurs without antecedent laying. Well-marked broodiness behavior may in certain cases disappear very quickly. The manifestations of the brooding instinct are apparently closely connected with the functional activity of the ovary, though the precise nature of the connection has not yet been analyzed."

Studies on the physiology of reproduction in the domestic fowl.—X, Further data on somatic and genetic sterility, Maynie R. Curtis and R. Pearl (*Abs. in Maine Sta. Bul. 234 (1914), p. 287*).—In a study to determine the cause for partial or complete sterility in the fowl it was found that "birds which are hereditarily high layers may fail to make good performance records because for some anatomical reason it is impossible for yolks to enter the oviduct. Birds which ovulate, or return partly formed eggs, into the body cavity usually show the nesting instinct. The nesting records show a rhythm similar to egg records of normal birds and it seems probable that they are the normal resultant of the ovulation."

It is stated that "in case of stoppage of the duct at any level the duct on both sides of the point of stoppage passes through the same cyclic changes coordinated with the cyclic changes in the ovary as a normal unobstructed duct. The duct functions only as far as it receives the stimulus of the advancing egg. Absence of pressure from the funnel does not prevent or apparently greatly retard ovulation. Increased internal pressure may therefore be the most important factor in normal ovulation. Yolks of partly or fully formed eggs may be absorbed rapidly and in large numbers from the peritoneal surface without causing any serious derangement of normal metabolic processes."

Some physiological observations regarding plumage patterns, R. PEARL and ALICE M. BORING (*Science, n. ser., 39 (1914), No. 995, pp. 143, 144; abs. in Maine Sta. Bul. 234 (1914), pp. 281–283*).—A study was made of the plumage pattern of Barred Plymouth Rock chickens to determine the manner in which the Mendelian factor, representing the barring pattern, operates physiologically.

It was found that "all feather follicles are not capable of continually producing successive feathers for an indefinite time. In the case of the general body plumage a feather is usually not regenerated more than about three times. The precise number of successive regenerations varies with different birds and different feathers. Wing primaries seem to possess the maximum regenerative capacity. After about the third removal in the case of body feathers the follicle usually remains in a perfectly quiescent condition, taking no steps whatever toward the regeneration of a new feather.

"This failure to regenerate is, however, very definitely related to the natural molt of the bird, and in the following way: A follicle which has been absolutely inactive for a long period of time (e. g., six months) preceding the natural autumn molt of the bird produces a new feather in connection with the molt, in the same manner as does any other follicle of the body. In other words, the process of natural molting reactivates the follicle which had been brought into a quiescent state by successive feather removal.

"The precise pattern exhibited by a particular feather is, in the usual course of events, reproduced each time a feather is produced by that follicle with extreme fidelity of detail. If, however, the feather is removed from the follicle as soon as it is fully grown, thus forcing continued regenerative activity of the follicle, the pattern tends progressively to be broken up, and probably will ultimately be entirely lost as a definite pattern. The experiments have not yet gone far enough to enable us to speak positively on this latter point. A progressive breaking up of an originally definite pattern is, however, very clearly shown in a number of cases. The behavior of the color pattern in successively regenerated feathers suggests, as a working hypothesis, that the pattern factor or gene is possibly represented in each follicle by a strictly limited amount of material, and that when this is used up the pattern is lost.

"The secondary sexual feathers of the male, such as the saddle hangers, only appear as adult plumage. The same follicles which bear these feathers produce, as juvenile plumage, undifferentiated body feathers. The formation of these secondary sexual feathers is not necessarily dependent upon any normal molt. If the juvenile feather is removed from the follicle the next feather produced by that follicle will be the secondary sexual feather, and not a feather of the juvenile type. After that all further regenerations are of the sexually differentiated feather."

The measurement of changes in the rate of fecundity of the individual fowl, R. Pearl (*Science, n. ser., 40 (1914), No. 1028, pp. 383, 384; abs. in Maine Sta. Bul. 234 (1914), pp. 283, 284*).—This is a preliminary paper calling attention to a method of measuring and representing graphically changes in the intensity of ovarian activity, as indicated by rate of ovulation in the domestic fowl.

It is said that "by a simple statistical expedient it is possible to represent the changes in rate of fecundity in an individual bird as a continuous curve, of which the ordinates represent the rates of egg production on a percentage scale (0 to 100) at the time intervals plotted as abscissæ. This is done by taking, as the rate of fecundity for any given day Pn, the percentage which the actual number of eggs laid by the bird during the 21 days, of which Pn is the central day, is of 21. Put as a formula, if—

RPn=rate of fecundity (or ovarian activity as indicated by ovulation) on the day Pn,

l=an egg produced, and

Σ denotes summation between the indicated limits, we have—

$$RPn=\frac{100\left(\sum_{Pn-10}^{Pn+10} l\right)}{21}.$$

"The rates so calculated for each successive day may be plotted as a curve. . . .

"Applying this method to records of one, two, and three-year-old hens many interesting and novel points regarding ovarian activity, as expressed in ovulation, may be made out. The long-period secular cycles of production appear much more clearly and precisely than in flock mass statistics. The steady diminution in maximum rate of fecundity per unit of time after the first spring cycle in the bird's life is very strikingly shown in the great majority of cases.

"This method of measuring fecundity opens the way to the attacking in the individual of a number of problems which hitherto have only been amenable to indirect, statistical treatment. Such, for example, are the questions of relation of size of egg to rate of fecundity, the realtion between fertility (in the fowl readily measured by hatching quality of eggs) and fecundity."

Poultry department, V. R. McBride (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1915), No. 10, pp. 26–30, fig. 1*).—From records kept of the substation flock, it is estimated that the average cost of feed for a laying hen is $1.50 per hen per year, for the general-purpose breeds, such as Orpingtons, Plymouth Rocks, and Langshans. The cost for Leghorns and Anconas has been $1.35 each. The average cost of producing eggs has been 16 cts. per dozen.

In incubating and brooding trials, out of 3,000 eggs incubated 2,300 chicks were hatched. The loss of chicks during the brooding period was 8 per cent. It was found that chicks hatched from eggs weighing from 24 to 27 oz. per dozen were more vigorous and grew more rapidly than those hatched from abnormally large or very small eggs. The small eggs were about equal to the larger ones in fertility, but the chicks hatched from these were lacking in vitality. The abnormally large eggs, weighing more than 27 oz. per dozen, were low in fertility and did not hatch well.

Three lots of 40 White Leghorn pullets each were fed during a six months' period similar rations, except that cracked corn, rolled barley, and whole oats were compared as supplements to whole wheat in the grain mixture. The amount of grain consumed by the respective lots was 1,040, 1,060, and 1,000 lbs.; the amount of mash consumed 400, 360, and 430; the total cost of feed \$26.40, \$23, and \$23.60; the number of eggs laid 2,975, 2,974, and 2,574; the gain in weight 27, 32, and 17 lbs., respectively. Out of 200 eggs incubated in lot 1, 185 were fertile, from which 153 chicks were raised; lot 2, 180 fertile and 150 chicks raised; lot 3, 168 fertile and 133 chicks raised.

Two lots of 50 White Leghorn and Ancona cockerels each were fed for 12 days a fattening ration as follows: Lot 1, corn meal, wheat bran, meat meal, and skim milk, 3 : 1 : 1 : 12.5; lot 2 was given the same ration as lot 1 except that 1 lb. of bean meal was used instead of the meat meal. The net gains were 21 and 32 lbs. and the cost per pound gain 6.5 and 4.5 cts., respectively.

Eight-weeks-old Barred Plymouth Rock, White Orpington, and Black Langshan cockerels were fed a fattening ration for two weeks. The average cost of producing 2 lb.-broilers in this was was 12 cts. per pound, including labor.

[Poultry], V. R. McBride (*Washington Sta., West Washington Sta. Mo. Bul., 1 (1914), No. 7, pp. 10–13, fig. 1*).—A system of line breeding for poultry is described. Suggestions are given for the selection of eggs for incubation. A brief discussion of types of incubators and their handling is included.

The truth about the poultry business, Conboie (*San Francisco: Author, 1914, pp. 160, pls. 12*).—This is a book of practical information on the breeding, feeding, care, and management of poultry.

Making poultry pay, E. C. Powell (*New York: Orange Judd Co., 1907, pp. XII+307, pl. 1, figs. 118*).—This booklet deals with the breeding, feeding, care, and management of poultry for commercial purposes.

How I breed the 200-egg hen, T. Barron (*Philadelphia: Tom Barron Publishing Co., 1914, pp. 79, figs. 19*).—This booklet contains practical information on the feeding and care of poultry for profit.

Building up a trade in pure-bred poultry, R. Searle and T. E. Quisenberry (*Mountain Grove, Mo.: American School Poultry Husbandry, 1914, pp. 38, figs. 5*).—This booklet gives practical information on methods of marketing poultry-breeding stock, and poultry products.

Poultry keeping, Agnes Kinross (*West of Scot. Agr. Col. Bul. 64 (1914), pp. 113–171, pls. 16*).—This bulletin contains general information on the breeding, feeding, care, and management of poultry, including chickens, turkeys, and ducks, and suggests desirable rations for both summer and winter. Methods of fattening and preparing for market are described.

Turkeys, Helen D. Whitaker (*Washington Sta. Popular Bul. 86 (1915), pp. 8*).—This treats of the breeding, feeding, care, and management of turkeys.

The practical production of game animals, A. Blanchon (*L'Élevage pratique du Gibier. Paris: Larousse, 1914, pp. 284, figs. 176*).—This is a treatise on the breeding, care, and management of game animals, including birds, deer, fox, rabbits, and other animals.

DAIRY FARMING—DAIRYING.

[Dairy feeding experiments], F. W. Wilson (*Arizona Sta. Rpt. 1914, pp. 357, 358*).—Four cows on alfalfa pasture produced a total of 1,089.1 lbs. of milk during a 7-day period, while the same cows on dry feed (alfalfa hay at the rack, wheat bran 7 lbs. and rolled barley 1.5 lbs. daily) produced 1,097.6 lbs. Three of the cows gained in milk yield on dry feed and one lost. Two lots of 9 cows each, were fed two weeks a ration of alfalfa hay, dried beet pulp, and wheat bran, lot 1 being then continued on the same feed for two weeks longer, while lot 2 was fed for two weeks on beet pulp and alfalfa hay. During these last two weeks lot 1 fell off 156 lbs. in milk yield, and lot 2 316 lbs. The loss of lot 1 is thought to be the normal loss due to advancement of the period of lactation and other natural causes. It is estimated that the actual saving by feeding beet pulp instead of beet pulp and bran was $3.72 in two weeks.

Body form and milk yield, E. AUGUSTIN (*Flugschr. Deut. Gesell. Züchtungsk., No. 33* (*1915*), *pp. 32*).—A general treatise on the relation of body form to milk yield.

Holstein-Friesian makes world's dairy record (*Breeder's Gaz., 67* (*1915*), *No. 13, p. 671*).—It is announced that the Holstein-Friesian heifer Finderne Holingen Fayne has broken all world records for fat production by producing in 365 consecutive days 24,612.8 lbs. of milk containing 1,116.05 lbs. of fat. She freshened at 3 years and 4 months and weighs 1,450 lbs., an increase of 250 lbs. during the period.

Report of four years' work of the North Dakota Holstein cattle breeding circuit, J. H. SHEPPERD and W. B. RICHARDS (*North Dakota Sta. Bul. 109* (*1914*), *pp. 93–158, figs. 16*).—A general account of the organization, management, and progress of the North Dakota Holstein cattle breeding circuit, which is being conducted in cooperation with the station and the U. S. Department of Agriculture. Detailed records are appended.

The development of the dairy products industry in Minnesota, M. J. ANDERSON, edited by E. V. ROBINSON and J. G. WINKJER (*Minn. Dairy and Food Dept. Bul. 52* (*1914*), *pp. 61, figs. 8*).—This reviews the development of the dairy industry in Minnesota and discusses its present status.

Cost of milk, W. A. LINKLATER (*Washington Sta., West. Wash. Sta. Mo. Bul., 2* (*1915*), *No. 10, p. 13*).—From records kept during a 12-month period of a herd of from 12 to 16 head of cows, the computed cost of milk was $9.89 per month per cow, or 3.9 cts. per quart. The cost of feed and pasture for the entire herd for the year was estimated to be $720.16, and of labor $770.

From experiments conducted in cooperation with a condensed milk concern, it was concluded that contamination of milk after it is drawn is the cause of inferior quality for condensing purposes rather than the feed eaten by the cow.

The useful and harmful bacteria of milk, R. PFISTER (*Milchw. Zentbl., 43* (*1914*), *No. 18, pp. 466–469*).—In this article the author discusses the value of kefir, kumiss, and various other sour milk drinks and differentiates between the beneficial bacteria contained in these milks and the harmful pathological bacteria often found in milk.

The devitalization of tubercle bacilli in milk by means of electricity, F. C. LEWIS (*Tuberculosis Year Book, 1915; abs. in Jour. Bd. Agr.* [*London*], *21* (*1914*), *No. 9, p. 844*).—Experiments conducted at the University of Liverpool demonstrate that electricity can be successfully applied as a sterilizing agent in milk. It is claimed that the total bacterial count is greatly reduced, all *Bacillus coli* and its allies are destroyed, tubercle bacilli are destroyed, no chemical changes in the milk can be detected, and the taste of the milk is unaltered.

Regulations governing food establishments; rules on dairies and the score-card system of dairy inspection, with suggestions to dairymen (*Agr. Com. Ohio, Bur. Dairy and Sanit. Insp. Bul. 1* (*1913*), *pp. 13*).—This bulletin gives the rules adopted by the State of Ohio relating to dairies and the score card system of dairy inspection, with suggestions to dairymen.

Milk quality as determined by present dairy score cards, J. D. BREW (*New York State Sta. Bul. 398* (*1915*), *pp. 107–132, figs. 2*).—The results of a comparative study made of the bacterial content of the milk and the scores of 34 commercial dairies as determined by the Cornell card, the official card approved by the Dairy Instructors' Association, and the New York City card, indicate that no correlation whatever exists between the quality of the milk so far as it could be determined by laboratory methods and the score as expressed by any one of the three cards. The apparent reason for this lack of relationship is that a large number of the items included on the score card have little or no effect upon the number of bacteria present in the milk, there being too great emphasis placed upon unessential factors in the score cards, with a consequent lessened emphasis upon the factors which actually do affect the milk.

While not denying the value of dairy score cards, the author believes that the results of this investigation show that present score cards can not be satisfactorily used as a means of grading milk according to quality.

Some variation was found in the relative position of the various dairies when scored simultaneously with all of the cards. In general, however, the scores secured by using the Cornell card were the most lenient, while those secured by using the New York City card were the most severe.

What causes contribute to the loss of the cream line on pasteurized milk in bottles, C. H. Kilbourne (*Cream. and Milk Plant Mo., 3 (1915), No. 8, pp. 11–20*).—Because of complaints that the volume of cream on bottled pasteurized milk was decreased and the distinctness of demarcation between the cream and the milk injuriously affected, tests were made by the Board of Health of New York City to determine the cause of these difficulties.

The results indicate that when milk is cleaned by a centrifugal clarifier the volume of cream in the milk is reduced from 2 to 3 per cent. It was evident that the volume of cream in bottled milk is influenced by various factors, among which are included the temperature to which the milk is heated, the length of time for which milk is held at the high temperature, the temperature of the heating medium with which the milk comes in contact during the heating process, the clarification of the milk, the type of apparatus used in treating the milk and the amount of agitation to which the milk is subjected, especially when hot. This last factor appears to be one of the most important. It is believed that under the most favorable circumstances heating to 145° F. and holding for 30 minutes may be done without any injurious effect upon the cream line, but it has been deemed best to reduce the required temperature to 142° in order to allow for uncontrollable factors which may tend to offset the volume of cream.

Factors influencing the quality of milk for condensing purposes, W. A. Linklater (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1914), No. 9, pp. 2–5*).—From studies made of the station dairy herd fed rations consisting of alfalfa hay and grain, supplemented by green oats and vetch, mangels, turnips, kale, and corn silage, it was concluded that variations in the quality of the milk were due to bacteria getting into the milk after it was drawn rather than to the kind of feed used, provided this was of good quality.

It was found that following rain, when the yard became muddy, the bacterial count increased. The cows got their flanks and udders soiled with mud, and in spite of careful wiping the quality of the milk was lowered. Poorly washed and unsterilized milk utensils were demonstrated to be a source of infection. The bacterial count increased from two to three times in the course of three or four hours even when the milk was aerated and cooled down to a temperature of about 60° F. A lowering of the quality of the milk followed exposure to dust, the drop in quality being especially marked on windy days, or when the feeding of silage, straw, or hay was done at the time of milking.

Care of cream on the farm and ice house construction, C. W. FRYHOFER (*Bul. Vt. Dept. Agr., No. 20 (1914), pp. 31, figs. 9*).—The subjects discussed in this bulletin are the relation of the quality of butter to the quality of cream, the importance of cleanliness, temperature, thickness of cream, frequency of delivery at the creamery, methods for cooling cream on the farm, specifications for making the cream-cooling box, ice storage, ice houses, variations in the patron's cream test, relations between the patron and creamery, and overrun.

Two factors causing variation in the weight of print butter, H. M. PICKERILL and E. S. GUTHRIE (*New York Cornell Sta. Bul. 355 (1915), pp. 99–111, figs. 3*).—As the result of their studies of the causes of variation in the weight of print butter the authors found that "the variation of pore space, which ranges from 0.5 to over 6 per cent in freshly made butter, is important in the printing process. Print butter gradually loses weight in storage. The rate of loss depends principally on the temperature and humidity of the storage room. If the temperature is kept down to 50° F. and the humidity is kept above 90 per cent, at least a month, and perhaps much longer, will be required for the shrinkage to approximate the limit set by law, provided the prints are packed in boxes. If the temperature is 60° or above and the humidity is 85 per cent or below, the shrinkage will approximate the limit set by law in a space of 10 days to 2 weeks, even if the prints are packed in boxes.

"The degree of shrinkage is not inversely proportional to the weight of the wrapper used, as is generally supposed. The degree of shrinkage decreases to a considerable extent when the prints are placed in cartons. The other two methods of packing, however, leaving the prints dry after placing them in boxes or sprinkling them with water, produce about the same effect on the degree of shrinkage. In the average small-store refrigerator the loss will approximate the limit set by law in a space of 10 days when the prints are piled loosely on shelves."

Mechanism of overrun in the manufacture of ice cream, M. MORTENSEN (*Cream. and Milk Plant Mo., 3 (1915), No. 8, pp. 21, 22*).—The author discusses the factors determining the amount of overrun in the manufacture of ice cream, among them the viscosity and temperature of the cream used, the temperature of the ice cream when drawn from freezer, the fillers used, and the temperature of the brine.

It is stated that pasteurization reduces the viscosity of milk and cream, and pasteurized cream, if used soon after pasteurization, will not retain as much air and the yield is accordingly reduced. The body of the ice cream is also coarser. Pasteurized cream, due to its lower viscosity, affords less resistance to churning, and hence during the freezing process butter particles are formed, which, in turn, reduce the viscosity of the mix and the yield. By holding the cream at within a few degrees of freezing temperature for not less than 24 hours after pasteurizing, the viscosity is increased and the formation of butter particles is less prominent.

A cream produced from milk containing small fat globules is deemed most satisfactory for ice-cream making, hence the value of strippers' milk and of cream from milk produced by the Holstein breed. Homogenization increases viscosity, and such cream is frozen without the formation of butter granules and therefore a greater yield and a smoother ice cream is obtained.

It is said that the principal advantages obtained from fillers are the increase in viscosity of the mix, the prevention of formation of butter particles during the freezing process, and the fact that they add strength to the cream films surrounding the moisture particles, thus insuring a body possessing better keeping properties. It is thought that fillers do not increase the yield obtained, but it is believed possible to increase the yield by prolonging the freezing process, and thus incorporating the air into the cream to which the filler has been added.

Sanitary code for ice cream manufactories (*[Columbus], Ohio: Agr. Com. Ohio, Bureau of Dairies, 1914, pp. 4*).—This gives the sanitary code of Ohio for ice-cream manufactories.

Method of making Swedish Emmental and large-celled Swedish Estate cheese, L. F. ROSENGREN (*Centralanst. Jordbruksförsök Flygbl., 47 (1914), pp. 7, figs. 6*).—The author gives detailed directions for the making of these two varieties of cheese, and discusses various factors which influence the texture of the cheese, notably the feed and the quality of the milk.

Fat content standards for Danish types of cheese, ORLA-JENSEN (*Milchw. Zentbl., 43 (1914), No. 22, pp. 540–542*).—This article discusses the fat content of various types of Danish cheese.

Fat content in the dry matter of various sorts of Italian cheese, G. FASCETTI (*Milchw. Zentbl., 43 (1914), No. 22, pp. 538–540*).—This article discusses the fat content of Grana, Gorgonzola, and other types of Italian cheese.

Fat content of Swiss Emmental cheese, R. BURRI (*Milchw. Zentbl., 43 (1914), No. 23, pp. 556–558*).—Analyses taken of 641 samples of Swiss Emmental cheese show that the average fat content in the dry matter ranges between 45 and 50 per cent, although some samples test as low as 40 per cent.

VETERINARY MEDICINE.

An analysis of the problem of the minimal lethal dose and its relationship to the time factor, G. DREYER and E. W. A. WALKER (*Biochem. Ztschr., 60 (1914), No. 2–3, pp. 112–130; abs. in Lancet [London], 1914, I, No. 15, pp. 1023–1027; Jour. Amer. Med. Assoc., 62 (1914), No. 19, p. 1509*).—"In warm-blooded animals dosage (D) must be calculated in relation to the body surface according to the expression $D=\frac{d}{W^{0.72}}$, where D is the 'surface dose' of the drug, toxin, or antitoxic substance used, d represents the actual quantity administered, and W is the weight of the animal in grams. No method, however, at present exists by which a true comparison of the relative toxicity of different substances (or of different samples of the same substance) can be instituted. The methods hitherto employed depend on the selection of an arbitrarily fixed weight of animal and lethal time, and do not afford a rational basis for the accurate measurement and standardization of drugs, toxins, and antitoxins.

"The formula here proposed, viz. $\frac{1}{D_0-a}-\frac{1}{D_l-a}=k(T_0-T_l)$, offers a simple means of making such measurements. In this formula D_0 and D_l are the concentrations of the drug or surface doses, corresponding to the times T_0 and T_l in which the death of the animal (or other desired effect) occurs; a is a figure representing the 'noneffective' dose of the substance employed, and k is a constant to be determined for the particular substance and species of animal under investigation. The formula states that to every equal increment in time there corresponds a definite decrease in the 'active dose' ($D—a$).

"This formula is here shown to afford a satisfactory expression for all the varied and diverse experimental data to which it has been applied. The use of the formula renders it possible not only to carry out the comparison desired, but also to make use of animals of every size over a wide range of weight within a species, and all observed death times, in the standardization of toxic substances, antitoxins, and the like. By this means a great saving both of time and animal material is introduced, since an equal value, independent of the actual lethal time and weight of individual animal, can now be attached to all the experimental data.

"The results obtained will also possess a greater validity and a wider application than it has hitherto been possible to attain by the use of an arbitrary death time and a fixed standard weight of experimental animal."

See also previous work (E. S. R., 31, p. 80).

Studies in anaphylaxis, R. WEIL (*Jour. Med. Research, 30 (1914), No. 3, pp. 299–364, figs. 33*).—This series of studies includes the relation between antibody content and lethal dose in anaphylaxis, the function of circulating antibody and the avidity of cellular antibody, the relation between partial desensitization and the minimal lethal dose in anaphylaxis, and the persistence of intracellular antigen as a factor in immunity. Each of the problems is said to have an important bearing on the understanding of certain aspects of immunity.

A theoretical discussion of the share of intracellular antigen in immunity and in desensitization is appended.

The relation of vaccine therapy to veterinary practice, R. E. SPLINE (*Amer. Vet. Rev., 45 (1914), Nos. 1, pp. 19–29; 2, pp. 161–177*).—A detailed exposition.

Observations upon the standardization of bacterial vaccines by the Wright, the hemocytometer, and the plate-culture methods, E. GLYNN, MILDRED POWELL, A. A. REES, and G. L. COX (*Jour. Path. and Bact., 18 (1914), No. 3, pp. 379–400, pls. 3; abs. in Lancet [London], 1914, I, No. 15, pp. 1028–1032, figs. 4; Jour. Amer. Med. Assoc., 62 (1914), No. 19, p. 1509*).—"Four methods of standardizing vaccines have been compared—Wright's and Allen's modification of it, the hemocytometer, and the plate culture. The gravimetric will be considered on a future occasion.

"The most scientific method of enumerating the bacteria is in some form of hemocytometer chamber. An optically plane cover slip must be used with such apparatus, for it is recognized as essential when counting blood, and is still more essential when counting bacteria, where accuracy is of greater importance. Owing to the small free working distance of oil-immersion lenses, most optically plane cover slips are too thick.

"Two types of hemocytometer chamber may be employed: (a) The ordinary chamber 0.1 mm. deep with an optically plane cover slip 0.13 mm. thick. This is suitable for all oil-immersion lenses with a free working distance of 0.17 and some of 0.15 mm.; (b) a chamber of 0.02 mm. deep with a special safety trench 2.5 mm. wide, and optically plane cover slip 0.18 mm. thick. This is suitable for all achromatic oil-immersion lenses, even if the free working distance is as low as 0.09. The 0.02 mm. chamber is preferable, for the following reasons: (a) Almost all the bacteria settle at the bottom in 15 minutes, when accurate counts can be made, whereas in the 0.1 chamber a considerable number are still moving after half an hour; (b) bacteria adhering to the under surface of the cover slip or still floating in the chamber are much more easily enumerated; (c) the optical definition of the bacteria is better owing to the smaller quantity of fluid; (d) the free working distance is greater, the cover slip more durable. A weak solution of carbol thionin is the best diluting and staining fluid; unlike Giemsa it is quite free from precipitate and stains more intensely.

"In order to ascertain whether the Wright film or the 0.02 hemocytometer chamber was more accurate, two observers standardized the same emulsion by each method, and took as the practical test of accuracy the percentage deviation from the arithmetic mean of their two counts. The error for each method, as estimated in a larger series of prepared emulsions of staphylococcus, streptococcus, and colon by three pairs of observers, is remarkably similar, being on the average less than 5 per cent with a minimum of 0.5 per cent, and a maximum of 21 per cent for the chamber method, and more than 15 per cent with a minimum of 1.1 per cent and a maximum of 54 per cent for Wright's. The fact that less time was spent on counting 64 squares by the chamber method than 75 or 50 fields by Wright's still further demonstrates the superiority of the former.

"The 0.1 mm. chamber is a little less accurate than 0.02, partly owing to the difficulty of correctly ascertaining to which squares the bacteria adhering to the under surface of the cover slip belong and partly owing to the greater amount of Brownian movement. Wright's method usually greatly underestimates the strength of the bacterial emulsion, sometimes by 100 or even 200 per cent. The main reasons are, first, because large numbers of bacteria are left behind at the beginning of the smear; and, second, because small groups of bacteria mix up with blood platelets and leucocytes and are drawn to the end of the smear, where they may be unnoticed unless specially looked for with a low power. Allen's modification of Wright's method has the same defects as the original; it underestimates the emulsion to the same extent, and the error is, if anything, larger. The plate-culture method is cumbersome, and time is wasted in waiting for the colonies to develop. It also seriously underestimates the strength of the bacterial vaccines, first, because of the impossibility of obtaining a homogeneous emulsion, especially in the case of the cocci; second, because even in comparatively young cultures a large number of bacteria are moribund or dead and fail to develop into colonies. Working with most carefully prepared emulsions, we found that coli were underestimated about 5 per cent in cultures four hours old, and about 60 per cent in cultures 24 hours old, while the staphylococci were underestimated by 50 and 100 per cent, respectively, the discrepancy being greater owing to the large number of diplococci in the younger cultures.

"This paper has been written because we believe it is the duty of the bacteriologist to standardize and dispense his vaccines with as much care as is exercised by the pharmacist in standardizing and dispensing his drugs. Scientific vaccine therapy will be advanced by scientific exactness."

Observations on hemolysin production by the streptococci, H. W. LYALL (*Jour. Med. Research, 30 (1914), No. 3, pp. 515–532, fig. 1*).—At the outset stress is laid upon the fact that in spite of extensive studies on this topic our understanding of the factors responsible for the grave toxic conditions arising from streptococcic infections is still far from satisfactory. This work was therefore conducted with a view of discovering any possible correlation between hemolysin production and pathogenicity, and determinations were made of the hemolytic titer of several strains of streptococci.

It was found that "the hemolytic titer does not afford any absolute criterion of virulence. The production of a potent hemolysin in broth cultures is dependent on the nature and proportions of enriching substances, the reaction of the medium, and the time of incubation. The hemolysin appears to be closely associated with the bacterial bodies and not to be in solution. The hemolysin does not appear to be in the nature of an enzym. The hemolysin is destroyed by a temperature of 56° C. for 30 minutes. It disappears within 49 hours at incubator temperature.

"Normal sera of sheep, guinea pig, rabbit, cow, and man contain appreciable amounts of antistreptolysin. Salvarsanized sera possess a markedly increased inhibitory power on the hemolytic action of streptococci. Hemolysin production is inhibited by the addition of sugar. This occurs most uniformly in the case of dextrose. It does not appear to be definitely associated with the amount of acid produced."

On the production of precipitins, L. Hektoen (*Jour. Infect. Diseases, 14 (1914), No. 3, pp. 403–410, figs. 5; abs. in Jour. Amer. Med. Assoc., 62 (1914), No. 25, p. 1991*).—"By giving rabbits intraperitoneal injections of increasing quantities of serum or blood on three successive days a serviceable precipitating serum may be produced in about 15 days. The same quantity of antigen injected at one time also appears to give good results. The curve of the precipitin in such cases is like the simple antibody curve following a single injection of other antigens. The injection of whole blood may be more advantageous in producing more precipitins for blood proteins in general than the injection of serum only. The injection of washed human corpuscles gives rise to precipitins for human serum."

Further observations on the presence of antibodies for Micrococcus melitensis in the milk of English cows, S. L. Cummins, C. J. Coppinger, and A. L. Urquhart (*Jour. Roy. Army Med. Corps., 23 (1914), No. 1, pp. 36–41*).—In a series of seven cows examined for agglutinations two gave positive results and one of these was found to agglutinate *M. melitensis* in dilutions varying from 1:250 and 1:1,000 at different times. The milk of this cow was also investigated for opsonins and deviating substances, and it was found that "the milk, whey, and blood serum of the cow behaved toward *M. melitensis* in a manner comparable to the body fluids of animals suffering from, or immunized against, this organism. Due allowances were made for differences in concentration of 'antisubstances' and degrees of immunity."

Can bacteria circulating in the blood be eliminated through the wall of the intestine? H. Beitzke (*Ztschr. Hyg. u. Infektionskrank., 78 (1914), No. 2, pp. 228–242*).—The experiments were conducted with rabbits, each animal receiving in the ear vein six loopfuls of a 4- to 8-day-old *Bacillus prodigiosus* culture grown on potato. About one hour after the injection the micro-organisms were noted in the bile. At the same time and in some instances earlier *B. prodigiosus* was found in other parts of the intestine, but was never noted in the stomach. In most of the cases the organisms were found in the ileum and cecum. Sections of organs, but more especially parts of the alimentary tract, were examined microscopically and the bacilli were never noted alone but always inclosed in cells, mostly in leucocytes and in the liver in Kupffer cells. This supports the theory that leucocytes aid in the transportation of organisms into the intestines.

Foot-and-mouth disease, J. R. Mohler (*U. S. Dept. Agr., Farmers' Bul. 666 (1915), pp. 16, figs. 7*).—This is largely a revision of the Department's earlier publications on the subject.

Vaccination with Löffler's serum against foot-and-mouth disease, J. Matschke (*Arch. Wiss. u. Prakt. Tierheilk., 40 (1914), No. 6, pp. 516–538; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 42, p. 707*).—The results indicate that when the serum is used under the conditions specified, it will prevent an outbreak of the disease. The protection conferred, however, is not permanent. The protective value of the serum is not dependent upon the virulence of the infecting agents and 2 cc. and more of the serum when given subcutaneously will absolutely prevent the occurrence of the disease.

Tetanus: Its prevention and treatment by means of antitetanic serum, A. MacConkey (*Vet. Jour., 70 (1914), No. 473, pp. 555–576*).—An account of tetanus and its preventive and curative treatment by means of antiserum.

Regarding tubercle bacilli in the circulating blood of bovines, especially after injecting tuberculin, L. Brante (*Ztschr. Infektionskrank. u. Hyg. Haus-*

tiere, 16 (1914), No. 3, pp. 187–194).—No tubercle bacilli could be noted in the blood of 50 tuberculous cows, 3 to 14 years old, under ordinary conditions, during the febrile stage, or after subcutaneous injections of tuberculin. Consequently, there seems to be no reason to suspect that there is great danger of liberating tubercle bacilli as a result of injecting tuberculin and causing infection of the blood.

Tuberculosis, J. M'FADYEAN (*Jour. Compar. Path. and Ther., 27 (1914), No. 3, pp. 218–234*).—A discussion of the measures which ought to be put in force against tuberculosis, prefaced by a short examination of the evidence for and against the view that the disease is transmissible to man. The subject is dealt with under the headings of transmissibility of bovine tuberculosis to man; types of tubercle bacilli; the eradication of bovine tuberculosis; measures necessary to safeguard human health; and measures to be taken against breeding cattle which have reacted to tuberculin, from the point of view of international trade.

"There is one, and only one, method by which tuberculosis can be eradicated from a herd, namely, that which relies upon the systematic use of tuberculin for diagnosis, and which requires the permanent separation of nonreacting animals from those which have not been tested or which have reacted."

Tuberculosis, O. MALM (*Jour. Compar. Path. and Ther., 27 (1914), No. 3, pp. 234–237*).—A reply to the above, and a discussion in regard to the effectiveness of the various systems for eradicating tuberculosis and the results of combating tuberculosis in Norway, where the system is said to be more rigorous than in any other country.

"The herds in Norway number somewhere about 160,000, and the number of cattle about 1,000,000. The herds are thus small, many of but from one to four head, and most between 10 and 20 animals; only a few herds number up to 100 and more. It is clear that in herds that are small and which largely live on extensive mountain pastures tuberculosis must be comparatively rare, and that, therefore, the expenses for the owners in isolating, cleansing the buildings, and slaughtering tuberculous animals must be much smaller than they would be where herds are large and exclusively kept in the cattle houses. Still another peculiarity must be noted in the case of Norway. Norwegians are accustomed to drink raw milk, and in the towns milk guarantied free from tuberculosis would command the preference. . . .

"Since 1895 up to the end of 1913 there have been tested altogether in Norway 39,672 herds and 324,422 animals; that is, from about 1,500 to 3,500 herds and from about 12,000 to about 27,000 animals each year. In 1897, of 2,136 herds, tuberculosis was found in 577, or about 27 per cent, and of 24,765 beasts 2,056 were tuberculous, or about 8.3 per cent. The number of infected herds and animals has subsequently decreased for each year in such wise that in 1912, of 3,463 herds tested, tuberculosis was found in only 288, equal to 8.3 per cent, and of 20,439 animals only 829 reacted, or about 4.8 per cent."

Tuberculosis is decreasing amongst cattle in the districts where breeding is most advanced. The subcutaneous test is believed to be as good as infallible. Milk pasteurized at 85° C. is inferior from a nutritive point of view.

It is not believed that under natural circumstances the types of tubercle bacilli are independently perpetuated. "Experience seems to show that the glandular form of children's tuberculosis, which also in a greater or smaller number of cases is due to bovine infection, is most often of a benign character, and that it is only in few instances that it goes on to a malignant form or terminates as a chronic pulmonary consumption in the adult. As not all the tuberculous children die, but many live and retain their tuberculosis until they become adults, the fact that bovine types are found in the adults in so much smaller a number of cases than in children must undoubtedly be due to the types, during their presence in the organism from childhood and afterwards, having become transformed from bovine to human types."

The frequency of pregnancy in slaughterhouse cattle in relation to the supply of corpus luteum, C. P. McCord (*Jour. Amer. Med. Assoc., 62 (1914), No. 16, pp. 1250, 1251*).—As a rule the corpus luteum of pregnancy attains a much larger size than the spurious type, but this does not seem to distinguish it, because the corpus luteum in the nonpregnant subject has frequently been found to occupy four-fifths of the entire ovary, and in pregnancy the corpus luteum is at times four times smaller than the average size for nonpregnancy. As regards variation in color as a distinguishing factor, it has been found that this is simply due to differences in the amount of blood and lutein cells. Variations in color usually stand in relation to the age of the corpus luteum.

"The cattle slaughtered in the larger abattoirs are usually range cattle, the males and females being together at all times. The greater number of the cows of such herds are at some stage of pregnancy. An examination of the ovaries and uteri was made on 40 cows appearing consecutively on the killing floors, but of two lots from different parts of the country. The cows so examined were all within the calf-bearing period, but of various ages. Of the 40 cows, 35 yielded ovaries containing corpora lutea of such size as permitted dissecting out. Of these 35 29, or 83 per cent (72 per cent of the entire number), were pregnant. The corpora lutea from these pregnant cows were not uniformly large; many were identical in size and general appearance with those from the nonpregnant animals. Others were so large as to occupy five-sixths of the entire ovary.

"From this examination it may be inferred that numerically 83 per cent of corpus luteum is derived from pregnant cows. On account of the larger yield of corpus luteum from a pound unit of ovaries from pregnant animals than from the same unit of ovaries from nonpregnant animals, because of the larger average size of the former, the proportion by weight may run as high as 90 to 95 per cent of corpus luteum verum.

"These figures may vary on an examination of a larger number of cattle, and furthermore, a seasonal variation may alter the percentage of pregnancy. If the foregoing figures at all approximate the general condition, all corpus luteum preparations are derived in a high percentage from pregnant cattle."

Hog cholera, R. M. Gow (*Arkansas Sta. Circ. 25 (1915), pp. 8, figs. 8*).—A popular description of the cause and nature of hog cholera and methods of vaccinating hogs against the disease. A method of preventing worms in hogs, and a recipe for a condition powder are also included.

Notes on attenuation of virus in the blood of cholera hogs to prepare a vaccine, R. Graham and A. L. Brueckner (*Jour. Med. Research, 31 (1915), No. 3, pp. 557–568*).—The inoculation of a hog-cholera virus attenuated at 60° C. for one hour may produce hog cholera, whereas one heated for one-half hour at 60° generally produces the disease. The virus heated at 60° for one hour does not produce an immunity sufficient to protect hogs against the disease.

"The same dose of vaccine may kill, protect, or non-protect inoculated animals of the same size under similar surroundings. Virus attenuated by heat and not carbolized may retain the disease-producing properties of the original vaccine for at least 24 days. Attenuated virus is worthless in rendering swine immune to hog cholera."

The treatment of hog cholera with methylene blue, Martens (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 28, p. 497*).—Four large hogs affected with acute hog cholera received 0.75 to 1 gm. of methylene blue dissolved in water and mixed with milk, daily. On the fourth day of medication a distinct improvement was noted, and after three weeks the animals had apparently recovered with the exception of a kind of weakness of the spine.

Combating hog cholera in North America, K. SCHERN and C. STANGE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1914), No. 1–2, pp. 27–55, figs. 4*).—A concise statement regarding the methods in use for combating hog cholera in the United States, especially in the State of Iowa, including the use of serum and virus serum, and the cost of production. The results obtained in the United States by the use of the serum both in healthy and diseased herds are discussed and analyzed with much detail.

Combating hog cholera in Germany, K. SCHERN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1914), No. 3, pp. 139–153*).—The conditions in Germany and the United States in regard to combating hog cholera are compared and reasons are given why the successes are not so great in Germany as anticipated. The measures in vogue in the State of Iowa, including extension work, are described.

A guide to the dissection of the blood vessels and nerves of the pectoral and pelvic limbs of the horse, G. S. HOPKINS (*Ithaca, N. Y.: Author, 1914, pp. 54, pls. 7*).—This guide was prepared with a view to assisting students in the dissection of the blood vessels and nerves of the pectoral and pelvic limbs.

Results with the Schreiber protective and curative vaccination against strangles, KURTZWIG (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 23, pp. 399, 400*).—The action of the lymph was found to be variable, but this is accounted for by the fact that mixed infections occur which also produce a variable clinical picture. Subcutaneous injections of 10 cc. of lymph will protect horses exposed to the infection. It is necessary, however, that the animal vaccinated be in good health and that it be kept in the stall for one or two days post vaccination. As a curative vaccination a single injection of 20 cc. does not suffice.

RURAL ENGINEERING.

Irrigation investigations, G. E. P. SMITH and A. L. ENGER (*Arizona Sta. Rpt. 1914, pp. 367–372*).—In the Sulphur Spring Valley the flood discharges from Leslie Canyon were measured with the aid of a concrete submerged dam. The deductions from the results obtained are as follows:

"Flood flows of great size originate occasionally from storms on the valley slopes; flows in the canyon begin suddenly and are of short duration; the rate of loss by seepage in a sandy stream bed is high; comparatively little water from the canyon reaches the river; most of the water spreads out over grass lands and sinks into the heavy soil, a minor portion of the flow (difficult to estimate) sinks through the stream beds to the main body of ground water, and a small amount also reaches the ground water through gopher holes and joints in the soil. Most of the water flooded over the draws does not sink below the reach of the grass roots."

The results of measurements of discharge of the Santa Cruz and Rillito rivers are given.

The conclusions relative to cost of pumping for irrigation, drawn from the results of investigations on the use of oil engines for irrigation pumping are as follows: "(1) The use of Tops in place of engine distillate decreases the cost of pumping about 30 per cent. (2) The cost of pumping on a 40-ft. lift with 4 ft. depth of application varies from \$8 to \$20 per acre per year, according to whether the plant is used much or little. Under the most favorable conditions the cost of pumped water is no greater than the cost of river water. (3) The cost of pumping on a 100-ft. lift with 4-ft. depth of application varies from

$20 to $40 per acre. (4) The largest item of cost is the fixed charges. In order to reduce these charges the plant should be used as much as possible. One pumping plant should, if possible, serve two or more ranches."

Comparative tests of a new centrifugal pump and an old stock type showed the efficiency of the former to be one-third higher than that of the latter. The new pump was a horizontal single stage pump having two outboard ring oiling bearings, water sealed gland, vacuum-proof grease cup, nonoverloading enclosed impellor, and automatic water balance.

The drainage of irrigated land, R. A. Hart (*U. S. Dept. Agr. Bul. 190 (1915), pp. 34, figs. 22*).—It is the purpose of this bulletin to present in concise form the fundamental principles upon which the reclamation of water-logged and alkali lands is based, to describe typical conditions and the best methods of treating them, and to give practical advice as to actual operations.

"Drainage practice in the arid section differs greatly from that in the humid region. . . . Drainage experience in the humid section avails little in dealing with the problems of draining irrigated lands. For this reason literature on the general subject of drainage should be used with caution, as the difference in conditions between the arid and humid regions has been clearly recognized only within the last few years."

The specific objects of draining water-logged and alkali lands are "(1) to lower the ground-water table to such a depth that the moisture and air conditions within the root zone are properly balanced, (2) to provide an outlet for percolating water, so that fluctuations of the ground-water table within the root zone will be prevented, (3) to effect rapid removal of the excess moisture resulting from spring thaws, and (4) to provide an outlet for the downward moving water used to dissolve out the injurious salts. . . .

"The most important factors affecting the design of a system of drainage for irrigated land are the source and movement of the damaging water. . . . Percolating irrigation water usually is the cause of the injury, and this may have its movement downward through the soil of the tract being irrigated, laterally through pervious strata extending back under higher lands, or upward from pervious strata having considerable depth and connecting with distant sources at a higher elevation."

In determining the quantity of water that will be developed and for which it is necessary to provide an outlet, it is stated that "for tracts up to a few hundred acres in area and having average soil and subsoil, the simplest method, and one which has proved reliable, is to determine the irrigation supply and to provide a drainage capacity of one-third that amount of water. As the size of the tract increases, however, this coefficient should be decreased. If the subsoil be clay, provision for one-fifth the irrigation supply will suffice for small tracts. In areas of a square mile or more, it is usually sufficient to provide for a run-off of from $1\frac{1}{4}$ to $2\frac{1}{2}$ cu. ft. per second for each square mile, depending upon the porosity of the soil and the duty of the irrigation water. . . . In lands [underlain by gravel] it is the area that is contributing the damaging water, not the area to be drained, that must be taken into consideration."

It is stated that in determining the required capacity of a drainage system in addition to the surface survey subsurface examinations should be made to gain information as to the nature of the soil, its stratification, water-carrying capacity, and capillarity. "In the design of an open canal the important points to be considered are the effectiveness of the drain, its carrying capacity, its mechanical construction, and its maintenance in good condition. . . . [The depth] should never be less than 6 ft., presuming that the maximum depth of flow will be 1 ft., and 8 ft. would be a better minimum. . . . A berm of not less than 6 ft. should be left on either side of the canal and the spoil should be banked up on one or both sides. . . . It is considered good practice to give open ditches a minimum bottom width of 4 ft., except in very stiff, homogeneous clay, where it may be 3 ft."

Lumber box and cement and clay tile drains are discussed under covered drains. "The smaller-sized tile should have a fall of at least 1 ft. per 1,000 ft. and the larger sizes at least ½ ft. Tile having an inside diameter of less than 4 in. should not be used, and even 4-in. tile should be used sparingly, usually at the extremities of small branches. Experience has shown that the use of tile less than 5 in. in diameter is not warranted by the comparative results and cost. . . . In deciding whether a large covered drain or an open canal shall be employed it is necessary to calculate the original cost of each, taking account of all auxiliary and protective devices required, and then to add to each sum an amount large enough to give an annual return, at current rates, sufficient to cover the cost of maintenance." It is stated that covered drains should never be less than 5 ft. deep and that depths of from 6 to 8 ft. are much more efficient. "In general, it may be said that the proper location of a drain depends upon the surface and subsurface topography, the nature of the soil, and the source of the damaging water."

Other sections describe protective devices for open canals and covered drains and typical problems encountered in the drainage of irrigated lands and their treatment.

In discussing the construction of drains it is stated that the most satisfactory method of constructing open canals is by means of some efficient excavating machine. In installing covered drains either hand labor or trenching machinery may be used.

The final sections deal with maintenance, subsequent treatment of land, the results and cost of drainage, and cooperative drainage. "The cost of draining ordinary sized farms having an average soil that is neither so hard as to require picking nor so soft that extreme trenching difficulties will be encountered will range from $10 per acre to $20 per acre, with the average between $14 and $15 per acre. If hardpan be present or if the soil is so finely divided and so wet as to be fluxible, the cost will run up to $50 per acre, and even more if much sheeting is required. In a few special cases drainage of small tracts in the midst of unreclaimed lands has cost between $75 and $100 per acre, but these costs represent situations that would not be encountered in regular operations."

A land-drainage problem in Missouri, C. H. Miller (*Engin. News, 72 (1914), No. 12, pp. 579–582, figs. 2*).—This article describes the solution of an extensive drainage problem, providing for the drainage of an area of 425,000 acres by means of levees, drainage ditches, and river by-passes.

Stream-gaging stations and publications relating to water resources, 1885–1913, Parts VI–X, compiled by B. D. Wood (*U. S. Geol. Survey, Water-Supply Paper 340 (1915), F, pp. XXIII+63–82; G, pp. XXII+83–94; H, pp. XXI+95–104; I, pp. XXIII+105–116; J, pp. XXI+117–129*).—Data similar to those reported in the first five parts (E. S. R., 32, p. 381) are given for other sections, as follows: Parts VI, Missouri River Basin; VII, Lower Mississippi River Basin; VIII, Western Gulf of Mexico Drainage Basins; IX, Colorado River Basin; and X, The Great Basin.

Winter stream measurements in western Canada, P. M. Sauder (*Engin. News, 72 (1914), No. 19, pp. 920–924, figs. 10*).—A description is given of stream measurement work done by the irrigation branch of the Canadian Government under particularly disadvantageous conditions in winter.

The gagings are made in the same manner as at open sections, except that the depth of the stream is taken as the distance from the bottom of the ice to the bed of the stream. The soundings, however, are always referred to the surface of the water in the holes. The vertical velocity curve method is usually used. The typical curve is said to differ from that obtained from an open-water observation in that it is drawn back more at the surface, which results in two points in the vertical near 0.2 and 0.8 of the total depth below the bottom of the ice at which the thread of mean velocity occurs under an ice cover. Both mean velocities at these two depths are said to give fairly accurate results.

The importance of chlorin determination for the superintendence and judgment of drinking water, F. MALMÉJAC (*Compt. Rend. Acad. Sci.* [*Paris*], *158* (*1914*), *No. 9, pp. 650–652; abs. in Chem. Zentbl., 1914, I, No. 15, p. 1458; Wasser u. Abwasser, 8* (*1914*), *No. 8, p. 481*).—It is shown that the variation in chlorin content of drinking water is accompanied by corresponding variations of the organic content of animal origin and of the bacterial content. Fixed relations are, however, not established.

Preparing land with dynamite, C. D. WOODS (*Maine Sta. Bul. 236* (*1915*), *pp. 62, 63*).—Experiments in progress since 1912 with a moderately heavy loam indicate that the use of dynamite for soil preparation, vertical drainage, and tree planting has not been in any way advantageous.

Silos and Silage, H. L. BLANCHARD (*Washington Sta., West. Wash. Sta. Mo. Bul., 2* (*1914*), *No. 2, pp. 4–11, fig. 1*).—General information regarding the construction and filling of the common types of silo is briefly given.

A movable hog house, W. HISLOP (*Washington Sta. Popular Bul. 85* (*1915*), *pp. 4, figs. 4*).—This enumerates the essential features of an ideal hog house and illustrates and briefly describes the A-shaped house. A bill of material and estimate of cost of this house is given, the latter totaling $11.17 on the basis of local retail prices at Pullman, Wash.

Homemade cow stall, H. L. BLANCHARD (*Washington Sta., West. Wash. Sta. Mo. Bul., 1* (*1913*), *No. 4, p. 16, figs. 2*).—A homemade stall used by the author for about 20 years is briefly described. The distinctive features are a sliding feed box and a crosspiece which compels the cow to stand near the gutter, thus promoting cleanliness.

Trap nests and their use, V. R. MCBRIDE (*Washington Sta., West. Wash. Sta. Mo. Bul., 2* (*1914*), *No. 5, pp. 10–12, fig. 1*).—The use of trap nests is briefly discussed and types installed at the station are illustrated and briefly described.

Lessons from the 1906 test fence, E. F. LADD and W. F. WASHBURN (*North Dakota Sta. Paint Bul., 1* (*1915*), *No. 6, pp. 73–79, figs. 14*).—This paper presents the deductions from the experiments with the so-called 1906 test fence described in a previous report (E. S. R., 20, p. 1089). A progress report of these experiments has also been noted (E. S. R., 30, p. 691).

Ochre was found to be unsatisfactory as a priming coat. The character of the lumber used influenced to a large extent the lasting quality of the paints, better results being obtained on soft pine than hard pine, western cedar, or fir. None of the mixed paints showed any superiority over the two single pigments used in the test.

"The indications are that it is far safer to use as a priming coat the same paint as is to be applied in the finishing coat, properly thinned with oil and turpentine, rather than to use ochre; and white lead (basic or sublimed) well thinned with pure linseed oil and turpentine has shown good quality and is well adapted as a priming coat. . . . Test fences properly constructed and with paint applied in accordance with the usual methods of practice, constitute the most practical and satisfactory method which we have been able to devise for studying and testing the wearing qualities of paints. . . . The substitution of benzin for turpentine does not appear to give the same result as where turpentine as the thinner is employed in moderate quantities."

The experiments also indicate that repainting often brings out defects in the first painting not previously recognized. Sublimed lead was not found inferior in wearing quality to basic white lead.

Further experiments along this line are in progress.

North Dakota paint law and its benefits, E. F. LADD (*North Dakota Sta. Paint. Bul., 1 (1915), No. 6, pp. 80–85*).—The general effect of the North Dakota paint law on the paint industry in the State is discussed. It is maintained that since its enactment there has been marked improvement in commercial paints, especially in the correct labeling of goods and the abolition of short-weight packages.

RURAL ECONOMICS.

The International Institute of Agriculture, its organization—its work—its results (*Rome: Internat. Inst. Agr., 1914, pp. 45, pls. 2, figs. 25*).—This pamphlet gives the history and organization of the International Institute of Agriculture, the work it has undertaken to accomplish, and the results obtained.

See also a previous note (E. S. R., 30, p. 899).

The lure of the land, H. W. WILEY (*New York: The Century Co., 1915, pp. 368, pls. 31*).—The author discusses some of the underlying motives affecting the movement of people from the rural districts to the city and the desire of city people to return to the country, and calls attention to the business side of farming as it is influenced by market conditions, the use of motive power, and the elimination of wastes. He briefly outlines the genesis of soils, theories regarding the causes governing its fertility, and the function of water in crop production. He also discusses the decreasing meat supply and the efforts of the Federal Government to improve agricultural production.

Wealth from the soil, C. C. BOWSFIELD (*Chicago: Forbes & Co., 1914, pp. 319*).—This book is written as an aid to urban people who wish to become farmers or land owners.

Handbook on diversified farming (*Arkansas Sta. Circ. 26 (1915), pp. 24, figs. 8*).—This circular contains brief statements regarding the methods of growing various farm crops, planning a home vegetable garden, preserving fruits and vegetables, and raising live stock.

A method of analyzing the farm business, E. H. THOMSON and H. M. DIXON (*U. S. Dept. Agr., Farmers' Bul. 661 (1915), pp. 26*).—This publication furnishes an outline of a method and a blank form for analyzing the farm business to determine the investment, receipts, expenses, and labor income, and indicates how the form is to be used to determine the labor income, and how to measure the farm efficiency. The authors state that on a majority of farms, success is primarily dependent upon the size of the farm business, the yields of the crops, the returns per animal, and the diversity of the business. Those farms that are excellent in none of these respects almost universally fail.

The business side of farming, T. J. BROOKS (*Mississippi Agr. Col. Bul., 1914, June 20, pp. 48*).—Suggested forms are given for organizing egg shipping associations, cooperative creameries, farmers' cooperative shipping associations, and cooperative marketing associations. A brief bibliography is appended.

Demurrage information for farmers, G. C. WHITE (*U. S. Dept. Agr. Bul. 191 (1915), pp. 27*).—This bulletin outlines the provisions of the uniform demurrage code, makes a general survey of the state codes, and calls attention to their special features. The author considers that the greater part of the annual car shortage is due primarily to a lack of breadth of vision on the part of shippers, railroad officials, and legislators.

Farm accounts, C. S. ORWIN (*Cambridge: University Press, 1914, pp. 209*).—The author outlines the methods of making the farm valuations, types of records to be kept, forms to be used in the bookkeeping, and methods of closing the accounts and obtaining the profit and loss and the balance sheet.

Farm credit in Kansas, G. E. PUTNAM (*Amer. Econ. Rev., 5 (1915), No. 1, pp. 27–37*).—In 1914 a schedule of questions relating to rural credit was sent to representative bankers, merchants, and farmers in each of the 105 counties in Kansas. Among the conclusions drawn from the replies were that the cost of borrowing was from 1 to 2½ per cent higher than the rate recorded in the mortgage contract, and that practically all short-term loans were made on the fall settlement basis. If the farmer had no funds to make full payment his note was taken for the balance. There seems to be dissatisfaction with the interest rate in those counties where agricultural production is uncertain and land values speculative. The bankers indicated that the rate paid by farmers and merchants was practically the same, but that the rate was higher on city real estate than on farm mortgage loans. The author points out that several of the State laws have a tendency to make the lender's risk greater and thus force up the interest rate. The replies also indicated that farmers would not be willing to unite in a cooperative credit association.

Report of the Bureau of Marketing and Supplies of the Maine Department of Agriculture, C. E. EMBREE (*Rpt. Bur. Marketing and Supplies, Maine Dept. Agr. 1913, pp. 17*).—This report sets forth the work of the year. The bureau believes that the farmers, instead of shipping their produce through the farmers' union, should consign their products direct to their selling agents in the marketing centers, since this procedure places more responsibility upon the local organization and would more quickly bring about better business methods.

[Agricultural associations in Italy] (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. B, 13 (1914), I, No. 5–6, pp. 175–222; II, No. 6, pp. 181–264*).—There are listed the name, location, type, date of organization, membership, and other facts for practically all the agricultural organizations in Italy.

The agricultural laborer in Belgium, B. BOUCHÉ (*Les Ouvriers Agricoles en Belgique. Brussels: Misch & Thron, 1913, pp. VIII+265*).—The author discusses the origin of paid agricultural workers, the types found, agencies for their distribution, contracts and agreements, and wages received, and suggests that there be an organization for their proper distribution, and that the agricultural laborer be represented on committees dealing with agricultural subjects.

The leasing of land in Belgium, E. VAN DIEVOET (*Le Bail a Ferme en Belgique. Louvain: C. Peeters, 1913, pp. VII+458, pls. 4*).—This book points out the relationship between the landowner and tenant, the length and termination of leases, and methods of recompensing the tenant for an increase in the value of the property.

Distribution of land according to crops and tenure (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 6 (1915), No. 1, pp. 83–101, figs. 2*).—This article points out that in 1910 the total population of Bulgaria was 4,235,575, of which 3,108,816 were engaged in and dependent upon agriculture and 1,739,181 actively engaged. The total land devoted to agricultural purposes in 1908 was 7,982,450 hectares, of which 3,628,016 hectares were in fields, 2,834,493 in forests, 913,081 in pasture land, and 399,412 in meadows. Of the total, 4,625,787 hectares belonged to private persons and the remainder to the

State and other organizations. The total number of holdings was 942,897, of which 933,367 belonged to private persons. Forty-five per cent of the holdings contained 2 hectares or less, but 45 per cent of farm land is in holdings of between 5 and 15 hectares.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 665 (1915), pp. 28*).—It is estimated that on March 1 there was about 21,000,000 bu. less surplus of wheat than a year previous. It appears that during the eight months ended March 1 the exports of wheat, including flour, amounted to 245,433,099 bu. as against 109,435,386 for a similar period for the year previous. The returns indicate that of the wheat produced in Minnesota and the Dakotas 43 per cent was Blue Stem, 21 per cent Velvet Chaff, 15 per cent Fife, and 12 per cent Durum.

The production of Hawaiian sugar is estimated at 612,000 short-tons for the 1914 campaign as against 546,524 for the 1913 campaign.

The first inquiry made as to the stocks of wool held by manufacturers on January 1 resulted in replies from manufacturers whose total purchases in 1914 amounted to 158,169,000 lbs. of wool (raw equivalent). Their stocks on January 1, 1915, amounted to 39,995,000 lbs., as compared with 22,933,000 lbs. on January 1, 1914.

It is stated that the average time of transit from the United States Pacific coast ports to England is about one-half what it was before the opening of the Panama Canal. Grain steamships previously averaged 94 days for this voyage while the average at present is 48.

The money wages of farm labor averaged during the past year about 1.7 per cent lower than in the preceding year, but about 9 per cent higher than 5 years ago. Information is given concerning the farm labor employment service of the U. S. Department of Labor, the countries prohibiting cereal exports, trend of prices of farm products, apples in cold storage March 1, etc. Statistical tables are given showing the stocks of cereals and aggregate value per acre of crop production for 1914–15 by States, the aggregate value per acre of crops by States for 1909–1914, and farm wages with and without board, by the month and by the day, and at harvest and other than harvest seasons. It also includes the usual data as to the prices of farm products.

Agricultural war-book (*Ottawa: Min. Agr., 1915, pp. 157, figs. 3*).—This book contains a series of articles describing the population, transportation, occupation of the people, and the agriculture of various countries with reference to conditions brought about by the present war.

[Agriculture in Canada], compiled by H. J. Boam (In *Twentieth Century Impressions of Canada, London and Montreal: Sells Ltd., 1914, pp. 212–260, figs. 77*).—These pages are devoted to a description of the various agricultural organizations found in Canada by T. K. Doherty, the system of agricultural education by S. B. McCready, the experimental farms by O. C. White, the fruit industry by W. T. Macoun, the cattle industry by H. S. Arkell, dairying by J. A. Ruddick, the poultry industry by W. F. Moore, and swine raising by J. B. Spencer.

A pilgrimage of British farming, 1910–1912, A. D. Hall (*London: E. P. Dutton & Co., 1913, pp. XIII+452*).—The author describes the systems of farming observed during three summers' travel in the British Isles and treats of soils, cropping systems, methods of handling live stock, and the general drift of the agricultural practices in the communities visited

[Agriculture in Denmark] (*Statis. Aarbog Danmark, 19 (1914), pp. 26–29, 36–37, 44–54*).—These pages continue statistical information previously noted (E. S. R., 30, p. 392).

AGRICULTURAL EDUCATION.

Proceedings of the twenty-eighth annual convention of the Association of American Agricultural Colleges and Experiment Stations, edited by J. L. Hills (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas., 28 (1914), pp. 272*).—This is a detailed account of the proceedings, including reports of committees and papers submitted, of the convention held at Washington, D. C., November 11 to 13, 1914 (E. S. R., 32, p. 8).

Cooperative agricultural extension work (*U. S. Dept. Agr., Office Sec. Circ. 47 (1915), pp. 12*).—This circular gives a brief explanation of the extension work now carried on in this country, discussing the cooperative agricultural extension act (E. S. R., 30, p. 601); organization of the extension work in the U. S. Department of Agriculture and the States; types of extension work—farm demonstrations, the county agent, boys and girls' club work, girls' demonstration work, home economics extension work, extension work through specialists, and movable schools; money available under the Smith-Lever Act, including a tabulated statement showing amounts available to the several States; and a list of Department and state officers in charge of extension work.

[The Smith-Lever Law and its probable operation in a number of the States] (*Quart. Alpha Zeta, 13 (1914), No. 2, pp. 45, figs. 5*).—This issue contains the text of the Smith-Lever Act and a series of articles by extension men and others interested in this work, giving an idea of the contemplated use of these funds in nearly all sections of the country.

Educational [work], R. H. Forbes (*Arizona Sta. Rpt. 1914, pp. 373–378*).—This is a progress report for the year on the regular and special agricultural courses and extension work of the Arizona College of Agriculture, including data as to attendance, etc.

[Instruction in home economics] (*Utah Agr. Col., Ext. Div. Circ., 2 (1914), Nos. 23, pp. 7, fig. 1; 41, pp. 4; 3 (1915), No. 5, pp. 4*).—These circulars include Instructions in Organization of Home Economics Associations, by Gertrude M. McCheyne, Home Building Contest, and Program of Home Economics Associations, respectively.

[Agricultural and domestic science instruction in the high schools of Wisconsin] (In *Manual of the Free High Schools of Wisconsin. Madison, Wis.: Democrat Printing Co., 1914, pp. 13–16, 71–92, 160–168, 178–180, 183, 184*).—This manual outlines general requirements for securing special state aid for instruction in agriculture and home economics in high schools; the plan and method of work in agriculture, to be developed by means of suitable class-room instruction, observation and experiment work, field work, home projects, manual training projects related to the farm, community or extension work, including lists of apparatus and supplies, illustrative material, texts, and reference books; requirements for state aid for agriculture in the seventh and eighth grades; suggested courses of study in domestic art and science for Wisconsin grade and high schools, as outlined by a committee appointed by the Wisconsin Teachers' Association in 1910; methods of instruction, subject matter in sewing and cooking in the seventh and eighth grades, and in sewing, cooking, food study and dietaries, hygiene, and home management in the high school; and the state laws relating to state aid for agricultural and home economics instruction.

High school clubs in agriculture and home economics, C. L. Anderson and Claire Parrish (*Utah Agr. Col., Ext. Div. Circ., 2 (1914), No. 43, pp. 6*).—This circular outlines the purpose and plan of these high school clubs, which have for their aim the study of industrial subjects and the development of a healthy community life.

Boys' and girls' demonstration club work in Arkansas, W. J. JERNIGAN (*Arkansas Sta. Circ. 27 (1915), pp. 16*).—This circular outlines the purpose and method of conducting and some of the results of the boys' and girls' corn, cotton, pig, canning, and poultry club work in Arkansas, as well as a tentative course for teachers in conducting club work in the schools.

School credit for home work, J. C. WERNER (*Kansas Agr. Col. Ext. [Pamphlet], 1914, pp. 7*).—The author calls attention to the importance of home work and gives a suggestive list of subjects for credit for home work and a plan for allowing credit and reporting to teachers.

The Montana Country Life Education Association (*Bozeman, Mont., 1914, pp. 16*).—This bulletin contains the proclamation of the governor of Montana setting apart October 9, 1914, as Rural Life Day, the constitution of the association, a model constitution and by-laws for local units, etc. A bibliography is added.

Agriculture, O. H. BENSON and G. H. BETTS (*Indianapolis: Bobbs-Merrill Co., 1915, pp. 9+444+16, figs. 183*).—This elementary text combines practical and scientific information on the importance and value, geographical distribution, varieties, diseases and insect enemies, growing, harvesting, and storing of the principal farm and horticultural crops; the soil; the uses, value, distribution, judging and selecting breeds, feeding and care, and diseases of cattle, horses, swine, sheep, and poultry; farm and home management, the home grounds and wood lot, the county agricultural agent, farm implements and mechanics, road building and maintenance, and birds and other insect destroyers.

Practical helps in agriculture and nature study, E. S. JONES and H. L. FOWKES (*Taylorville, Ill.: Authors, 1914, pp. 88*).—This is intended as a supplementary book of practical information and scientific facts, rather than an outline or a manual, on cereals, legumes, soil, live stock, birds, the forest and ornamental trees, fungi, the potato, insects, farm machinery, composition of air, effects of heat upon bodies, siphons, collections and preservation of material for use in the study of agriculture, and school gardens and school yards. It includes type lessons, a number of bibliographies, score cards, and tables.

Outline of course in nature study and agriculture, D. R. WOOD (*Cal. Ed., 2 (1910), No. 3, pp. 143–205*).—The author defines nature study, discusses its purpose, the training it gives, and the use of nature-study material, and outlines a course in nature study, through the seven grades, a course in the principles of agriculture, and a course in and directions for school-garden work. Types of nature-study lessons and experiments, an article on How to Find Material for Nature Study, by Mrs. L. C. Gay, and numerous bibliographies and references for teachers are included.

Nature study and agriculture for the rural schools of Texas, W. S. TAYLOR and C. H. WINKLER (*Bul. Univ. Tex., No. 361 (1914), pp. 73*).—This is an outline of work in nature study for use in grades 1 to 6, inclusive, and of work in elementary agriculture for the seventh grade. A bibliography of reference books on nature study and agriculture for the rural schools is appended.

Nature study and agriculture in Manitoba schools (*Agr. Gaz. Canada, 1 (1914), No. 11, pp. 932, 933*).—An outline is given of the courses in school gardening and nature study in grades 1 to 8 of the elementary schools and in agriculture in grades 9 and 10 of the secondary schools.

Fights of the farmer, A. SNYDER (*Philadelphia and London: J. B. Lippincott Co., 1914, pp. XIV+234, pl. 1, figs. 115*).—Instruction is given on fighting soil erosion, the loss of soil moisture and fertility, the wind, frost, weeds, injurious insects and animals, and farm waste. While intended primarily for the farmer, it can be utilized in nature study from an agricultural standpoint and for supplementary reading in the schools.

The book of useful plants, Julia E. Rogers (*Garden City, N. Y.: Doubleday, Page & Co., 1913, pp. XIV+374, pls. 31*).—This book, which is written for children, discusses the origin, geographical distribution, growth, and varieties of bread, forage, sugar, beverage, narcotic, and fiber plants, plants with edible seeds, leaves and stems, roots and tubers, and seed vessels, and plants that serve many or special purposes.

Correspondence courses in agriculture for teachers.—Course I, Farm plants and soils (*Off. Pub. Iowa State Col. Agr., 13 (1914), Nos. 21, pp. 23, figs. 3; 22, pp. 19, figs. 3; 13 (1915), Nos. 25, pp. 24, figs. 7; 27, pp. 21, figs. 5*).—Twenty lessons on farm plants and soils are presented in four assignments to show teachers what to teach and how the material can be best presented, and to furnish them a sufficient knowledge of agriculture to meet the requirements of the school law. Each lesson consists of a topical outline and exercises.

MISCELLANEOUS.

Twenty-fifth Annual Report of Arizona Station, 1914 (*Arizona Sta. Rpt. 1914, pp. 317–378, fig. 1*).—This contains the organization list, an administrative report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1914, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Colorado Station, 1914 (*Colorado Sta. Rpt. 1914, pp. 32*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, a report of the director on the work and publications of the station, and departmental reports.

Annual Report of Florida Station, 1914 (*Florida Sta. Rpt. 1914, pp. CVI+X, figs. 9*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, 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. Records of the dairy herd are also included.

Twenty-seventh Annual Report of Illinois Station, 1914 (*Illinois Sta. Rpt. 1914, pp. 13*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, brief notes as to the principal lines of work, and a list of the publications issued during the year.

Twenty-seventh Annual Report of Louisiana Stations, 1914 (*Louisiana Stas. Rpt. 1914, pp. 32*).—This contains the organization list, a report by the director discussing the work of the stations, an account of their progress, including brief departmental reports, and a financial statement as to the federal funds for the fiscal year ended June 30, 1914, and as to the state funds for the fiscal year ended November 30, 1914. The experimental work reported is for the most part abstracted on page 32 of this issue.

Finances, meteorology, index (*Maine Sta. Bul. 234, pp. 279–306+XVI*).—This contains the organization list of the station; meteorological observations noted on page 19; a financial statement for the fiscal year ended June 30, 1914; an index to Bulletins 223–234, which collectively constitute the thirtieth annual report of the station; a list of the publications of the year; announcements of the work, personnel, and equipment of the station; abstracts of papers published elsewhere, including Studies on the Physiology of Reproduction in the Domestic Fowl—VIII, On Some Physiological Effects of Ligation, Section, or Removal of the Oviduct (E. S. R., 32, p. 670); and IX, On the Effect of Corpus Luteum Substance Upon Ovulation in the Fowl (E. S. R., 32, p. 671);

Studies on Inbreeding—IV, On a General Formula for the Constitution of the Nth Generation of a Mendelian Population in which all Matings are of a Brother+Sister; and V, Inbreeding and Relationship Coefficients (E. S. R., 32, p. 665); On the Law Relating Milk Flow to Age in Dairy Cattle (E. S. R., 32, p. 575); The Immature Stages of the Tenthredinoidea (E. S. R., 31, p. 155); and A Note on *Rhagoletis pomonella* in Blueberries (E. S. R., 32, p. 350); and abstracts of several papers abstracted elsewhere in this issue.

Twenty-sixth Annual Report of Vermont Station, 1913 (*Vermont Sta. Rpt. 1913, pp. XX+327, pls. 14, figs. 42*).—This contains the organization list, a brief announcement concerning the station, a financial statement for the fiscal year ended June 30, 1913, a report of the director on the publications and work of the station, and reprints of Bulletins 168–174, previously noted.

Twenty-seventh Annual Report of Vermont Station, 1914 (*Vermont Sta. Rpt. 1914, pp. XIX+394, pls. 39, figs. 17*).—This contains data corresponding to the above for the fiscal year ended June 30, 1914, including reprints of Bulletins 175–183, previously noted.

Report of the Western Washington Experiment Station, April 1, 1913, to December 31, 1914, W. A. LINKLATER (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1915), No. 10, pp. 30, figs. 3*).—This contains the report of the superintendent of this substation for the period indicated, including a financial statement and departmental reports. The experimental work recorded is for the cost part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 1 (1913), Nos. 3, pp. 16, figs. 7; 4, pp. 16, figs. 10; 1 (1914), Nos. 5, pp. 16, figs. 5; 6, pp. 16, figs. 9; 7, pp. 16, figs. 4; 2 (1914), Nos. 1, pp. 16, figs. 3; 2, pp. 16, figs. 4; 3, pp. 16, figs. 5; 4, pp. 7, fig. 1; 5, pp. 12, fig. 1; 6, pp. 16, figs. 5; 7, pp. 12, fig. 1; 8, pp. 12, fig. 1; 9, pp. 16, figs. 4; 2 (1915), No. 12, pp. 16, figs. 6; 3 (1915), No. 1, pp. 16, figs. 5*).—These numbers contain brief articles on the following subjects:

Vol. 1, No. 3.—The Balanced Ration, by H. L. Blanchard; Renewal of Old Orchards, by J. L. Stahl; Blossom End Rot of Tomatoes and Woolly Bear Caterpillars, by H. L. Rees; Feeding for Egg Production, by V. R. McBride; and Alfalfa in Western Washington and Sweet Clover, by B. Stookey.

Vol. 1, No. 4.—Standard Varieties of Tree Fruits, by J. L. Stahl (see p. 44); Fire Blight of Pear and Apple, by H. L. Rees (see p. 53); The Growing of Succulent Feeds for Fall and Winter Use—I, Root Crops, by E. B. Stookey (see p. 34); Poultry Diseases, by V. R. McBride; and Homemade Cow Stall, by H. L. Blanchard (see p. 90).

Vol. 1, No. 5.—Varieties of Strawberries and Raspberries, by J. L. Stahl (see p. 47); The Breeding Flock, by V. R. McBride; The Growing of Succulent Feeds for Fall and Winter Use—II, by E. B. Stookey (see p. 34); and Potato Blight and Identification of Plant Diseases, by H. L. Rees.

Vol. 1, No. 6.—Potato Growing in Western Washington, by J. L. Stahl (see p. 40); Means of Determining Soil Fertility, by E. B. Stookey; and Diseases of Potatoes, II, by H. L. Rees (see p. 52).

Vol. 1, No. 7.—What Dairy Farming Means, by H. L. Blanchard; Systems of Training Berry Canes, by J. L. Stahl (see p. 47); Drainage and Aeration, I, by E. B. Stookey; Mating and Line Breeding Poultry, by V. R. McBride (see p. 77); Selecting Eggs for Incubation, by V. R. McBride (see p. 77); Incubation, by V. R. McBride (see p. 77); and Diseases of Potatoes, III, by H. L. Rees (see p. 52).

Vol. 2, No. 1.—The Dairyman's Best Crop, by H. L. Blanchard; Soil Tillage, Part 2, by E. B. Stookey; Brooding Chicks, by V. R. McBride; Spraying Machinery and Accessories, by J. L. Stahl; and Spraying for Orchard Diseases and Insects, by H. L. Rees.

Vol. 2, No. 2.—Silos and Silage, by H. L. Blanchard (see p. 90); Hog Raising on Partially Cleared Land, by W. A. Linklater; Eradication of Lice and Mites, by V. R. McBride; and Feeding and Care of the Calf for the Dairy, by H. L. Blanchard.

Vol. 2, No. 3.—Concerning Moles, by T. H. Scheffer; Saving Hay Crops, by H. L. Blanchard (see p. 38); Harvesting the Berry Crops, by J. L. Stahl (see p. 47); Capons and Caponizing, by V. R. McBride; and Notes on Plant Diseases, and Some Vegetable Insects, by H. L. Rees.

Vol. 2, No. 4.—The Feed Supply in Dry Weather, and Grazing the Aftermath, by H. L. Blanchard; Summer Pruning, by J. L. Stahl; Producing Marketable Eggs, by V. R. McBride; Notes on Tomato Diseases, by H. L. Rees; and Late Sown Feed Crops, by E. B. Stookey.

Vol. 2, No. 5.—Agricultural Fairs; Fall Sowing of Hay and Pasture Mixtures, by E. B. Stookey; Trap Nests and Their Use, by V. R. McBride (see p. 90); and Hill Selection as a Preventive of Certain Potato Diseases, by H. L. Rees.

Vol. 2, No. 6.—Experimental Spraying for Blackberry Anthracnose, by H. L. Rees (see p. 54); Fall Sown Forage and Grain Crops, by E. B. Stookey; Late Summer Care of Poultry, by V. R. McBride; and Concerning Bee Culture, by J. W. Ware.

Vol. 2, No. 7.—Liming the Soil, by E. B. Stookey; Fertilizer Tests with Red Raspberries, by J. L. Stahl (see p. 48); Feeding Laying Hens, by V. R. McBride; and Keeping Out Fire Blight, Danger from Lead Arsenate Poisoning, and Apple Anthracnose or Black Spot Canker, by H. L. Rees.

Vol. 2, No. 8.—Soil Fertility Problems, by E. B. Stookey (see p. 33); The Double Decked Hive to Control Increase, by J. W. Ware; The Potato Crops, by J. L. Stahl; Potatoes as a Poultry Food, by V. R. McBride; Concerning Some Farming Failures, by H. L. Blanchard; and Poultry Diseases, by V. R. McBride.

Vol. 2, No. 9.—Factors Influencing the Quality of Milk for Condensing Purposes, by W. A. Linklater (see p. 79); Poultry House Construction, and The Colony Brooder, by V. R. McBride; The Succulent Feed Supply, by W. A. Linklater; Barnyard Manure is Worth Saving, by E. B. Stookey; What is the Foot-and-Mouth Disease, by W. Hislop; and the Winter School.

Vol. 2, No. 12.—The Root Maggot Pest, by E. B. Stookey (see p. 62); Incubation, by V. R. McBride; Spring and Summer Spraying for the Orchard, by H. L. Rees (see p. 47); and Rhubarb Culture, by J. L. Stahl (see p. 44).

Vol. 3, No. 1.—Dealing with the Mole, by T. H. Scheffer; Farm Butter Making, by H. L. Blanchard; Brooding and Feeding Chicks, by V. R. McBride; The Drone Bee Nuisance, by J. W. Ware; Concerning Hog Raising, by W. A. Linklater; and Control of Damping Off Fungi, by H. L. Rees.

NOTES.

Colorado College and Station.—Mrs. Agnes M. Riddle, of Denver, and H. D. Parker, of Greeley, have been elected to the governing board, vice F. E. Brooks and William Harrison.

A central heating plant has been authorized under a state appropriation of $50,000 and construction will begin at once.

Hawaiian Sugar Planters' Station.—W. R. McAllep has been appointed assistant chemist.

Illinois University and Station.—The legislature has appropriated $5,000,000 for the use of the institution for the current biennium. This is practically the full amount accumulated in the state treasury from the one mill tax voted four years ago for the support of the university.

Robert Stewart, professor of chemistry and chemist in the Utah College and Station, has been appointed associate professor of soil fertility and assistant chief in soil fertility in the station beginning September 1.

Oklahoma College and Station.—James W. Cantwell, superintendent of schools at Fort Worth, Tex., has been appointed president of the college. Under a recent act of the legislature providing for the appointment of members of the Board of Agriculture by the governor, the following four new members have been designated, who by virtue of their position become members of the board of regents of the agricultural college: R. H. McLish, Ardmore; Joe Alexander, Moffitt; C. B. Campbell, Minco; and J. J. Savage, Hollis.

Purdue Univeristy.—The first rural minister's conference was held at the university May 11–13, with an attendance of about 200 ministers and laymen.

Iowa College and Station.—*Science* notes that J. B. Davidson, professor of agricultural engineering and chief engineer, has been appointed to the newly established professorship of agricultural engineering at the University of California, and among other duties is to develop at Davis a testing plant for the study of the efficiency of farm machinery.

Maryland College.—Despite adverse weather conditions, the annual Farmers' Day, May 29, attracted an attendance of over 1,000. The speaker of the day was Hon. Carl Vrooman, Assistant Secretary of Agriculture, who spoke on The New Agriculture. He urged the fullest participation in the new system of demonstration work and the improvement of country life, not only along economic lines but also in the establishment of the cooperative spirit, the spirit of organization in every country neighborhood for the common good of all concerned.

Nebraska University and Station.—The legislature has granted the funds necessary to duplicate those accruing under the Smith-Lever Act and has authorized a one mill state tax for salaries and maintenance and a three-fourths mill tax for a building fund. Approximately $1,320,000 will be available for land and buildings during the ensuing biennium. Plans have been completed for the new dairy building and nearly completed for the Bessey Natural Science building. An agricultural engineering building and a horse barn are also contemplated.

R. J. Pool has been appointed acting head of the department of botany, J. E. Weaver, formerly of the botanical department of the Washington College, has been appointed assistant professor of botany, and E. H. Hoppert assistant professor of horticulture in extension work.

Oregon College and Station.—R. M. Rutledge, secretary to the dean and director, has accepted a research fellowship at the University of Wisconsin in cooperation with this Department.

Weekly Forecasts by the Weather Bureau.—A system of special weekly weather forecasts during the crop season has recently been established by the Weather Bureau of this Department for the corn, wheat, and cotton growing regions. These forecasts are telegraphed every Tuesday to certain weather stations in each State and there printed and mailed to such weekly newspapers as express a desire to receive them. Arrangements are also made for telegraphic distribution where desired.

Agricultural Education and Research in Canada.—The Dominion of Canada has appropriated $3,308,000 for agriculture for the year 1915–16, $785,000 of which is for the maintenance of experiment farms, $550,000 for the development of the live-stock industry, $540,000 for the "health of animals," $280,000 for exhibitions, $275,000 for the administration and enforcement of the meat and canned-foods act, and $200,000 for the encouragement of cold-storage warehouses.

The appropriation includes $150,000 for the development of the dairying industries and the improvement in transportation, sale, and trade of food and other agricultural products, $140,000 to enforce the seed act, $113,000 for the Fruit Branch, $100,000 for the administration and enforcement of the destructive insect and pest act, $25,000 for the administration and carrying out of the provisions of the agricultural-instruction act, $25,000 for the National Biological Laboratory, $20,000 to assist in the maintenance of the International Institute of Agriculture, $20,000 for entomology, $15,000 for publications, and $70,000 for exhibits, repairs, etc. A further $900,000 is allotted under the agricultural-instruction act.

The new building at the Ontario Veterinary College is now in use. It is a five-story brick structure with 134-foot frontage and 900,000 cu. ft. capacity, and cost about $250,000. It contains several large laboratories, an assembly room seating 500, an infirmary for horses, offices, etc.

At the Nova Scotia Agricultural College, a new science building 130 by 50 feet, with laboratories for chemistry, soil physics, entomology, plant diseases, and home economics, an assembly hall seating 250, offices, classrooms, etc., is nearing completion. J. A. Sinclair has succeeded J. Standish in the veterinary department, and C. A. Good has been appointed assistant entomologist.

F. L. Drayton has been appointed assistant botanist at the Canadian Experimental Farms and George W. Muir assistant animal husbandman.

In a one-acre turnip-growing contest in three counties of Nova Scotia, participated in by 30 farm boys between the ages of 15 and 20 years, the yields of the first prize winners in Cumberland County were 1,296 bu., in Colchester County 1,266 bu., and in Pictou County 1,245 bu. Four prizes of $75, $50, $30, and $20 were given in each county. The average yield of field roots in Canada, according to the Canada Yearbook, is about 360 bu. per acre.

Journal of the Association of Official Agricultural Chemists.—In accordance with the decision of the association at its 1914 meeting, the *Journal of the Association of Official Agricultural Chemists* is to be established. This will be issued quarterly and will consist of the proceedings, official and provisional methods of analysis, and reports of investigations of value to food, drug, and feed control chemists which are not available for publication elsewhere. The first number is expected to be ready for distribution in July and will contain the 1913 proceedings.

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U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
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Vol. XXXIII AUGUST, 1915 No. 2

EXPERIMENT STATION RECORD

WASHINGTON
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U. S. Department of Agriculture—Con.

U. S. Department of Agriculture—Con.

[a] Printed in scientific and technical publications outside the Department.
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EXPERIMENT STATION RECORD.

Vol. XXXIII. August, 1915. No. 2.

A year has passed since the cooperative agricultural extension act of May 8, 1914, commonly known as the Smith-Lever Extension Act, went into effect. In that period much has been accomplished in creating or perfecting the administrative machinery for carrying on the extension work in agriculture and home economics in the Department and the several States. The general lines along which these extensive enterprises will be conducted have also been quite well determined.

All the States have assented to the provisions of the Act either through their governors or their legislatures and the action of the governors has been ratified by all the legislatures which have been in regular session during the year. A single agricultural college in each State has been designated as the beneficiary of this Act, thus providing for a unified administration of the Act within the State. In several States where the college designated is not coeducational, a cooperative arrangement for the work in home economics has been made with the State college for women, and similarly in a few States having separate land-grant colleges for negroes a cooperative arrangement has been made for extension work among people of that race.

In all the States the colleges having charge of the work under the Smith-Lever Act have created extension divisions or services and have brought under these divisions all their extension work in agriculture and home economics whether carried on with Smith-Lever or other funds. In some States these divisions are not yet as clear-cut as is desirable, and in some cases old state laws or general administrative regulations of the institutions adopted years ago have thus far continued a confusing union of the extension organization with that of the experiment station. In thirty-two States a separate officer is in charge of the extension work usually under the title of director, in thirteen States the extension director is also director of the experiment station or dean of the college of agriculture, and in three States there is still an acting director. In almost every State the extension work has already become such a large and varied enterprise that a separate officer in active charge of its operations and devoting his entire time to this work is essential to its highest efficiency.

In twenty States the farmers' institutes are still carried on by the State Department of Agriculture, though in a number of States there is a movement for their transfer to the agricultural college and this has taken place in South Dakota. In practically all the States where the institutes have a separate organization there is some kind of a cooperation with the agricultural college in this work. Where the institutes are under the direction of the college they are undergoing more or less reorganization with a view to making them more definitely demonstrational and educational.

The plans for the unifying of the management of the agricultural extension enterprises within the States were met by the Secretary of Agriculture, in the first place, by the creation of a States Relations Committee, for the general supervision of all the extension enterprises of the department bureaus and of the cooperative arrangements with the State institutions involving the use of Smith-Lever or department funds for demonstrations or other forms of extension work. This committee has now been succeeded by a permanent States Relations Service, created by Congress in accordance with the Secretary's recommendations, which, beginning with July 1, 1915, will have among its functions the duties previously performed by the States Relations Committee.

All the State agricultural colleges receiving the benefits of the Smith-Lever Act have entered into cooperative relations with the Department, and in forty-six States these institutions and the Department are conducting all their extension work in agriculture and home economics under the terms of a general "Memorandum of Understanding," which is used as the basis for a great variety of cooperative project agreements.

There has been remarkable unanimity in the acceptance by the States of one of the fundamental features of the extension enterprises which was developed by the Department with funds wholly under its control prior to the passage of the Smith-Lever Act. The experience of the past 12 years has fully demonstrated the value of the county agricultural agent as a means of bringing to our agricultural people on their farms and in their homes the results of practical experience and scientific research in agriculture and home economics and securing the practical application of these results through demonstrations and otherwise. There is therefore general agreement that nothing is more important in the development of extension features under the new conditions arising from the Smith-Lever Act than the establishment in each county of permanent headquarters for extension work, in charge of a competent county agent, who shall act as the joint representative of the local community, the State through its agricultural college, and the Nation through its Department of Agriculture. It is believed that in this way the need of the agricultural people in their several communities can be best determined, and whatever help the State and the Nation can give them in their agricultural and home problems can be most speedily and effectively brought to them. A large share of the department extension funds, much money derived from State, county, and local sources, and a considerable portion of the Smith-Lever fund have therefore been devoted to the maintenance and extension of the county agent system. There are now over 1,000 counties in the forty-eight States which have county agents.

On the whole these agents have been very successful in winning the support and confidence of the farming people and the tangible results of their work are very encouraging. The personality of the agent is, of course, a very large factor in determining the measure of his success. His understanding of the real problems of the region in which he is working, his sympathy with rural people, and his ability to meet them on their own ground and actually to convey to them important practical instruction and information in a convincing way are among the essentials. When to these qualifications are added studious inclinations and habits, the possession of accurate and up-to-date knowledge of the practice and science of agriculture and business ability of high order we have a very able and useful man whose services will mean much for the agricultural and social advancement of his county.

Considering the limited number of agricultural college graduates and the numerous avenues for congenial work which are opening up to them it is not surprising that up to the present time it has not been practicable to obtain a sufficient number of such graduates with the practical experience and other qualifications required for the position of county agent. There will be a steady demand for men of thorough training, combined with satisfactory practical experience, to fill these positions. The colleges have therefore a special duty to train the future extension workers and it is encouraging to notice that they are beginning to feel their responsibility in this direction.

Inasmuch as it is impracticable for the county agent to deal altogether with individual farmers, the problem of the organization of groups of farm people through whom they may work is assuming great importance. Two general types of such organizations are now being utilized. County organizations, often called farm bureaus, are being formed which are expected to take the initiative in securing county or local financial support for the county agent, take part in the selection and appointment of the agent, and stand behind him in his efforts to advance the agricultural interests of the county. Many of these organizations include business and professional men, as well as farmers, and their complex organization has given rise to special problems. It is, however, now very apparent that while the cordial sympathy and support of all classes of our people in the movement for the improvement of agricultural conditions is very much to be desired, the farming people themselves should control and in the end determine the character and work of the organizations on which the extension system must depend for its local support.

Another type of local organization being tested in various places is the small community club. Where a considerable number of these clubs exist in a county they are often confederated to form some kind of a county organization. The exact relations of organizations of either type to the extension system, the breadth and variety of their functions relating to extension work or other enterprises, and the most effective forms for their organization are as yet largely undetermined and they must still be considered as in the experimental stage.

Another important line of extension work which has been developed in a large way by the Department and the agricultural colleges prior to the passage of the Smith-Lever Act and which has been carried over into their new extension organizations is the boys' and girls' club work. In the Southern States this enterprise is organically associated with the county agent work, but in the other States has a more separate organization. Through the club work the extension agencies are brought into close touch with the State and local officers and teachers, who largely cooperate in the formation and management of the clubs. This has raised many interesting questions regarding the relations which the club work might or should sustain with the regular school instruction in agriculture and home economics. For example, is it practicable and desirable to consider the club work as in the nature of a home project for the pupils and to give school credit for this work? Undoubtedly such questions will require much consideration by the extension officers in the future.

For many years the agricultural colleges have done a large amount of extension work through the members of their faculties and experiment station staffs. At first this was purely incidental to their regular duties, but as the demand for extension work has grown a somewhat definite and, in many cases, a large share of the time of specialists in various branches of agriculture and home economics has been devoted to this work. More recently in some institutions certain officers have been set apart wholly for this service. With the coming of larger funds for extension work under the Smith-Lever Act, much attention is being given to the enlarging and strengthening of the force of extension specialists in practically all the States.

These officers are expected to supplement the work of the county agents by giving them advice and assistance in connection with special problems which arise in the counties, to carry on short practical courses of instruction, often called movable schools, in various parts of the State, to conduct demonstrations along special lines, to prepare extension publications, to address meetings of farmers, to answer the inquiries of county agents or farmers on a great variety of subjects, etc. In general, they are to gather up the available knowledge in their several specialties, and especially the knowledge obtained by the state experiment stations which bears directly on the farmers' problems within the State, to put this knowledge in effective form for delivery to the farming people, and to carry it to them directly or through the county agents by word of mouth, demonstrations, or publications.

The organization of such a force on a large scale is giving the administrative officers of the colleges much trouble and perplexity. The determination of the status of the extension specialists as members of the college faculties and their relations to the teaching force and the station staffs is by no means an easy or simple matter. The question as to how far the extension specialists should devote all their time to extension work or should combine such work with teaching or research is a very complicated one. Obviously there is great danger that persons employed on the extension staff will waste much time and energy in traveling about on indefinite errands, will do too much offhand talking or writing, will be content to be superficial students of their subjects, will not give sufficient attention to the planning and conducting of worth-while demonstrations, will make their teaching too theoretical or sensational, etc.

The standardization of the work of extension specialists has hardly begun. The colleges are practically compelled to increase their numbers rapidly by the appointment of the best available personnel. They must not, however, neglect to establish some reasonable system for scrutinizing the work of these officers with a view to determining its real value as measured by its practical results. It is believed that such specialists should be called upon from time to time to outline their work quite definitely in project statements to be reviewed and approved by the extension director. They should be encouraged to restrict their principal endeavors in any one year to a few well-chosen and strictly limited subjects and should be made to feel that their success will be measured largely by their ability to secure definite results along these lines. Many of the projects for specialists thus far submitted to the Department under the Smith-Lever Act are far too general and do not reveal any thorough study of what is actually needed or feasible. This is undoubtedly due in part to the rush of work imposed on the extension officers during the past year, and it will be expected that there will be definite improvement along this line in the near future.

The difficulties of the colleges in the proper development of their extension staffs and enterprises are greatly enhanced by the extravagant expectations regarding the immediate effect of this work on our agricultural advancement entertained by the public, partly as a result of enthusiastic propaganda conducted by various agencies. Agricultural advancement over large areas and among farming people of very diverse elements is necessarily a slow process. Superficial results, often very beneficial as far as they go, can be obtained, it may be, in a comparatively short time. Propagandas wisely planned may be useful but they will fail of permanent success unless they are followed up by patient and continuous education.

The Smith-Lever Act has provided the means for a permanent system of popular practical education in agriculture and home economics, so organized as to preserve the autonomy of our state agricultural institutions, to encourage and develop local initiative and self help, and at the same time to bring to the support of the state institutions and local organizations the National Department of Agriculture with its broad outlook on our agricultural problems and its force of scientists and experts who have specialized in various lines or have had wide opportunities for study and observation in certain directions. The most encouraging thing about the extension development in the United States during the past year has been the formation on a grand scale of a cooperative system involving national, state, and local organizations and the general good will and cordiality which has marked the relations of these agencies in the inauguration of this system. A few of the major features of this vast enterprise and some of the outstanding administrative problems with which it will have to deal have been briefly touched upon in this article. It is obviously impracticable in so short a space to give an adequate idea of the immense range and great intricacy of a work which will ultimately touch every phase of the industrial, home, and community life of our agricultural people.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Organic constituents of Pacific coast kelps, D. R. Hoagland (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 1, pp. 39–58*).—The object of this work was to study the organic constituents of California kelps. The following species were examined: *Macrocystis pyrifera, Nereocystis luetkeana, Pelagophycus porra, Egregia lævigata, E. menziesii, Laminaria andersonii,* and *Iridæa* sp.

Qualitative examination showed the presence in the kelps of complex compounds in a highly colloidal state, but starch and reducing sugars were absent. In all cases a furfurol test was obtained and some samples gave the galactan test, i. e., for mucic acid, after oxidation with nitric acid.

The average results of quantitative analyses of kelps are given in the following table:

Average composition of the organic matter of Pacific coast kelp, calculated on whole plant.

Kind of kelp used.	Number of samples analyzed.	Moisture.	Percentage composition calculated to a water-free basis.							
			Total salts.	Total organic matter.	Protein (6.25).	Ether extract.	Crude fiber.	Pentosans.	Water soluble alcohol precipitate.	Sodium carbonate fraction (algin).
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Macrocystis pyrifera, harvestable portion, San Diego	8	86.3	38.2	61.7	7.4	0.34	7.2	7.7	6.6	18.7
M. pyrifera, harvestable portion, Pacific Grove	4	87.7	42.9	56.9	13.4	.40	7.6	6.3	8.7	14.4
M. pyrifera, nonharvestable portion, San Diego	8	87.7	42.0	57.8	10.8	.44	7.2	8.0	8.8	17.5
Nereocystis luetkeana, entire plant, Pacific Grove	4	91.7	54.5	45.1	10.8	1.06	5.1	6.4	8.6	14.1
Pelagophycus porra, entire plant, San Diego	2	89.7	52.7	47.7	7.5	.27	6.2	8.4	5.8	16.1
Egregia lævigata, entire plant, San Diego	2	83.7	35.5	64.5	11.6	.88	9.0	9.8	9.1	18.7
E. menziesii, entire plant, Pacific Grove	3	83.6	33.4	66.3	17.2	.67	8.7	9.0	5.5	19.1
Laminaria andersonii, entire plant	1	78.5	26.5	73.5	15.0	.65	10.4	10.0	1.7	22.8
Iridæa sp., entire plant	1	80.1	31.4	68.8	17.0	.44	10.5	.9	1.3	1.0

Much of the nitrogen present in kelp is in the nonprotein state. Extractions indicated that one-fifth to one-third was soluble in cold water, which about corresponds to the figures obtained for nonprotein nitrogen. The water extracts from a number of samples of ground kelp were analyzed for acid amid and ammonia nitrogen. "Protein nitrogen was precipitated by means of phosphotungstic acid, the filtrate boiled in an 8 per cent solution of hydrochloric acid and distilled in the presence of an excess of magnesium oxid. In all cases the amount of nitrogen so estimated was insignificant."

The most important carbohydrate constituent of kelp is algin, obtained by digesting cold for 24 hours with a 2 per cent sodium carbonate solution and precipitating from the filtered extract with dilute hydrochloric acid. The percentage of algin obtained varied from 13 to 24 per cent when calculated on a dry basis. An exception was *Iridæa* spp., which only showed 1 per cent of the complex. The composition of a purified, bleached with sulphurous acid, and dried sample of algin was as follows: Nitrogen, 0.3 per cent; ash, 2.2 per cent; furfurol calculated to pentosans, 38.6 per cent; and material insoluble after treatment with concentrated nitric acid (cellulose derivative) 24.5 per cent. Algin is regarded as a very complex resistant compound (or mixture of compounds) of the pentosan type, with cellulose possibly making up a part of the complex. It has weakly acid properties, forming soluble compounds with the alkali metals. The properties of soluble and insoluble alginates are described.

The carbohydrates in kelp precipitable by alcohol were smaller in quantity than algin, and in *M. pyrifera* the stems showed uniformly higher percentages than the leaves. The dried substance contained 1.2 per cent of nitrogen and yielded furfurol, corresponding to 13.2 per cent of pentosan. No color test was given with iodin and no reduction with Fehling's solution. The moist precipitate when boiled several hours with a 2 per cent solution of sulphuric acid reduces alkaline copper solution considerably. Upon drying, the precipitate became very resistant to solution and to hydrolysis. A composite sample of fiber, obtained as in the crude fiber method, was treated by the chlorination method of Cross and Bevan (E. S. R., 28, p. 805) and showed that approximately one-half of the crude fiber, or calculated on the whole dry plant, 3 to 4 per cent was composed of pure cellulose.

Dried kelp when treated with 2 per cent sulphuric acid was very resistant to hydrolysis and yielded copper-reducing substances only with difficulty. Kelp was found to contain a considerable portion of water-insoluble sulphur, which is regarded as organic sulphur. The leaves contained uniformly more sulphur than the stems. Volatile sulphur compounds could not be noted. The iodin of dried kelp was found almost entirely soluble in cold water or in 90 per cent alcohol.

Although Pacific coast kelps contain an appreciable amount of nitrogen, it is doubtful whether they can be considered an important feeding stuff. Although the percentage of acid amid nitrogen is apparently very small, it is necessary to prove that the remainder of the soluble nitrogen is present in the form of suitably proportioned amino acids before a high nutritive value can be assigned to the material. "Furthermore, the nitrogenous compounds would undoubtedly be rendered less available because of the admixture of large percentages of highly resistant polysaccharids." Another factor which must be taken into consideration is that cows will not eat the leached or unleached fresh kelp unless it is well mixed with other feed. "In order to ascertain whether kelp might be preserved in the fresh state as a sort of silage, a sample of *N. luetkeana* was packed in an air-tight container and stored for three months. At the end of this period there was no indication of putrefaction. The acidity had increased slightly, the final percentage being 0.18 as lactic acid. The sample had become soft and 'crumbly,' but there was no formation of reducing substances or marked increase in soluble material."

The so-called algin might be employed as a size for paper and fabrics, but whether it is economically feasible is questionable. Its physical properties are not well adapted for clarifying wines. As leached kelp only has a small amount of cellulose its use for paper making is questionable, especially in view of the fact that redwood wastes and other wastes of much greater possibilities are still to be utilized.

Destructive distillation of kelp side by side with Douglas fir shavings and oak sawdust showed "that the distillates from the kelp, judged by their content of acetic acid and alcohol, had a value of only one-fifth to one-tenth that of the oak and fir distillates, a value so slight as to preclude any profitable recovery of the products. The yields for oak and fir approximate those obtained in larger experiments on similar materials, and it is very probable, therefore, that the general comparisons with kelp would hold even in distillations on a commercial scale. The distillates obtained from the kelp were watery in appearance and had a very slightly acid reaction to litmus, although they contained considerable amounts of basic substances. By the Kjeldahl method 3.2 gm. of nitrogen was found in the total distillate from 1 kg. of dried kelp. The tar oils obtained with the distillate floated on the surface, having a specific gravity of 0.984. Their percentage varies from 4 to 7 on the basis of the dry kelp. The gases evolved from the kelp differ from those of the oak and fir in not being combustible during any of the earlier stages of distillation. The charcoal residue in the retort was soft and of dull-gray color. Leaching experiments indicated that most of the potash may be recovered from the char as a high-grade product."

A bibliography of cited literature is appended.

The theory of alkalimetrical and acidimetrical titrations, N. BJERRUM (*Samml. Chem. u. Chem. Tech. Vorträge, 21 (1914), No. 1–3, pp. IV+128, figs. 11*).—This book contains material given in a course of lectures at the University of Copenhagen in the spring of 1913. The book is divided into three sections. The first part deals with the present views regarding acid and basic reaction, the strength of acids and bases, and the hydrolysis of salts. The second part considers the law of indicators with special regard to volumetric analysis. The third part deals with the principles of titration.

A comparison of the Gunning-copper method with the Kjeldahl-Gunning-Arnold method for the determination of nitrogen, O. F. JENSEN (*Jour. Indus. and Engin. Chem., 7 (1915), No. 1, pp. 38, 39*).—A quantitative yield of ammonia was obtained more quickly in dried blood by the Kjeldahl-Gunning-Arnold method than with the Gunning-copper method. In the case of other substances studied, which included bone meal, casein, egg albumen (dried), fish scrap, animal tankage, beef scrap, castor-bean pomace, cotton-seed meal, etc., a digestion of one and a half hours was equally efficacious for either of the methods. "The Gunning-copper method possesses advantages in manipulation which makes it preferable to the Kjeldahl-Gunning-Arnold method, especially where a large number of determinations are to be made."

Cleaning soils for microscopic examination, W. H. FRY and J. A. CULLEN (*Jour. Indus. and Engin. Chem., 7 (1915), No. 1, pp. 40, 41*).—For cleaning soils for microscopical mineral work a 10 per cent solution of oxalic acid is recommended. "In about 30 minutes it removes the iron stains satisfactorily. Tests upon various soil minerals showed that, with the exception of apatite, it did not affect them appreciably; and in the case of apatite, although there is undoubtedly some effect, it leaves that mineral in a determinable state. Of course, in any case calcite would be removed—a fact which renders very difficult the determination of small quantities of this mineral in discolored soils."

The strength of nitric acid, period of extraction, and ignition as affecting the gravimetric determination of phosphoric acid in soils, O. L. Brauer (*Jour. Indus. and Engin. Chem., 6 (1914), No. 12, pp. 1004, 1005*).—"Acid weaker than 1 N to 2 N HNO_3 will not extract all the soluble phosphoric acid from a soil. It is needless to extract with the acid for a longer period than two hours on the steam bath. Ignition decreases the HNO_3-soluble phosphoric acid in the soils."

The estimation of citric acid-soluble phosphoric acid in Thomas slag powder, Neubauer (*Landw. Vers. Stat., 85 (1914), No. 3-5, pp. 238-247*).—A report by the referee of cooperative work done with the methods for determining citric acid-soluble phosphoric acid given to the Association of Agricultural Experiment Stations of Germany. The methods best suited for the purpose, according to the referee, are the iron citrate method (E. S. R., 29, pp. 409, 410) and the Lorenz method (E. S. R., 13, p. 14; 31, p. 112). Preference is given to the latter method. Discussions of the report by members of the Association are included.

Estimation of water-soluble phosphoric acid in superphosphate mixtures, Neubauer (*Landw. Vers. Stat., 85 (1914), No. 3-5, pp. 248, 249*).—The author believes that better results are obtainable if the flask containing the sample is filled up to the mark before rotation. This confirms the opinion of Pilz (E. S. R., 30, p. 809).

About the titrametric estimation of cyanamid, G. Grube and J. Krüger (*Ztschr. Angew. Chem., 27 (1914), No. 46, Aufsatzteil, pp. 326, 327; abs. in Chem. Ztg., 38 (1914), No. 114-115, Repert., p. 488*).—The authors conclude that the Kappen method (E. S. R., 21, p. 419) and the Caro method (E. S. R., 25, p. 24) will yield identical results, provided the precipitation is done with silver nitrate in a slightly acid (acetic) solution of the cyanamid and the solution is subsequently made slightly alkaline with ammonia. A large excess of ammoniacal salt or free ammonia must not be present.

Examination, sampling, and guaranty of fertilizing lime, Neubauer (*Landw. Vers. Stat., 85 (1914), No. 3-5, pp. 228-238*).—In cooperative work under the auspices of the German Association of Agricultural Experiment Stations six limes were studied by the Tacke sulphuric acid titration (official) method, the Förster hydrochloric acid titration method, and the Fresenius method.[a]

The figures obtained by the Fresenius method were much more uniform than those given by the Tacke method and the operation is more simple than the latter method. Both methods, however, can be used only for comparatively pure limes. The method of sampling in use by the association is deemed inadequate.

Blood charcoal as a purifying agent for arsenic solutions previous to titration, R. M. Chapin (*Jour. Indus. and Engin. Chem., 6 (1914), No. 12, pp. 1002, 1003*).—In assaying arsenical dipping fluids, of which an important ingredient is an alkaline arsenite, it often becomes necessary to remove organic material which interferes with the titration by iodin. Organic matter, when present, may absorb iodin and thus render the end points inaccurate and fugitive, and it furthermore imparts color to the solution. Purified kaolin or infusorial earth only obviates the disturbing factor moderately, but in blood charcoal a

[a] Quantitative Chemical Analysis, by K. R. Fresenius, trans. by A. I. Cohn, 1904, vol. 2, pp. 334, 335.

substance was found which, when used in small amounts and with brief digestion produced filtrates wherein the end point came out sharply and permanently. Blood charcoal, though slightly absorbing arsenic acid from acid solution, will again release it quantitatively, but more or less oxidized to arsenic acid. When the charcoal is washed this finding may be of considerable value in the determination of both arsenious and arsenic acid in a variety of substances. A test was made of its decolorizing power on a sample of London purple with good results.

See also a previous note (E. S. R., 31, p. 115).

A substitute for potassium permanganate to liberate formaldehyde gas from a water solution, S. G. DIXON (*Jour. Amer. Med. Assoc., 64 (1915), No. 5, p. 459*).—The formaldehyde solution shipped in combination with sulphuric acid when exposed to extremely low temperatures in winter was not found sufficiently stable for northern climates. By adding 1½ fluid oz. of glycerin to the formula a solution was obtained which is moderately stable at low temperature and will withstand polymerization. The following formula is now used: "Sodium dichromate, 10 oz. avoirdupois; saturated solution of formaldehyde gas, 1 pint; sulphuric acid, commercial, 1½ fluid oz.; glycerin, 1½ fluid oz."

It was also found that when the acidulated solution became cloudy on account of low temperatures it could be made clear and potent by gently warming it for a long period of time.

See also a previous note (E. S. R., 33, p. 12).

An improved method for the estimation of inorganic phosphoric acid in certain tissues and food products, R. M. CHAPIN and W. C. POWICK (*Jour. Biol. Chem., 20 (1915), No. 2, pp. 97–114*).—The method, which was designed for and effectively used in the determination of inorganic phosphorus in eggs and in meats, is said to possess a sufficient number of advantages to make it superior to the methods of Emmett and Grindley (E. S. R., 17, p. 887), Siegfried and Singewald (E. S. R., 17, p. 635), and Forbes et al. (E. S. R., 23, p. 303). "The Emmett and Grindley method falls short by the use of a neutral solvent and of heat; the Siegfried and Singewald method, by failure to remove the protective colloids, by exposure of the organic phosphorus to the action of the phosphate precipitant, and by the long duration of the initial filtration; and the Forbes method, by the use of heat and the necessity for a double filtration. Finally, Collison's modification of the Forbes method of extraction is open to the criticism that the proteid superficially coagulated by the strong alcohol interferes with the further penetration of the tissue by the solvent."

In the method proposed picric acid solution containing a small amount of hydrochloric acid is used for extracting the phosphorus. "The extraction is complete; bacterial action is prevented, and the proteids are effectually coagulated by the reagent, while the danger of chemical or enzymatic changes is minimized by the low temperature and the rapidity of the extraction. The extract is easily filtered and is practically free from organically combined phosphorus, while by the use of an aliquot of the filtrate for further work, a tedious washing of the precipitate is avoided."

In the method an initial precipitation is made with magnesia mixture and the final precipitation by means of an ammonium molybdate. The phosphoric acid is finally estimated gravimetrically by weighing the ammonium phosphomolybdate by the Lorenz method (E. S. R., 13, p. 14) as modified by Neubauer and Lücker (E. S. R., 27, p. 503). Several modifications of the method are also presented.

"By means of this method a progressive increase in the ratio of the inorganic to the total phosphorus in eggs has been found, which increase corresponds to the increased deterioration of the eggs as judged by physical means." The data on eggs show the total and inorganic phosphorus content.

Methods adapted for the determination of decomposition in eggs and in other protein food products, H. W. HOUGHTON and F. C. WEBER (*Abs. in Biochem. Bul., 3 (1914), No. 11–12, p. 447*).—"The methods that are most applicable for the determination of decomposition are the Folin titration and Nesslerization methods for free ammonia, Klein's modification of Van Slyke's method for amino nitrogen, and the Folin-Wentworth method for acidity of fat.

"Calculating the results on liquid eggs to a moisture-fat free basis, the following amounts of ammonia nitrogen in milligrams per 100 gm. of material were obtained: By the Folin titration method—seconds, 11.4; spots, 14.1; light rots, 17.3; rots, 26.2; black rots, 169.6. By the Folin Nesslerization method—seconds, 12.4; spots, 20; light rots, 21.5; rots, 29.9; black rots, 148.6. The amino nitrogen determination is of service in detecting liquid and dry blood rings, spots, and light rots. Increase in the acidity of the fat indicates spots and worse grades of eggs.

"The ammonia methods applied to herring give results indicating decomposition of the fish after standing 24 hours at about 70° F. Applied to clams, an appreciable increase in the ammonia is shown after keeping two days at a temperature of 60 to 65°."

The relation between the specific gravity and the percentage of fat and total solids in cows' milk, W. FLEISCHMANN (*Jour. Landw., 62 (1914), No. 2, pp. 159–172*).—A review and discussion of practically all of the more important methods for estimating the total solids of milk, etc. A formula is given which yields approximate results under practical conditions.

Morres' alizarol test for testing the keeping quality of milk, A. DEVARDA and A. WEICH (*Arch. Chem. u. Mikros., 6 (1913), No. 4, pp. 207–212; abs. in Chem. Ztg., 37 (1913), No. 128, Repert., p. 586*).—The combined alizarol test (E. S. R., 22, p. 515) is a color test combined with the alcohol test which will empirically determine the degree of acidity of milk with an accuracy of 1 per cent. The chief advantage of this test lies in the fact that the alcohol and acidity test can be conducted at one time and can be used by the milk inspector with satisfactory results. Alkaline decomposition products when present vitiate the results.

What value has the alizarol test for the examination of milk as a control of the milk supply? A. DEVARDA (*Österr. Molk. Ztg., 21 (1914), No. 2, pp. 17–19*).—A detailed criticism of the Morres alizarol test.

With this test it is not possible to determine whether a pure culture has caused coagulation or whether it has been due to a number of organisms. The alcohol test is satisfactory for judging the quality of milk in market control. It is possible to determine approximately the degree of pure lactic acidity of the milk with the alizarol method, but the diagnostic value is thereby limited to the empirical testing of milk, especially as to its value for cheese making. This use was suggested by Eugling in 1882.

The alcohol and alizarol tests, W. MORRES (*Milchw. Zentbl. 43 (1914), No. 8, pp. 208–211*).—The alizarol test is said to be more valuable for testing milk than the alcohol test alone. Eugling's test with alizarin is only a qualitative procedure, while the alizarol test is qualitative and quantitative. It will indicate both the nature and the degree of decomposition, and in this it displaces titration of acidity with alkali as well as the alcohol test. Judging a milk on the basis of the consistency of the coagulum obtained with the alcohol test alone is deemed uncertain. A method for proving the value of the alizarol test is included in the article.

Titration of milk with alcohol of various concentrations, F. LÖHNIS (*Molk. Ztg. [Hildesheim], 28 (1914), No. 9, pp. 153–155*).—The alcohol test has been modified as follows:

Two cc. of the milk under examination is placed in a beaker and titrated with 80 per cent alcohol until the appearance of coagulation, the number of cubic centimeters of alcohol required indicating the alcohol number of the milk. The coagulating point of milks which require more than 6 cc. of alcohol is hard to determine. The test is said to be an index to the number of bacteria present in the milk, a milk with a low germ content requiring more than 4 cc. of alcohol, while that of a medium micro-organism content requires from 2 to 4 cc., and high germ contents less than 2 cc.

The alcohol test in relation to milk, S. H. AYERS and W. T. JOHNSON, JR. (*U. S. Dept. Agr. Bul. 202 (1915), pp. 35, figs. 4*).—The purpose of this work was to determine the practical value of the alcohol test for the quality of milk, and incidentally to determine some of the causes for the coagulation of milk by alcohol.

Fresh milk from a single healthy cow in the middle of the period of lactation was found to give occasionally a positive alcohol test with an equal volume of 68 or 70 per cent alcohol. Colostrum gives a positive reaction, and the same is true, usually, of "old" milk (milk from a cow in the last of its lactation period). Normal milk when mixed with colostrum milk did not show positive with the 68 per cent alcohol test until the amount of colostrum milk reached 80 to 90 per cent. "When 75 per cent alcohol was used the test was positive with as low as 25 per cent of colostrum milk, but when colostrum milk from another cow was used a mixture of 80 per cent was required to give a positive reaction with 75 per cent alcohol. It seems evident from these results that the mixing of colostrum and normal milk would not cause a positive alcohol test unless a very large percentage of the milk were colostrum milk."

As a result of reviewing the literature on the behavior of the alcohol test with market milk, it was evident that the acidity plays a part in the alcohol test. In the present investigation it was found that if the acidity was raised by the addition of 1 cc. of decinormal lactic-acid solution, a medium-sized flake coagulum with 75 and 68 per cent alcohol could be obtained. "Since an increase in acidity will cause a positive alcohol test, it is evident that the growth of acid-forming bacteria in milk will cause a positive test.

"In order to determine the relation between the number of acid-forming bacteria, the acidity, and the alcohol test, two experiments were performed, using a pure culture of a lactic-acid-producing organism." In one of the samples of milk the alcohol test was negative 7 hours after incubation, but in the second sample, where a larger portion of bacterial culture was used for the inoculation (at the beginning of the incubation 480,000 bacteria were present), the alcohol test with 75 per cent alcohol was positive on the fifth day, when the number of bacteria reached over 16,000,000. On the sixth day 68 per cent alcohol gave a positive test and the number of bacteria was 31,400,000.

Since the acidity of milk is due partly to phosphates, the effect of sodium and potassium acid phosphates on the outcome of the alcohol test was studied. "The results show that it is possible by increasing the acidity of milk with acid phosphates to cause a coagulation with the alcohol test, but the acidity has to be increased to a high degree, and there would never be enough acid phosphate in a mixed market milk for it to be entirely responsible for a positive alcohol test. . . . When from 7 to 8 cc. of decinormal lactic acid was added to the milk with dibasic phosphate, the alcohol test became positive; that is, when the dibasic phosphate had been converted into monobasic phosphate, then further increases in acidity caused a positive alcohol test. As a very general explanation of this result, it may be said that when acid is added to milk it converts the dibasic phosphate into the monobasic phosphate. It follows that the acid, and also the monobasic phosphate, probably affect the casein and thereby change it into a condition in which it is possible to precipitate the casein by alcohol and cause a positive test. This action on the dibasic phosphate probably explains in part the positive alcohol tests with different low acidities."

The addition of 1 per cent of sour milk to fresh milk caused a positive alcohol test with 75 per cent alcohol and the addition of 2.5 per cent of sour milk caused a reaction with 68 per cent alcohol. As much as 10 per cent of sour milk was necessary to cause coagulation with 44 per cent alcohol. Milk in which the acidity was increased to 4.3 per cent by the addition of lactic acid and then reduced to 1.9 per cent by neutralization gave a positive alcohol test with 68 per cent alcohol. "The positive alcohol tests with 68 per cent alcohol could be made negative at acidities below 4.3 by reducing to about the original acidity of the normal milk."

Some milks when heated to 90° C. will not give the alcohol test with 75 or 68 per cent alcohol.

To determine the effects of rennet on the outcome of the alcohol test (75, 68, and 44 per cent) rennet in percentages ranging from 0.00005 to 0.0015 was tried and the tests with alcohol were made at intervals of one hour. "The results show that the action of rennet in milk may produce changes which cause a positive alcohol test and that two main factors are of importance, viz, the amount of rennet and the length of time the rennet has to act. Undoubtedly a third factor must be taken into consideration; that is, the temperature at which the milk is held. In the experiments the milk was held at room temperature." The activity of rennet-forming bacteria may cause a positive alcohol reaction but the number of bacteria propagated must be large. A test indicated that it is also possible to differentiate between an acid and rennet fermentation in milk on the basis of the alcohol test. When sufficient rennet was added to milk to cause a positive alcohol reaction and then heated to 90° C. the milk no longer gave a positive alcohol test with 75 per cent alcohol, although rennet and acid probably play the principal rôle in obtaining a positive alcohol test.

The presence of carbon dioxid may also be considered a factor. Carbon dioxid passed into milk will cause an alcohol test. Alkali-forming bacteria will not cause a positive alcohol test. With samples of market milk no relation was found between the bacterial count and the alcohol test. In this work particular attention is drawn "to the bacterial counts of 142 samples of raw milk which ranged from 2,000 to 19,600,000 bacteria per cubic centimeter. Of these 142 samples none gave a positive alcohol test, yet 86, or 60.6 per cent, contained less than and 39.4 per cent more than 500,000 bacteria per cubic centimeter. The bacterial counts of samples of pasteurized milk which gave a negative alcohol test ranged from 1,200 to 3,600,000 per cubic centimeter. . . . When the 68 per cent alcohol test is positive with a sample of market milk, it is evident that there is some change in the milk from normal. In some cases it may be due to an increased acidity and in consequence a change in the casein of the milk, due to bacterial action. In other cases it may be due to a pure rennet fermentation or there may be a combination of an acid-and-rennet fermentation. In such cases the bacterial count would undoubtedly be high. However, there still remains to be explained the reason for a positive alcohol test in samples of market milk with a low bacterial count and low acidity."

The alcohol titration method of Löhnis (see p. 113) was tested on 116 samples of market milk. No definite relation between the bacterial count and the alcohol titration test was found. There was also no definite relation found between the alcohol test and the acidity, until the acidity was more than about 2.2 per cent. "If we were dealing with pure cultures of organisms which influence the alcohol test the titration with alcohol might be of value in giving an idea of the bacterial numbers from the results of experiments in which we used pure cultures of lactic acid and rennet-forming bacteria. In milk, however, we have a varied bacterial flora to contend with and we can not see from our results that the alcohol titration method is of much greater value than the simple alcohol test."

With the alizarol test of Morres (see p. 112) all of the color changes described by Morres could not be obtained. From the results obtained it is evident that the alizarol test will show slight changes when the acidity is low, but that when the acidity is high it is not very sensitive. "In regard to the value of the alizarol test, it is believed that wherever the alcohol test can be considered of value, the addition of an indicator, such as alizarin, may increase the value of the alcohol test by possibly giving additional information as to acidity. On account of the complexity of the bacterial fermentations in market milk we do not believe that the alizarol test gives any very valuable information as to the conditions existing in the milk."

A bibliography of cited literature is appended.

Some milk investigations with special reference to the value of the rosolic acid-alcohol test, L. BAHR (*Ztschr. Fleisch u. Milchhyg., 24 (1914), Nos. 10, pp. 228–233; 11, pp. 251–256; 16, pp. 370–376, figs. 4; 17, pp. 398–406; 20, pp. 472–477; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 44, p. 734*).—In examining the milk from 105 cows located in five establishments with the rosolic acid-alcohol test (E. S. R., 26, p. 87), about 16 per cent gave positive reactions. This was especially true in those cases where the titer against normal alkali was somewhat below normal. The rosolic acid reaction probably depends upon the presence of secondary or tertiary phosphates.

Generally speaking, the results with the test compared well with the leucocyte and catalase tests, which sometimes give a higher number of positive findings. In the majority of the milks in which the rosolic acid-alcohol test was positive the milk contained many bacteria, leucocytes, and fibrin. There were also reactions obtained with milk from a cow in an advanced stage of lactation, but this milk did not show a large amount of leucocytes or bacteria. A few tests made with methylene blue indicated that it had no relation to the number of bacteria present in the milk.

The rosolic acid test may be employed for detecting cows affected with mastitis, especially those in which it is not clinically manifest, and is considered a good barn test. The catalase test indicates a larger number of animals giving pathological milk, and it is believed that this also may be so arranged that it can be used as a practical test in the dairy barn. The bacteriological examination of the milks revealed that some of them contained ordinary streptococci (mostly diplococci), amongst which there was one type which resembled the one causing mastitis. In a few cases a previously undescribed bacillus (*Bacillus pseudopyogenes lactis*) was noted and in others staphylococci and small nonacid-fast bacilli were found.

The use of Kellner's modification of Petermann's method for the estimation of citrate-soluble phosphoric acid in feed limes, LOGES (*Landw. Vers. Stat., 85 (1914), No. 3–5, pp. 218–226*).—This is a report made to the German Association of Agricultural Experiment Stations. It is stated that duplicate results can only be obtained when the mixture is shaken the same length of time in each case.

A study in drying urine for chemical analysis, W. W. BRAMAN (*Jour. Biol. Chem., 19 (1914), No. 1, pp. 105–113*).—In these investigations it was found that some urines from herbivora on drying lose nitrogen from ammonium compounds and free ammonia, in some cases as much as 50 per cent of this nitrogen. The main loss of nitrogen, however, comes from the decomposition of ammonium carbonate rather than from that of urea or hippuric acid. The carbon loss, which consists of carbon dioxid, is in excess of what would be necessary to combine with the ammonia to form normal carbonates, and comes partly from the bicarbonates. The total carbon and total hydrogen can be determined directly by combustion in a quartz combustion tube using the ordinary combustion furnace.

The quantitative estimation of urea, and indirectly of allantoin, in urine by means of urease, R. H. A. PLIMMER and RUTH F. SKELTON (*Biochem. Jour., 8 (1914), No. 1, pp. 70–73*).—"The estimation of urea in urine is quickly and accurately made by decomposing it with urease (1 gm. powdered soy bean) at 35 to 40° C. for one hour. During this time the ammonia evolved is removed by an air current, as in Folin's method for estimating ammonia. One gm. of anhydrous sodium carbonate is then added and the air current is continued for another hour. Liquid paraffin is very convenient for lessening the frothing. Since urease does not decompose allantoin, and since both allantoin and urea are quantitatively decomposed by the magnesium chlorid method of Folin, the amount of allantoin in those urines which contain both compounds is readily estimated by difference."

A permanent preparation of urease, and its use for rapid and accurate determination of urea, D. D. VAN SLYKE and G. E. CULLEN (*Jour. Amer. Med. Assoc., 62 (1914), No. 20, pp. 1558, 1559, fig. 1; Jour. Biol. Chem., 19 (1914), No. 2, pp. 211–228, figs. 3*).—Soy-bean meal is extracted with five parts of water and the extract is poured into ten volumes of acetone. The precipitate containing the enzym is dried and obtained as a powder, which is said to maintain its action indefinitely. The ammonia evolved is collected in fiftieth-normal acid, which may be either hydrochloric or sulphuric.

METEOROLOGY.

Relation of climate to plant growth in Maryland, F. T. McLEAN (*Mo. Weather Rev., 43 (1915), No. 2, pp. 65–72, figs. 3*).—Selected strains of wheat, corn, soy beans, and Windsor beans were grown in nine different localities on the same type of soil in 6-in. pots sunk in the ground, and an attempt was made to correlate the growth of the plants with the meteorological environment, viz, rainfall, evaporation, temperature, and sunshine. To eliminate the disturbing influence of drought, the soil moisture in the pots was prevented from falling below the optimum by the use of an autoirrigator. Evaporation was measured by means of a Livingston atmometer.

Only the results obtained with soy beans at Oakland and Easton are discussed in this article. These indicate that with a sufficient supply of moisture provided for, the soy bean "exhibited a pronounced and somewhat regular march of its growth rate (as measured in terms of the dry-weight material accumulated in leaves and stems during the first month of its growth from seed) throughout the growing season," the maximum rate of production of dry matter occurring in the warmest part of the season. "The growth rate tended to vary almost directly with the 'temperature index' [mean daily temperature above 40° F.] when the air temperatures were low. With high air temperatures the growth rate was relatively much greater than can be accounted for by the 'temperature indexes' alone. The agreement in this regard between the data from the two very different stations included in these studies seems to suggest that this feature may be general for a considerable range of conditions, at least for the plant form here considered. With the given soil and soil moisture content the intensities of evaporation experienced by these soy-bean plants were apparently not sufficiently high seriously to overtax the process of water absorption or that of water conduction." It therefore appears that the seasonal changes in temperature were "much more important in the control of growth than were the changes in any other measured condition or conditional complex."

In general the rates of growth at Oakland were found to be from about 10 to about 20 per cent or more lower than the corresponding rates at Easton. "The early occurrence of frost at Oakland brought the season to a close earlier than was the case at Easton, and the last growth rate for the latter station is shown as markedly lower than any encountered at Oakland. The principle here brought out is worthy of considerable emphasis. For a short frostless season, characterized by a great daily range of temperature, the lowest growth rate may be generally expected to be higher in value than the lowest rate for a longer frostless season, with more equable temperatures."

A correlation of weather conditions and production of cotton in Texas, J. B. Kincer (*Mo. Weather Rev., 43 (1915), No. 2, pp. 61–65, figs. 9*).—In this article an attempt is made to correlate the actual departures from mean temperature and precipitation with the departures from the average yield of cotton during the period from 1894 to 1913, inclusive.

The results show a correlation coefficient of +0.88 and a probable error of ±0.03. The method, however, was found to be inapplicable where the summer rainfall frequently occurs in excessive amounts. In such cases it is necessary to take account of the rainfall actually absorbed by the soil and that which is removed in the run-off.

Temperature and spring wheat in the Dakotas, T. A. Blair (*Mo. Weather Rev., 43 (1915), No. 1, pp. 24–26, figs. 2*).—Continuing studies reported in a previous article (E. S. R., 30, p. 418), the author is led to modify the conclusions from his earlier study to the extent of stating that the mean temperature of June is as important a factor as the total precipitation of May and June in determining the yield of wheat in the Dakotas.

The distribution of the rainfall in the eastern United States, B. C. Wallis (*Mo. Weather Rev., 43 (1915), No. 1, pp. 14–24, figs. 18*).—From studies similar to those already noted (E. S. R., 32, p. 119) the author draws the following general conclusions: "The rainfall intensity as well as the actual amount of precipitation of the eastern United States depends upon three sparate factors—(1) the 'swing of the sun,' which has its most marked effect at places farthest from the sea; (2) the local variations in temperature, which give rise to abnormal temperature conditions, which have their most marked effect in causing variations in the months of maximum and minimum intensity of rainfall; (3) the proximity of the ocean, which causes heavy total precipitation near the coast and masks to some degree the effect of insolation."

The eastern United States is divided into three rainfall belts paralleling the Atlantic coast: (1) The interior or continental belt, characterized by summer rains and winter dryness; (2) a belt of rainfall at all seasons, due to the middle position of the area between the continental conditions of belt 1 and the oceanic conditions of belt 3; and (3) a belt of masked summer rains.

Monthly Weather Review (*Mo. Weather Rev., 43 (1915), Nos. 1, pp. 56, pls. 24, figs. 39; 2, pp. 57–59+X, pls. 8, figs. 12*).—In addition to notes on weather forecasts for January and February, 1915, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology and seismology, notes from the Weather Bureau library, the weather of these months, a condensed climatological summary, climatological tables and charts, and seismological reports, these numbers contain the following articles:

No. 1.—The Snowfall of the Eastern United States (illus.), by C. F. Brooks; The Rainfall of the Northeastern United States (illus.), by B. C. Wallis; The Distribution of the Rainfall in the Eastern United States (illus.), by B. C. Wallis (see p. 117); "Monsoon" Rainfall, by B. C. Wallis; On the Use of "Average," "Mean," "General," by H. R. Mill; Temperature and Spring Wheat in the Dakotas (illus.), by T. A. Blair (see p. 117); An Eight-Day Mechanically Recording Rain Gage (illus.), by C. F. Marvin; New Meteorological Stations in Korea, by R. S. Curtice; Meteorological Radiotelegrams to Mariners from Scheveningen; and The Water Resources of Strawberry Creek, Berkeley, Cal. (illus.), by W. G. Reed and H. M. Loy.

No. 2.—The Diurnal Period of the Wind Velocity; The Ascent of Air above Active Volcanoes, by K. Wegener; A Correlation of Weather Conditions and Production of Cotton in Texas (illus.), by J. B. Kincer (see p. 117); Relation of Climate to Plant Growth in Maryland (illus.), by F. T. McLean (see p. 116); New Zealand Rainfall in 1914, by D. C. Bates; and Gigantic Snowflakes. A subject and author index of the Monthly Weather Review, 1914, is also included in this number.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and R. E. McLain (*Massachusetts Sta. Met. Buls. 315, 316 (1915), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1915, are presented. The data are briefly discussed in general notes on the weather of each month.

Instructions for cooperative observers (*U. S. Dept. Agr., Weather Bur., Instrument Div. Circs. B and C, 5. ed. (1915), pp. 37, pl. 1, figs. 10*).—This is a fifth revised edition of this pamphlet, which is designed "to furnish cooperative observers with brief instructions for their guidance in taking and recording meteorological observations, more especially of temperature and rainfall, and for reporting earthquakes." The revision consists mainly in the addition of a section relating to earthquake observations and an index. It is stated that there are now about 4,500 cooperative observers in the United States, and that the records furnished by them "are of great value in affording information upon which many of the important publications of the Weather Bureau are based, and it is the policy of the Bureau to foster and encourage the keeping of such records."

These observers receive no money compensation, but are loaned the necessary instruments and regularly receive such of the publications of the Weather Bureau as can be furnished free of cost. The conditions under which instruments may be secured are explained and instructions are given for the erection and care of instruments and for making and recording observations.

SOILS—FERTILIZERS.

Colloid chemistry in the study of soils, K. K. Gedroĭts (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 3, pp. 181–216*).—This is the second communication on the subject (E. S. R., 28, p. 516), and deals with (1) the speed of the exchange reaction in the soil, and (2) the colloidality of soils saturated with different bases and the color method for determining the quantity of colloids in the soil.

Experiments were conducted to determine the speed of the exchange reaction between the calcium (CaO) of chernozem soil and normal solutions of sodium chlorid and ammonium chlorid, and parallel thereto the speed of the exchange reaction between acid sodium phosphate and calcium carbonate. It was found that the reaction between soil calcium and sodium chlorid was instantaneous, and that that between soil calcium and ammonium chlorid, while not instantaneous, was extraordinarily quick. The speed of reaction between sodium phosphate and calcium carbonate was much slower, and it is considered evident, therefore, that the soil calcium is not chemically combined.

To determine the colloidal nature of soils saturated with different bases, 200 gm. portions of a loamy chernozem soil containing 1.395 per cent of calcium oxid were treated 20 successive times with 1 liter of solutions of variable concentration of sodium, potassium, and ammonium chlorids. It was found that such treatment with normal and four times normal salt solutions almost entirely displaced the calcium oxid content soluble in 10 per cent hydrochloric acid.

In a study of the so-called zeolitic compounds in soils samples of chernozem soils were washed repeatedly with water saturated with carbon dioxid until no acid was freed on contact with neutral solutions of sodium chlorid and the water extract was neutral. A comparison of soil so treated with the same soil repeatedly washed with water showed the former to have a much smaller base content but a correspondingly larger colloidality and saturation capacity. It is concluded, therefore, that the zeolitic and humus substances of the soil represent gels of hydrophilous colloids.

Treatment of the chernozem soil with the alkalis sodium, potassium, and ammonium caused the displacement not only of calcium but of iron, magnesia, and potassium, and the soils became saturated, not always exclusively but usually prevailing, with an alkali metal. The colloidality of the soil increased as the saturation with alkali metals increased. This was especially marked when the soil was saturated with sodium. The colloidality was increased less by saturation with ammonia and less still with potassium. It is concluded that when the zeolitic and humus substances are saturated with any of the three alkalis they assume the character of gels of hydrophilous colloids.

Treatment of the original chernozem soil with solutions of iron and aluminum salts caused the displacement of bases, reduced the colloidality, and caused the zeolitic and humus substances to assume the amorphous character of gels of colloids which do not readily take up water.

With reference to the colorimetric method of determining the quantity of colloids in soil, studies were made of the absorption of methyl and crystal violet by eight samples of chernozem soil consisting of the original soil, samples repeatedly treated with 0.2 normal solutions of the chlorids of sodium, potassium, ammonium, calcium, aluminum, and iron, and a sample repeatedly washed out with water saturated with carbon dioxid. A complete adsorption of the coloring matter was observed only by the soil saturated with iron. The adsorption was weak by the soils saturated with aluminum and calcium and the soil washed out with carbon dioxid water. The coloring of the surface film of the samples saturated with potassium, ammonium, and sodium was rather marked, and increased in the order named.

A comparison of the quantities of color adsorbed by the eight soil samples with their so-called colloidalities, that is, the amounts of swelling after saturation with water, showed the color adsorption to proceed not only not parallel with the colloidality but in an opposite direction. It is therefore concluded that the colorimetric method gives a reverse indication of the amounts of colloids in soils and is an unsuitable method.

The destructive distillation of soil, E. J. Holmyard (*Proc. Chem. Soc. London, 30 (1914), No. 428, p. 109; abs. in Chem. Abs., 9 (1915), No. 4, p. 498*).—By the destructive distillation of soils, a distillate of two layers was obtained. The lower aqueous layer was strongly alkaline and smelled of ammonia, and the upper layer consisted of small quantities of a brown oil with an odor like pyridin. Qualitative tests on the lower layer showed the presence of phenol and ammonia. The oil, after the addition of alkali, was distilled in a current of steam, and the pale yellow distillate obtained gave qualitative tests for pyridin, quinolin, pyrrol, thiophene, and possibly furfuraldehyde. Both field soils and garden soils gave similar results. More oil was obtained from garden soils than from field soils.

The results are consistent with the view that the processes of decomposition occurring in the organic matter in soil are similar to those operative in the formation of coal.

Electrolytic determination of the biological solution of soil, E. Pantanelli (*Centbl. Bakt.* [etc.], *2. Abt., 42 (1914), No. 15–16, pp. 439–443.*)—The author reports studies of the biological solution in 23 samples of desert soils of Tripoli of variable composition, in which he determined the bacterial content of each soil and compared the results of measurements of the electrolytic conductivities of percolates through these soils of water, water and chloroform, 0.5 per cent glucose solution, and 0.5 per cent glucose and chloroform.

By this means it was found that the soil salts were not readily washed out by water, but more so by chloroform and water in 16 cases and less so in 7 cases. With water and chloroform, after seven days at most, considerably more salts were leached out than with pure water alone. Bacterial activity was only slightly stimulated by added moisture, and the chloroform completely inhibited the setting free of soil constituents. In 18 cases the use of the glucose solution was accompanied by an increased washing out of soil salts and a marked solution of soil constituents, which is attributed to an increase in bacterial numbers. With glucose and chloroform more salts were leached out in 7 cases only than with glucose alone, and in 5 cases the chloroform retarded the leaching out. In 11 cases glucose and chloroform caused less leaching out of soil salts than chloroform alone, while in 9 cases the opposite was observed. It is concluded that chloroform increases and glucose sometimes decreases the leaching out of soil salts. Chloroform in the presence of glucose completely inhibited the setting free of soil constituents.

The setting free of soil constituents varied for the most part, but not always, with the bacterial content of the soil. It is thought that this power of biological solution depends less on the total bacterial numbers than on the numbers of individual acid and ammonia formers.

It is concluded that the measuring of the electrolytic conductivity is a suitable method for determining the microbiological solubility of soil constituents, especially when comparative experiments are conducted with and without the use of chloroform and glucose.

Contribution to bacteriological studies of the soil, A. Wojtkiewicz (*Centbl. Bakt.* [etc.], *2. Abt., 42 (1914), No. 10–14, pp. 254–261*).—Studies to determine the nature and extent of the influence of methods of management and the different seasons on the microbiological processes in the soil are reported.

The results indicate that the bacterial numbers in soils undergo no extreme variations during the year. The maximum numbers were observed in the spring and the minimum in the winter. The power of the soil to assimilate nitrogen varied greatly with the seasons, the minimum occurring in winter and the maximum in the fall. In general a certain parallelism appeared to exist between bacterial numbers and the power to assimilate nitrogen.

The optimum temperature for nitrogen fixing bacteria varied with the seasons but somewhat slowly. Temperature variation during the day exerted no influence. Studies of other biological processes produced no conclusive results.

Isolation of Bacillus radicicola from soil, C. B. LIPMAN and L. W. FOWLER (*Science, n. ser., 41 (1915), No. 1050, pp. 256–259*).—The methods used with success for the isolation of *B. radicicola* directly from the soil are described, and it is shown that the organism so obtained "at least in some forms and places can be readily made to grow on agar plates in large numbers," thus indicating the desirability of using soil extract-maltose agar for this purpose. The latter was prepared by dissolving 15 gm. of agar and 10 gm. of maltose in a soil extract, of the proper dilution, prepared by shaking 30 gm. of soil for 15 minutes in a sterile bottle with 150 cc of sterile water.

The origin of the "niter spots" in certain western soils, R. STEWART and W. PETERSON (*Jour. Amer. Soc. Agron., 6 (1914), No. 6, pp. 241–248*).—Investigations reported more fully elsewhere (E. S. R., 32, p. 28) are cited to show "that (1) the nitrates of the 'niter spots' are derived by concentration from the original rocks contributing to the soil formation, and that (2) the color of these spots is the direct result of the solvent and decomposing action of the sodium or potassium nitrate upon the organic matter of the soil."

The soils of the western New York fruit and grain region, E. O. FIPPIN (*Cornell Countryman, 12 (1915), No. 5, pp. 368–374, figs. 3*).—This article deals with the characteristics, crop adaptabilities, and fertility requirements of the soils of an area in New York lying adjacent to Lakes Erie and Ontario on the south side.

The natural drainage of the area is poorly developed and the topography is very diverse, varying from flat to undulating. The soils range from heavy stratified clay to loose sand and gravel and are divided into seven series, two of which are of glacial origin, four of lake and swamp derivation, and one of recent alluvial origin. The Ontario series is the most extensively developed in the region. The prevailing soil is a heavy loam to a clay loam. There are extensive areas of silt loam and several small areas of drifting sand, and gravel deposits are widely distributed. "A large part of the land is notably calcareous, especially in the subsoil. . . . In general the stock of organic matter is fairly good but requires attention."

The sandy soil of Sylvan Beach, New York, N. KNIGHT (*Chem. News, 111 (1915), No. 2879, p. 49*).—Analyses of a sandy soil on the eastern shore of Oneida Lake which shows marked oxidizing powers disclosed the presence of much less iron than was expected. The free access of air is thought to be the main reason for the rapid oxidation of organic matter. It is also thought that by the free use of organic manures a fairly rich and productive soil may be formed.

Salts in soils and waters of the south coast of Porto Rico, J. T. CRAWLEY (*Porto Rico Bd. Agr. Expt. Sta. Bul. 9 (1915), pp. 25*).—Continuing work by Zerban (E. S. R., 29, p. 513), this bulletin reports studies of the chemical composition of the soils and irrigation waters of the locality. One of the purposes of the investigation was to show a connection between the existence of so-called "salt spots" and the noticeable deterioration of cane.

The results show that the salt spots and areas affected by salts are widely distributed and of considerable total extent. "In some cases the salt areas are increasing in size and encroaching on the cane areas, while in other cases they are diminishing, and the cane areas extending. The prevalent salts are the bicarbonates, chlorids, and sulphates, and of these the bicarbonates are more widely distributed than the others. Sulphates are generally found in large quantities in the areas that can not be cultivated, but are often absent, except in small amounts, in the cane areas. Chlorids are found in all samples, but often in such small quantities as to be negligible. . . .

"Where the soil contains from 0.1 per cent to 0.2 per cent of bicarbonic acid unaccompanied by any large quantity of other acids the cane is affected in its growth; beyond this point it rarely thrives. . . . In most cases 0.3 per cent of total acid radicles is very injurious or fatal to the cane, depending somewhat on the relative proportion of the various radicles and upon the frequency of irrigation."

The analyses of irrigation waters show most of these to be excellent for irrigation purposes. The chlorin content is small.

It is concluded that the three chief factors influencing the purity of cane juices from the south coast are root grubs, cane borers, and the salts of the soils.

The application of fertilizers to the soil, and losses by leaching, J. T. Crawley and W. B. Cady (*Porto Rico Bd. Agr. Expt. Sta. Bul. 8* (*1915*), *pp. 17–23*).—Experiments with a lowland clay loam soil, a red clay hill soil, and a sandy clay soil with reference to their absorptive powers for fertilizers are reported.

The results as a whole indicated that phosphoric acid is very quickly and firmly fixed by all the classes of soils, but that there is an appreciable loss from the light sandy soils when the fertilization is followed by repeated irrigations. The nitrogen losses, while the greatest, were of material consequence only in the sandy soils. The clay soils fixed the nitrogen quickly and held it firmly. Potash was lost from all the soils, but in small quantities except in the case of the sandy soils. It is stated that heavy rainfalls or irrigations may wash the potash out before it is fixed, especially from sandy soils, but after becoming fixed it is washed out only in small quantities. There was very little loss of fertilizers from clay soils even after very heavy rains or irrigations. It is thought that there is not the same reason for thoroughly mixing the fertilizers with sandy soils as with clay soils, owing to the tendency for moisture to diffuse the ingredients. It is suggested also that fertilizers should be applied in small and frequent doses to sandy soil rather than in large doses at long intervals.

The effect of fertilizers on the physical properties of Hawaiian soils, W. McGeorge (*Hawaii Sta. Bul. 38* (*1915*), *pp. 31, figs. 3*).—This bulletin reports data obtained from an extensive study of the physical properties of Hawaiian soils and the effect of different fertilizers on these properties. Soils of widely differing chemical and physical characteristics and about 40 salts, fertilizer materials, and mixtures were used in the experiments.

It was found that within certain limits the effect of adding a larger application of a salt only magnifies that of a smaller application. Capillarity was diminished in clay soils by the addition of salts but increased in sandy soils. This property was more active in silts than in sandy or clay soils, being slowest in the latter. The percolation of water was most rapid in sandy soils and slowest in types the particles of which are most likely to swell. Fertilizers considerably increased the resistance to percolation. It was found that the theory that soils of greater capillary activity offer the least resistance to percolation of water does not apply to Hawaiian soils.

The results as regards flocculation indicated a relationship between the valency of the salt and its flocculating power. "The most active salt is aluminum sulphate, a trivalent salt. . . . The divalent calcium and magnesium salts of nitric, hydrochloric, and sulphuric acids are next, while the monovalent salts of sodium, potassium, and ammonium are least active. The acids are stronger than any of their divalent salts but the trivalent salt, aluminum sulphate, is stronger than any of the acids. Nitric acid is the strongest, hydrochloric second, and sulphuric third. Likewise the nitrates and chlorids are stronger than the sulphates."

The cohesion of the soil particles, the apparent specific gravity of the soil in most cases, and the hygroscopicity with but very few exceptions were increased by the addition of salts. The vapor pressure was lowered in most instances but it is stated that this can not be explained from a consideration of the surface tension of the added salts.

The influence of radio-active earth on plant growth and crop production, H. H. Rusby (*Jour. N. Y. Bot. Gard., 16 (1915), No. 181, pp. 1–23, pls. 10, figs. 2, Sci. Amer. Sup., 79 (1915), Nos. 2048, pp. 216–218, figs. 9; 2049, pp. 228–230, figs. 12*).—Finely powdered extracted radium ore containing from 2 to 3 mg. of radium per ton was used at rates of 25, 50, 100, and 200 lbs. per acre in mixture with 200 lbs. per acre of "ordinary fertilizer" on a variety of crops grown in window boxes, in a greenhouse, and in field plats at different places.

The general conclusion is that "nearly all, if not all, field crops gave an increased yield under the influence of the proper amount of radio-active fertilizer," the largest increase observed being 135 per cent. The greatest gains reported were obtained with applications smaller than 200 lbs. per acre. Different plants and families of plants showed varying susceptibility to the radio-active fertilizer. "Members of the Cruciferæ or mustard family, comprising mustard, rape, cabbage, cauliflower, sprouts, kale, kohl-rabi, turnips, and radishes were greatly benefited. So were the Cucurbitaceæ, comprising the pumpkin, cucumber, squash, and melons; in fact, more so than any others. The Gramineæ, or grass family, comprising hay, corn, sugar cane, sorghum, and lawn grass, was enormously benefited. . . . The effect on a second crop on the same ground was greater than on the first. . . . The effect upon germination, when small amounts are used, was to increase the percentage of seeds germinated and to accelerate the process. The earliest effect of radium is to increase the root growth. Often the stem growth will be retarded for a time, but will later undergo a great acceleration. A given amount of sunlight has produced a greater amount of growth when radium was used, and the same amount of food production has resulted from a smaller amount of green tissue, or tops in case of the greenhouse radishes. An increased tendency to branching has been observed when a large amount of radio-active fertilizer is applied to the soil.

"Perhaps the most important effect of radium was that of improving the edible properties of the product. Potatoes were more mealy. Root crops were remarkably tender, sweeter, and of finer flavor. Beets, carrots, onions, sweet corn, and similar vegetables were markedly sweeter. Tomatoes were also sweeter and chemical analysis showed them to contain less water and more sugar. Radium-grown string beans and peas were peculiarly sweet."

Investigations by others in the same line are reviewed.

Radio-active ores and plant life, H. Bastin (*Sci. Amer., 112 (1915), No. 15, p. 335, fig. 1*).—Brief reference is made to experiments with radio-active materials conducted by M. H. F. Sutton, the English seedsman. These experiments were made with ore containing radium as well as with residues from radium manufacture. The crops experimented with included peas, radishes, lettuce, tomatoes, nasturtiums, rape, clover, and various flowering annuals. The amount of radio-active materials used varied from 1 part in 12 to 1 part in 2,240 parts of soil.

The results indicated that whereas the radio-active materials benefited, more or less, rape, clover, radishes, and lettuce, they had little or no effect upon peas, tomatoes, nasturtiums, and other flowering annuals. Soils treated with black oxid of uranium in the proportion of 1 part in 2,240 of soil appeared, generally, to produce more sturdy plants, but in these cases it was noticeable that the inflorescence was retarded.

The significance of certain food substances for plant growth, W. B. Bottomley (*Ann. Bot.* [*London*], *28* (*1914*), *No. 111, pp. 531–539, figs. 2; abs. in Jour. Chem. Soc.* [*London*], *106* (*1914*), *No. 626, I, p. 1208*).—A considerable fixation of nitrogen by bacterized peat (E. S. R., 31, p. 821) mixed with soil is reported. Experiments with various plants indicated that a water extract of the peat furnished all the plant food required. The residue from the alcoholic extract of the peat, the phosphotungstic precipitate from the aqueous extract, and the fraction (vitamin) obtained by treatment of the phosphotungstic precipitate with baryta and silver nitrate with the subsequent removal of reagents, exerted a stimulating effect on plant growth. The effect was especially marked in the case of the vitamin.

The author advances the theory "that the nutrition of a plant depends not only upon the supply of mineral food constituents but also upon a supply of certain accessory organic food substances, very small amounts of which are sufficient to supply the needs of the plant. During the early stages of growth of the embryo, these substances are supplied by the seed; later when the young plant is able to maintain itself, they are obtained from the humus of the soil." Further investigations as to the correctness of this theory are stated to be in progress.

The question of fertilizers, L. Rebello da Silva (*Bol. Dir. Geral Agr.* [*Portugal*], *11* (*1912*), *No. 11, pp. 64*).—The whole subject of sources, value, and use of fertilizers is discussed with particular reference to Portuguese conditions. The restricted use of fertilizers in Portugal as compared with other countries and the very great importance of extending their use in that country are very strongly emphasized.

Utilization with special reference to deriving a financial return from the sewage of New York City, G. A. Soper et al. (*Rpt. Metropol. Sewer. Com. N. Y., 1914, pp. 341–413*).—The report deals especially with sewage farming and with the utilization of sewage sludge. It reviews fully previous investigation and experience and the opinions of authorities in this line throughout the world. The consensus of opinion and experience cited seems to be that the combination of conditions necessary to make sewage farming an efficient means of purification rarely occurs and that, as a rule, the interests of agriculture and of sanitation are opposed.

As regards the utilization of sludge, however, it is concluded that "the revenue to be derived from the sale of dried sludge as fertilizer and from grease will, in many cases, more than offset the cost of production, in large towns, besides furnishing a sanitary and inoffensive method of disposing of sludge. The drying of sludge for fertilizer and the extraction of the contained grease offer a more promising outlook than others. In many works where it would not be worth while to undertake these somewhat elaborate processes, it will be found of advantage to dispose of the semidried, centrifuged, or pressed sludge to farmers for what it will bring or else burn it under the boilers of the plant."

The mechanism of nitrification, E. M. Mumford (*Proc. Chem. Soc. London, 30* (*1914*), *No. 424, p. 36; abs. in Chem. Abs., 9* (*1915*), *No. 4, p. 499*).—In a study of the bacterial oxidation of aqueous solutions of ammonium salts on experimental filters inoculated from actively nitrifying sewage filters, it was found that the oxidation proceeds in a series of stages compatible with the hypothesis that the hydrogen atoms are successively hydroxylated with the subsequent elimination of water. Hydroxylamin salts and salts of hyponitrous and nitrous acids were found as intermediate compounds. "The loss of nitrogen which invariably takes place to a certain extent on such filters is due, in part, to complex interactions between these various intermediate compounds, and as the relative concentration of these compounds is determined by the degree of aeration of the filter, this hypothesis is in correlation with the observed difference in the loss of nitrogen between a percolating filter and a contact bed."

Synthesis of the oxids of nitrogen by the electric arc, E. ROSELIER (*Bul. Assoc. Ingen. Élect. Liége 13 (1913), pp. 566–646; Rev. Électrochim. et Électrometal., 8 (1914), Nos. 2, pp. 33–50; 4, pp. 97–117, figs. 11; abs. in Sci. Abs., Sect. B—Elect. Engin., 17 (1914), No. 6. p. 305*).—A rather full discussion of the theory and processes of electrical fixation of the free nitrogen of the air, especially the oxidation of the nitrogen, is given.

The appliances used and the works in operation are described and the future of the industry is discussed.

When should lime nitrogen be applied to winter grains? P. WAGNER (*Deut. Landw. Presse, 42 (1915), No. 6, pp. 39, 40*).—Experiments are reported which indicate that the best results will be obtained on light well-drained soils by applying the lime nitrogen about the middle of February if the weather conditions are favorable. If the weather is very cold, vegetation backward, or the soil still covered with snow it may be advisable to delay the application from 8 to 14 days. Sodium nitrate apparently gives the best results when applied not earlier than the first of March.

Nitrogenous fertilizers from refuse substances, C. ELSCHNER (*Amer. Fert., 42 (1915), No. 5, pp. 21–23, fig. 1*).—Methods of preparing available nitrogenous fertilizers from such substances as wool, hair, shoddy, rag, felt, and leather waste are briefly described. The methods are, as a rule, based upon treatment with sulphuric acid, sometimes with the addition of other substances, such as nitrate, to hasten the reduction.

Availability of the nitrogen in Pacific coast kelps, G. R. STEWART (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 1, pp. 21–38*).—The availability of the nitrogen of the kelps was measured by its rate of ammonification and nitrification as determined by the so-called beaker method of soil bacteriology. The tests were made with dried and ground kelp.

Ammonification and nitrification of this material in fresh field soil were found to vary with different species and with the manner of preparation. The nitrogen of *Nereocystis luetkeana* was found to be relatively very available, while that of *Pelagophycus porra* ammonified and nitrified less readily. The nitrogen of *Macrocystis pyrifera*, which is the variety of greatest commercial importance, changed very slowly in the soil. It was most available when the kelp was added to the soil in a fresh or only partially dried condition and decreased materially when it was fully dried. Removing the salts by leaching did not increase the rate of decomposition.

"The addition of moderate quantities of Nereocystis to a sample of fresh soil in the laboratory did not cause any great interference with either ammonification or nitrification of readily available organic matter, such as dried blood. Similar experiments with Macrocystis showed at first a decrease in the rate of transformation, especially in nitrification. This decrease did not continue and as time passed the ammonification and nitrification became practically normal."

A bibliography of twenty references to literature bearing on the subject is appended.

The bone, animal waste, phosphate, and phosphorus industries, L. Vézien (*Industries des Os, des Déchets Animaux, des Phosphates, et du Phosphore. Paris: Octave Doin & Sons, 1914, pp. 423, figs. 50*).—This is one of the volumes of the Toulouse Encyclopédie Scientifique. It treats of (1) glue and gelatins, (2) phosphates, and (3) phosphorus. The second part, which is of special interest from the agricultural standpoint, deals with forms of phosphate and the occurrence and mining of phosphate deposits; phosphates of animal origin and their methods of manufacture; and the manufacture of superphosphates.

Analyses of commercial fertilizers, T. F. Peck, J. W. Sample, and A. L. Garrison (*Tenn. Agr., 4 (1915), No. 2, pp. 59–123, figs. 2.*)—Analyses and valuations of 456 samples of commercial fertilizers and fertilizing materials offered for sale in Tennessee during 1914 are reported, with some general notes on the use of fertilizers and the text of the state fertilizer law.

It is stated that the consumption of fertilizers in the State during 1914 was 100,000 tons. Of the total number of brands examined about 60 fell below the guaranty in composition.

Commercial fertilizers, B. H. Hite and F. B. Kunst (*West Virginia Sta. Insp. Bul. 3 (1915), pp. 45*).—This bulletin reports actual and guarantied analyses of samples of fertilizers offered for sale in West Virginia during 1914. "The inspection work for the past year discloses very few failures on the part of manufacturers to deliver everything that was guarantied." The economy of purchasing high-grade fertilizers is urged. "Purchasers of fertilizers are advised not to invest in fertilizers in which the sum total of the available phosphoric acid, potash, and nitrogen is less than 14 per cent. In the case of ground bone, the nitrogen and phosphoric acid (together) should be at least 24 per cent."

AGRICULTURAL BOTANY.

On certain relations between the plant and its physical environment, J. B. Farmer (*Jour. Roy. Hort. Soc., 40 (1914), No. 2, pp. 197–207, pls. 4*).—This article deals with the plant in its relation with its physical environment, considering such factors as moisture, temperature, illumination, nutriment, and response, rather indicating the problems which are becoming evident than giving the results of investigations carried out.

The general conclusion arrived at is that the more closely we are enabled to analyze the response of a plant to the demands of its physical environment, the more we find that such laws as are known of chemistry, molecular physics, surface tension, etc., hold good and serve as guides to investigation. Even autoregulation seems (at least in some critical instances) to be explicable as the result of limiting factors not essentially different in kind from those which control chemical actions in vitro. In these directions, it is thought, lies our hope of gaining control over vital processes.

The plant in relation to its biological environment, J. B. Farmer (*Jour. Roy. Hort. Soc., 40 (1914), No. 2, pp. 208–214*).—This deals with the influence of such biological factors as competition (in relation to chemical processes or properties), symbiosis, chemical products favorable to certain successions, parasitism and its modifying effect on hosts, submission or resistance to chemotaxis, and the relation of form to composition.

Town smoke and plant growth, C. Crowther and A. G. Ruston (*Jour. Agr. Sci. [England], 6 (1914), No. 4, pp. 387–394, figs. 3*).—Having followed up previous investigations (E. S. R., 25, p. 434), with attempts to measure directly the inhibiting effects of atmospheric pollution upon plant growth in the city of Leeds and vicinity, the authors state that while of the disturbing factors, soil differences, altitude, exposure, etc., they were able to eliminate only the first mentioned, still the differences in plant development (corresponding to changes in atmospheric content) at the several stations in different directions and at increasing distances from the main center of pollution are so definite as to leave little doubt that the dominant factor therein is the varying quality of the atmosphere.

On damage caused to vegetation by sulphurous and sulphuric acids in the atmosphere, R. R. Tatlock and R. T. Thomson (*Analyst, 39* (*1914*), *No. 458, pp. 203–210*).—Giving the results of observations and analyses of different portions of several plants and of soils in different localities, the authors reach the conclusion that the atmosphere even of cities consuming large quantities of coal is acid only under very exceptional circumstances, and even then within narrow limits. Injurious effects, when present, are strictly local, neither acidity nor damage being perceptible in cases where the acid has been dispersed through a large volume of surrounding air.

Hail injury to cereals, R. Schander (*Fühling's Landw. Ztg., 63* (*1914*), *No. 21–22, pp. 657–703, figs. 12*).—Giving details and conclusions of a study of hail injury to rye, wheat, barley, and oats, as regards the different parts and stages, the author claims to have shown that certain forms of such injury may be both qualitatively and quantitatively estimated by methods here exemplified.

Transpiration and the ascent of sap in plants, H. H. Dixon (*London: Macmillan & Co., 1914, pp. VIII+216, figs. 30*).—The author offers an explanation of the ascent of sap in plants, based very largely on physical properties of liquids.

The transpiration stream, it is claimed, is raised by secretory actions taking place in the leaf cells, or by evaporation and capillarity. The author maintains that structural and physiological evidence prevents the acceptance of the physical or vital theories, as the same configuration, physical properties, and structure of the wood indicate that water in the conducting tracts not acted upon by force behind must pass into a state of tension. Therefore when root pressure is not acting and when the leaves of trees are transpiring, the cohesion of their sap explains fully the transmission of the tension downward, and consequently explains the rise of sap. In order to raise the transpiration stream 100 meters in height a tension of 20 atmospheres would be required. Studies of cohesion of sap indicate that it amounts to at least 200 atmospheres, and consequently would be in no way overtaxed by this tension. The determination of the osmotic pressure of sap has been shown to be adequate to resist transpiration tension. Other factors, however, are said to enter in, and the pressures developed are much in excess of those demanded by transpiration. It is claimed that the stored energy set free by transpiration in leaves is quite sufficient to do the work of secretion against the resistance of the transpiration stream.

Extreme alterations of permeability without injury, W. J. V. Osterhout (*Bot. Gaz., 59* (*1915*), *No. 3, pp. 242–253, figs. 4*).—As some investigators have claimed that permeability is a relatively fixed property of cells while others assume that there are reversible changes, the author has undertaken a series of experiments with living tissues of *Laminaria saccharina*, determining the permeability of the cells by their electrical resistance.

The results obtained by the use of quantitative methods indicate that the permeability of protoplasm may be greatly increased or diminished without injury. A rapid alternation of increase and decrease did not produce injury.

The problem of food movement in trees, S. B. Elliott (*Forestry Quart., 12* (*1914*), *No. 4, pp. 559–561, figs. 2*).—An account is given of a young white pine which had been girdled at least five years previously by some rodent. It had continued to live, growing above (not below) the decorticated portion, but apparently only between the first and second whorl of branches, the first of which was just above the injured region which had been denuded of bark, cambium, and some of the outer sapwood. The circumstances are held to show that mineral food must have passed from the roots to the leaves and that material was practically prevented from passing down from the leaves to the roots, but no complete explanation is yet evident for the nonincrease in size of the portion between the second and the third whorl of branches.

A second case is noted of a white pine, originally a forked tree, in which natural grafting between the two forks has taken place in three or four places. One stem has been separated below but continues to grow, the crown now being more vigorous and thrifty than that of the rooted member. The taper of the severed tree has been altered and is now considerably less than that of the other. An important feature is the continued healthy growth of the severed stem below the graft and the more rapid increase at the junction end of the trunk than at the severed end. The upper end apparently permits only such food as its needs do not require to pass downward to the lower portion of the severed trunk, which has no roots, live limbs, or leaves.

The influence of chlorids and nitrates of potassium and sodium on germinating plants, H. Micheels (*Internat. Ztschr. Phys. Chem. Biol., 1 (1914), No. 5-6, pp. 412-419*).—Studies were carried out regarding the effects on percentage of germination, length of first leaf, length of root, and weight of the plantlet in case of wheat grown in solutions of potassium chlorid, potassium nitrate, sodium chlorid, and sodium nitrate, which show almost the same degree of dissociation at the two concentrations employed ($\frac{1}{100}$ and $\frac{1}{1000}$ normal).

In solutions uninfluenced by the presence of an electrical current the chlorin ion was more harmful than the nitric acid ion and the sodium more so than the potassium ion. The nitric acid ion acts favorably on leaf length, plant weight, and length of root hairs, but this is not true of the chlorin ion. While sodium is more harmful than potassium, it gives greater root length. The same general results were obtained during electrolysis of the solutions. The differences observed are ascribed to physiological properties of the same ions and not to any chemical properties.

A method of prophesying the life duration of seeds, W. Crocker and J. F. Groves (*Proc. Nat. Acad. Sci., 1 (1915), No. 3, pp. 152-155*).—This article gives a detailed account of investigations previously noted (E. S. R., 32, p. 221), in which the authors claim that gradual loss of viability in seeds during storage is due to a slow coagulation of the proteins in the plasma of the embryo. They have found in experiments a rather close agreement between calculated and found values, which indicate that a time-temperature formula for the coagulation of proteins can be applied as a temperature-life duration formula for seeds, at least under the conditions of these experiments.

Light and the rate of growth in plants, D. T. MacDougal (*Science, n. ser., 41 (1915), No. 1056, pp. 467-469*).—Attention is called to a statement by the author (E. S. R., 15, p. 339) in which it was shown that light has no invariable or universal relation to growth in plants. In the present paper additional data are presented to substantiate this claim. The investigations of Richards and Spoehr on the growth, hydratation, and acidity in certain species of Opuntia (E. S. R., 30, pp. 429, 431) are said to have a bearing on this problem.

The results of an extended series of observations on *O. blakeana* are given, which are said to show that the growth of the enlarging joints is at a minimum in the morning, with a rapid acceleration parallel with the rising temperature of the open, reaching a maximum about noon and then decreasing to a minimum before 3 o'clock. The growth of the opuntias takes place during a period of decreasing acidity, resulting from the disintegrating action of light and rising temperatures. This statement, it is believed, applies not only to the diurnal behavior of the plants during the growing season, but to the growing season as a whole.

In conclusion the author states that light and temperature in lesser degree are seen to exercise a totalized releasing effect on growth coincident with reduced acidity and increased hydratation to a certain limit. Beyond this growth is checked.

The time and distance relation between brief illumination and reaction in sprouting vetches, G. CAMPANILE (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), I, No. 12, pp. 966–969*).—This gives in tabular form the responses by sprouting vetches after an exposure of one second to a light of 50 candlepower at distances of 1 to 4 meters. Distance does not appear to affect the degree of curvature, but the percentage of preceptible responses increases with the time from zero at all distances employed for half an hour to 58, 25, 22, and 14 per cent at 1, 2, 3, and 4 meters, respectively, for $2\frac{1}{2}$ hours, and 100, 98, 82, and 70 at these distances for 10 hours.

On the identity of heliotropism in animals and plants, J. LOEB and H. WASTENEYS (*Proc. Nat. Acad. Sci., 1 (1915), No. 1, pp. 44–47*).—Attention is called to the fact that the investigations of Blaauw (E. S. R., 22, p. 329) showed that the time required to bring about the heliotropic curvature of plant changes inversely with the intensity of illumination, and that the same law holds for the heliotropic curvature of the polyps of Eudendrium.

Some further investigations have been conducted to compare the relative efficiency of the various parts of the spectrum upon the production of heliotropic curvatures in Eudendrium with that found for the heliotropic curvatures in plants. These showed that the relative efficiency of the different parts of the spectrum of a carbon arc light for the production of heliotropic curvatures in Eudendrium and in seedlings of Avena is practically identical.

The coefficient of mutation in Œnothera biennis, H. DEVRIES (*Bot. Gaz., 59 (1915), No. 3, pp. 169–196*).—The author gives the results of a study of about 8,500 individuals grown from seeds taken from pure line pedigreed plants of *Œ. biennis*.

There were found among these specimens 8 *nanella*, 4 *semigigas*, and 27 *sulfurea* mutants, giving percentages of about 0.1, 0.05, and 0.3 per cent. The origin of mutants from other species, the question of partial sterility, and other mutation factors are discussed at some length. The author considers the phenomenon of mutability observed in *Œ. lamarckiana*, *Œ. biennis*, and allied forms, as a simple continuance of the supposed mutability which presided at the origin of the wild species of the evening primroses.

In connection with his investigations, it was found that the seeds of evening primroses were often very slow in germinating. This difficulty, it is said, can be overcome by pressing water into them, a pressure of 6 to 8 atmospheres for from 1 to 3 days being sufficient to stimulate all to a rapid germination.

An interpretation of self-sterility, E. M. EAST (*Proc. Nat. Acad. Sci., 1 (1915), No. 2, pp. 95–100*).—The author offers a suggestion as to the cause of sterility based upon a study of descendants of a cross between *Nicotiana forgetiana* and the large white-flowered variety commonly known as *N. affinis*. A large number of experiments in which plants were self-crossed and back-crossed through several generations were made and studies were conducted with pairs of plants which furnished series of selfed and crossed flowers. In these the pistils were examined at regular periods and the difference between the development of the pollen tubes in the selfed and crossed styles was found to be wholly one of rate of growth. In the selfed pistils the pollen tubes developed steadily at a rate of about 3 mm. in 24 hours. Since the maximum life of the flower was found to be about 11 days, the tubes were never able to traverse more than one-half the distance to the ovary. On the other hand, the tubes in the crossed pistils, though starting to grow at the same rate as the other, pass down the style and reach the ovary in 4 days or less.

From these facts it is concluded that the secretions in the style stimulate the pollen tubes from other plants instead of inhibiting the tubes produced by pollen grains from the same plant. It is believed that there are present on the style stimulants, and experiments indicate that the principal one is a sugar, probably of the hexose group. In the pollen grains there is considered to be a specific material in the nature of an enzym which calls forth secretion of the sugar that gives the direct stimulus.

Further observations 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. 11, pp. 533–549, figs. 4*).—In a previous paper (E. S. R., 31, p. 523), the author discussed the relationship between the number of seeds maturing and the number of ovules formed in the pods of a series of trees of *C. canadensis* from different habitats.

In the present paper an account is given of collections made from individual trees, in which it appears that the physical constants, type, variability, and correlation of the number of ovules per pod and the number of seeds developing per pod in *C. canadensis* differ sensibly from individual to individual and from habitat to habitat. The data do not, however, justify the conclusion that trees from different habitats may be distinguished taxonomically. The correlations for number of ovules formed and number of seeds developed per pod have always been found positive and of a moderate, considerable, or even high intensity. The correlation coefficient is said to be slightly raised by the combination of collections from different individuals.

The taxonomic value of pore characters in the grass and sedge rusts, J. C. Arthur and F. D. Fromme (*Mycologia, 7 (1915), No. 1, pp. 28–33, fig. 1*).—It is stated that there are at present known in North America 105 species of rusts on grasses and 40 on sedges having urediniospore-pore characters that are clearly distinguishable, and hence available for use in their possible application to taxonomic study. Three general types of distribution of the pores are recognized, namely, scattered, equatorial, and extraequatorial. It is thought that the practical importance of pore characters of the urediniospores of the grasses and sedge rusts lies in the application of this knowledge to the identification of the material that is incomplete. It has already been possible to make some progress in determining the species of rusts from urediniosporic material alone.

The development of Armillaria mellea, G. F. Atkinson (*Mycol. Centbl., 4 (1914), No. 3, pp. 113–121, pls. 2*).—This is an account of the progress of differentiation in *A. mellea*. The view is expressed that the zone of radial hyphæ, and a part at least of the cortical zone of the young carpophore of *A. mellea*, is homologous with the radial and cortical zone in *Lepiota clypeolaria*. It is thus homologous with the universal veil in certain species of Amanita and Amanitopsis, but does not become differentiated from the pileus as it does in these two genera.

FIELD CROPS.

Report on the experimental work of the Palur agricultural station for 1913–14, G. D. Mehta (*Dept. Agr. Madras Rpt. 1913–14, pp. 21*).—The variety tests here reported include peanuts, sugar cane, and rice grown on irrigated land, dry land, and wet land. Rotation experiments on these lands include peanuts, cotton, "tenai" (*Setaria italica*), "cumbu" (*Pennisetum typhoideum*), and "ragi" (*Eleusine coracana*).

Results covering a period of seven years show that growing a cereal with peanuts gave an increased net profit per acre, although the yield of peanuts was less than when that crop was grown alone. Manurial tests included bone meal, burnt shell lime, powdered shell, peanut stalks, shells, and cake, and pit manure. Using a green manure crop, "daincha" (*Sesbania aculeata*), in the production of rice proved very beneficial.

A handbook of Nebraska grasses, E. M. Wilcox, G. K. K. Link, and Venus W. Pool (*Nebraska Sta. Bul. 148 (1915), pp. 5–120, figs. 114*).—Nearly 150 species are identified, and a bibliography of publications of the U. S. Department of Agriculture and the state experiment stations on agrostology is appended.

The Spanish grasses of northern Africa, C. Manetti (*Agr. Colon. [Italy], 8 (1914), Nos. 9, pp. 553–576, pls. 4, figs. 9; 10, pp. 641–663, pls. 4, figs. 5; 11, pp. 743–763, figs. 10; 12, pp. 815–830, fig. 1*).—This series of articles constitutes a very complete treatise on the Spanish grasses (*Stipa tenacissima, Lygeum spartum, Ampelodesma mauritanica,* and *Aristida pungens*), covering their cultivation, improvement, uses, and enemies.

Agave.—Its culture and exploitation, F. Michotte (*L'Agave. Culture et Exploitation. Paris: A. Challamel, 1914, pp. 339, figs. 113*).—A treatise containing a study of this plant, its exploitation and culture, the extraction of the fiber, and the utilization of the plant and its products.

First series of researches with reference to red clover breeding, H. M. Gmelin (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch. [Wageningen], 7 (1914), No. 5, pp. 149–165*).—This describes methods of employing the bumblebee in the seed production of red colver, and gives results of observations upon several varieties of red clover and the effect of different insects upon the fertilization of the flowers.

A genetic and cytological study of certain types of albinism in maize, F. C. Miles (*Jour. Genetics, 4 (1915), No. 3, pp. 193–214, pl. 1, figs. 9*).—This article briefly reviews previous investigations along this line, gives results of work conducted at the Nebraska Experiment Station in the inheritance of albinism in maize, and includes an anatomical study of the leaves of certain types of maize.

"From the studies of the various categories it appears that in all cases, with the possible exception of the striped leaves in *Zea japonica*, the several degrees of albinism in corn leaves behave as simple Mendelian recessives; the first generation of a cross with ordinary green races giving fully green plants and the second generation segregating in the ratio of three green plants to one plant of the particular type which was used in the cross. The study of the manner of inheritance of variegated leaves of *Z. japonica* in crosses where aleurone color is involved has not been completed.

"A rather definite relation has been pointed out between a pure white type of maize plant and a yellowish-white type, the results indicating that the presence of at least two factors is necessary for the development of normal green in the leaves of maize. In the absence of one of these factors the plant is pure white and soon dies, while in the absence of the other factor the plant at first is yellowish white but is capable of developing into a greenish condition and sometimes into a pure green plant.

"Studies of the relation between the other categories have not been completed. Crosses of striped plants of the japonica type with golden plants, and those of the green striped plants with golden plants and also the crosses of green striped plants with yellowish-white individuals which turn green, have all resulted in first generation plants which were of the normal green color. Although it was impossible to note the second generation plants, except during the first five weeks of their growth, it was possible at that time to identify segregates of the respective categories. The results secured in these crosses, however, add further evidence to the hypothesis that more than one factor is concerned in the production of normal green color in the leaves of maize. Apparently there is lacking in each parent some genetic factor (or factors perhaps) which is concerned in the development of chlorophyll, and, since the F_1 plants are normal green, it appears as if that factor which is lacking in one parent may be present in the other.

"In the pure white plants no plastids could be differentiated. In the yellowish-white plants which later may become green plastids apparently are present from the first, although they are few in number and are very small, gradually increasing in number and size as the leaf turns green.

"In *Z. japonica* the manner of distribution of plastids may be compared with the condition which Trelease has described in certain variegated agaves. He found that the normal green condition was due to the presence of plastids in the subepidermal region of the leaf. In variegated leaves, if the stripe was pale greenish, there was found to be a suppression of plastids through several of the subepidermal cells, while in a pure white stripe there was 'all but complete suppression of recognizable plastids.'"

Perjugate cotton hybrids, C. G. MARSHALL (*Jour. Heredity, 6 (1915), No. 2, pp. 57–64, figs. 5*).—This article notes the great diversity of characters that appeared in the perjugate, or second generation, while the individuals of the conjugate, or first generation, resulting from a cross between Hindi and Egyptian cotton were very uniform and showed characters intermediate between the two parents.

It is noted that "studies of the different parts of the several plants, such as the leaves, involucral bracts, bolls and seeds, revealed as great diversity and range of differences among these more detailed characters as there was in the general appearance and habit of growth of the plants. . . . The leaves of the different plants varied in color from a light or yellowish green to a very dark green, some of the plants showing a bronze or reddish tinge. They also varied in shape from simple leaves to leaves with deeply cut lobes, with margins wavy or crenate in many different degrees. There was the same variation in the glossy or hairy surfaces, as well as in texture and veining; in fact, the leaves of sister plants were often so different that they might well have represented as many distinct types of cotton. . . .

"The extra floral nectaries, which are one of the specialized features of the cotton plant, also showed many aberrations and sometimes marked degeneration. The general tendency seemed to be toward a smaller development of nectaries than in the parent stocks. On the majority of the plants the nectaries both of the leaves and involucres were very small and inactive or altogether absent. . . .

"The bolls of these perjugate hybrids were perhaps more striking in their diversity and possession of strange characters than any other parts of the plant. There were many shapes, some very unusual and freakish. The bolls of one plant were very long and narrow, almost cigar-shaped. Another plant had bolls almost round but with a beak as long as, and in many cases longer than, the body of the boll. Still another plant had small bolls with blunt ends and a constriction at the middle which made them look like peanuts. Some plants had large bolls and some small, some had bolls dotted with numerous oil glands and some with few; some plants had bolls deeply pitted and some had bolls with smooth surfaces, the oil glands being more deeply buried in the tissues of the wall.

"The seed and lint characters were as diverse as the boll characters. The seeds from the different plants were of many sizes and shapes and no two plants showed the same distribution of fuzz on the seed. The seed of one hybrid plant was entirely naked while usually there were tufts of fuzz at either the apex or base of the seed or at both ends, these tufts varying in size for the different plants. Several plants had the seeds completely covered with thick fuzz, but even these differed from each other in that some had green fuzz, some brown, and some pure white. The lint also varied greatly in both quantity and quality and ranged in color from a pure white to a decided buff. From a commercial standpoint the lint would have been of little value because of the variation in length and quality of the lint from the different plants."

Twelve individuals derived from self-fertilized seeds from the same conjugate Hindi×Egyptian plant are described in detail and serve to show those features in which the plants differ most noticeably from each other and from the parental types.

Relation of density of stand and yield in cotton, A. Shreder (*Izv. Turkest. Selsk. Khoz. Opytn. Stantsiĭ, 4 (1913); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 5, pp. 522, 523*).—Observations of the author indicate a ratio existing between the soil surface occupied by the cotton plant and the leaf surface of that plant. This ratio is unaffected by the thickness of planting, and the soil condition seems to be the chief factor in determining it. The number of bolls on each plant was found to be approximately proportional to the distance between each plant, and it is noted that the number of maturing bolls was found to depend on the number of stems per unit area and not on the total number of ovaries.

Close planting of cotton to avoid frost injuries, R. Shreder (*Turkest. Selsk. Khoz., No. 2 (1913); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 5, pp. 518, 519*).—This notes the success of close planting as a means of securing early maturity of the bolls to avoid injuries by early frosts.

Flax culture, V. E. Freeman (*New York: Author, 1915, pp. 19, figs. 9*).—This book treats of the preparation and industrial use of the flax plant in its various phases.

Germination of hemp seed, G. Consolani (*Staz. Sper. Agr. Ital., 47 (1914), No. 6, pp. 427–430, figs. 2*).—This article gives results of germination tests in 1914 of hemp seeds grown in the years 1909–1913. The percentages of germination were 60, 0, 71, 65, and 79, respectively. With the 1909 seeds the plumules did not appear until the ninth day and germination continued until the twenty-first day, while with the 1913 seeds the plumules appeared on the sixth day and germination was ended by the sixteenth day.

Experiments on lime requirements of lupines, von Seelhorst, Geilmann, and R. Thiele (*Deut. Landw. Presse, 42 (1915), No. 1, pp. 3, 4, figs. 2*).—This article reviews previous work of investigators, and gives results of pot experiments conducted at Göttingen to determine the influence of applications of lime on the nodule development and consequent growth of the plants. Half of the pots were filled with sterilized soil, and these soils were then inoculated by means of soil known to contain the proper nodule-forming bacteria and that had been variously treated with lime, sodium nitrate, and ammonium sulphate.

Tabulated data show that the maximum development of nodules was produced with the untreated inoculating soil or that containing small quantities of lime or nitrate of soda. The combined applications of small or large quantities of lime, sodium nitrate, or ammonium sulphate seemed to check their development. The authors conclude, therefore, that the injurious effect of lime applied to lupines is due directly to the unfavorable soil conditions thus produced for the development of the nodule-forming bacteria.

Yields of native prickly pear in southern Texas, D. GRIFFITHS (*U. S. Dept. Agr. Bul. 208* (*1915*), *pp. 11, pls. 2*).—This bulletin reports work in continuation of that previously noted (E. S. R., 20, p. 34), but includes the additional species *Opuntia gommei* and *O. cyanella* and some other less important species. Methods of cultivation employed at Brownsville and San Antonio, Tex., and at Chico, Cal., are described.

The yields at Brownsville were at the rate of from 35.492 tons to 185.837 tons per acre for 2- and 3-year-old plants, making an annual production of from 17.746 to 54.703 tons of succulent feed per acre. These yields were from newly planted cuttings. Yields of stumps from which a crop had been harvested often averaged over 100 tons per acre per year. The yields from cuttings at San Antonio ranged from 2.83 to 20.685 tons per acre, and from stumps from 9.8 to 28 tons per acre.

It is noted that shallow cultivation to suppress weeds gave better results than deep cultivation or a dust mulch system. Thorough preparation of the soil before setting the cuttings seems essential for the best results.

Report of the prickly pear traveling commission, November 1, 1912, to April 30, 1914, T. H. JOHNSTON and H. TRYON (*Rpt. Prickly Pear Travel. Com., Queensland, 1912–1914, pp. XX+131, pls. 28*).—The report of a commission of inquiry appointed by the Queensland Government to visit countries in which prickly pear plants are indigenous or have become naturalized, for the purpose of ascertaining what diseases, parasitic plant organisms, and parasitic or predatory insects are injurious to these plants, as a method of destroying or controlling their growth, and also the possibility of utilizing prickly pears for commercial purposes. The results of these studies of the activities of rodents, insects, and diseases; the utilization as food for man and for stock, as a fertilizer, and as a source of alcohol, fiber, and oxalic acid, and the utilization of the mucilage, and coloring matter in the fruit; and the destruction by overgrowth, by chemicals, and by mechanical means are summarized for each of the following countries: Java, Ceylon, India, South Africa, the Canary Islands, Europe, and the Mediterranean area, the United States, Mexico and Central America, the West Indies, South America, the Hawaiian Islands, and the Australian States other than Queensland.

A bibliography of over 400 titles is appended.

On the inbreeding of rye, K. VON RÜMKER and R. LEIDNER (*Ztschr. Pflanzenzücht., 2* (*1914*), *No. 4, pp. 429–444, figs. 4*).—This article discusses data obtained in experiments previously noted (E. S. R., 21, p. 736; 30, p. 525), to study the kernel color of rye in pure lines, and also points out from the same data the increase in yields of progeny of crosses between pure lines of rye.

Physiological studies of Bacillus radicicola of soy bean, J. K. WILSON (*Abs. in Science, n. ser., 41* (*1915*), *No. 1048, p. 180*).—This paper, presented at the ninth annual meeting of the Botanical Society of America, Philadelphia, in December, 1914, "confirms earlier work as regards the influence of nitrates on nodule production, and indicates in addition that sulphates in relatively weak concentration inhibit the process. Chlorids and phosphates stimulate nodule production, while ammonium salts are inhibitory. The significant fact was developed that while nodule development was prevented by the presence of nitrates, phosphates, and ammonium salts, yet the organism retained its vitality in the presence of these salts. Whether the effect of the salt is upon the root, such as to make it resistant, or upon the organism can not yet be stated."

Can sodium replace potash as a nutrient for sugar beets? KRÜGER (*Deut. Zuckerindus., 39 (1914), No. 47, pp. 951–953*).—This article describes an experiment in which sodium was applied as a fertilizer in place of potash. The results showed that the sugar and potash contents of the beets followed closely the quantities of potash applied with little reference to the quantities of sodium. The author believes, however, that the presence of the sodium increased the effectiveness of the potash.

Loss in tonnage of sugar beets by drying, H. B. SHAW (*U. S. Dept. Agr. Bul. 199 (1915), pp. 12, figs. 5*).—This bulletin gives results of experiments to determine the amount of loss of sugar beets by evaporation in the field.

The weights of sugar beets pulled at Ogden, Utah, on October 17, 1912, and left spread out, not topped, for 24 hours showed a loss of 10.32 per cent in a mean temperature of 43.29° F. When pulled, topped, and left in rather small piles in a mean temperature of 50° for 3⅗ hours the roots lost 0.54 per cent in weight. In another similar test in a temperature of 62° for 6½ hours the roots lost 2.42 per cent in weight.

In a test at Garden City, Kans., in which the roots were placed in medium-sized piles and left exposed from November 10 to November 14, there was a mean daily loss of 6.48 per cent in weight. A similar experiment in which the roots were thrown into large piles (500 lbs.) showed a total loss when covered with the beet tops of 4.18 per cent in one series and 4.85 per cent in another. When left exposed the losses were 15.06 and 14.14 per cent, respectively.

In testing the effect of drying upon the sugar content of beets laboratory results showed that the percentage of sucrose increases as the water is withdrawn by evaporation. It was also shown that some inversion and decomposition take place even during so short a period as about 30 hours.

Beets in large open piles containing 11 tons 900 lbs., 16 tons 1,700 lbs., and 28 tons 190 lbs., respectively, and left from November 3, 1912, to January 4, 1913, lost 4.1 per cent in weight during the two months. The mean temperature was 36.72°.

The relation of shrinkage to money loss is discussed.

Variation in the content of sugar in beets during the second year, O. MUNERATI, G. MEZZADROLI, and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 47 (1914), No. 5, pp. 317–336, figs. 6*).—This article gives results of a study to determine the variation of sugar in beets during their seed-producing period. Beets were analyzed in March, 1913, at the time of transplanting and again at different dates in September, October, and December, just before, during, and after the maturation of the seeds.

The tabulated data show a wide variation in the content of individual beets and that many had a relatively high sugar content at the end of the season, even higher in some cases than before the growth of the seed stalk; that there is a class of roots that nearly maintains its quality, form, and weight; that there is another class that substantially changes in quality and increases more or less in weight by new growth; and that there is an intermediate class.

Contribution on the biology and valuation of beet seeds, M. PLAUT (*Jahresber. Ver. Angew. Bot., 11 (1913), No. 2, pp. 168–217*).—This article reviews work of previous investigators, and gives results of work performed at the experiment station at Hohenheim, Germany, respecting methods of sampling, testing, and estimating the agricultural values of beet seeds. The method of sampling that proved to be the most exact is that termed the "count-percentage method" (Zählprozentmethode), with modifications in averaging originally used by the author. The comparative exactness of the three methods, actual count, count-percentage method, and count-percentage method with averages are indicated as 58 : 37 : 25.

As a measure of the agricultural value of beet seeds the author tried several methods of weighing 100 germinating seeds within definite periods. This proved satisfactory, as this weight bore a direct relation to the vigor of the germ.

Results of work in breeding and selection and of observations on variability and the correlation of variability with sugar cane, carried on at the sugar factory at Sempalwadak, Java, R. A. QUINTUS (*Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 39–40, pp. 1369–1495, pls. 22*).—The work here reported was carried on in 1911, 1912, and 1913. The studies were made in regard to heredity as influenced by selection in both sexual and vegetative methods of propagation with pure lines and hybrids of sugar cane. Variability and the correlation of variability in regard to the production of the crops are discussed.

The author concludes that with self-fertilized sugar cane the inheritance of characters follows closely Galton's law of regression. Deviations either within pure lines or in hybridization do not seem to be inherited. In hybridizing it appears that the individual parental characters follow Mendel's law in the second generation. Some characteristics such as thickness, tillering, and sugar content do not seem to be inherited. There is a negative correlation between cane weight and percentage of sugar in the juice, and a positive correlation between the cane weight and sugar yield.

The structure of the stomata of the sugar cane, J. KUYPER (*Meded. Proefstat. Java-Suikerindus., 5 (1914), No. 1, pp. 12, pls. 2, fig. 1; Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 47, pp. 1679–1690, pls. 2, fig. 1*).—This article gives results of microscopical examinations of the parts of the stomata, including guard cells, accessory cells, and the movement mechanism of the stoma cells.

Sugar cane, its cultivation and gul manufacture, J. B. KNIGHT (*Dept. Agr. Bombay Bul. 61 (1914), pp. 41*).—This bulletin discusses the methods of producing sugar cane, including the planting methods known as the Gujarât, Mauritius, Poona, row system, and Java system, and pests and diseases.

Conservation of soil moisture in the cane fields, J. T. CRAWLEY and W. B. CADY (*Porto Rico Bd. Agr. Expt. Sta. Bul. 8 (1915), pp. 7–9*).—This gives the results of a field test in which the soil to the depth of 1 ft. under a 6-in. mulch of cane trash showed a weekly average from September 8, 1913, to June 1, 1914, of 2.2 per cent more moisture than soil which had been cultivated, and 4.1 per cent more than soil that was left fallow, neither cultivated nor mulched.

Stripping of cane, J. T. CRAWLEY (*Porto Rico Bd. Agr. Expt. Sta. Bul. 8 (1915), pp. 10–16*).—This gives results of two seasons' work as to the advantages in stripping the dead leaves and suckers from the growing cane. The averages for the season 1912–13 for stripped and unstripped cane are given as 38.16 and 38.04 tons of cane, 15.44 and 15.46 Brix, 13.23 and 13.19 per cent of sucrose, and 85.6 and 85.3 per cent of purity, respectively. For the season 1913–14 the figures are 20.85 and 21.28, 17.01 and 17.04, 14.86 and 15.06, and 87.4 and 88.3, respectively.

Using cane tops for planting, A. H. ROSENFELD (*Internat. Sugar Jour., 17 (1915), No. 193, pp. 16–18*).—This article gives results during the first and second years of using the upper third of the stalk for planting, this practice being based on its lesser value as a sugar-producing part. The data show a smaller yield from the cane tops the first year, but there was much less difference the second year between the cane tops and ordinary cane in yield per acre, and the average weight per stalk was greater than from the ordinary cane, being 1.74 and 1.60 lbs., respectively.

Tobacco mutations, H. K. HAYES (*Jour. Heredity, 6 (1915), No. 2, pp. 73–78, figs. 2*).—This article briefly reviews work with the mutation tobacco known as the Stewart Cuban, already noted (E. S. R., 30, p. 631).

It is stated that on December 28, 1913, seed of this new type was planted in the greenhouse, and transplanted to the field in the spring, where in September the plants had attained a height of from 12 to 14 ft., had produced an average of 80 leaves per plant, and showed no sign of a blossom. They blossomed in October in the greenhouse. The recurrence of other mutants of similar types in several fields in Connecticut is noted and discussed.

Tobacco breeding in Dalmatia, K. PREISSECKER (*Fachl. Mitt. Österr. Tabakregie, 14 (1914), No. 1–2, pp. 4–48, pls. 3, figs. 11*).—This article gives results of hybridization and selection of Dalmatian varieties of tobacco in the experimental fields of Vrlika, Sinj, Imoski, Vinjane, Postranje, and Runovitch, and continues work previously noted (E. S. R., 27, p. 238).

Report of cultural and variety tests with wheat, M. NELSON and L. W. OSBORN (*Arkansas Sta. Bul. 121 (1915), pp. 3–31*).—This bulletin briefly notes the importance and need of improvement of wheat in Arkansas and gives results of cultural and variety tests that were begun in 1907 at the station.

In weekly seedings from the fourth week of September to the first week of November the best average results at Fayetteville, Ark., were obtained from seeding the first part of October. An average difference in yield of 3.61 bu. per acre with three varieties is noted in favor of drilling over broadcasting wheat. The average of the different rates of seeding for the entire test indicates approximately equal yields from either the 4-, 6-, or 8-pk. seedings. Six pk. per acre is the quantity recommended for average conditions. Under the usual conditions shallow (1 in.) covering of the wheat seed was found to be more satisfactory than deep covering.

The number of varieties tested during the several years ranged from 12 to 61 per year. The results indicate that "while the source of seed is not as important as is the type or variety to be chosen, it would seem that preference should be given to home-grown seed, providing a suitable variety can be secured. Varieties obtained from sources having a climate similar to that of Arkansas as a rule have given best satisfaction.

"Results of variety tests indicate that early maturing soft winter varieties yield well and produce the best market quality of grain under Arkansas conditions. Red May and Alabama Bluestem are varieties of this type which have proved satisfactory. Fulcaster and Fultz, though somewhat later in time of maturity, have given good results. Other varieties of this same type which have given general satisfaction are Kentucky Bluestem (a white wheat) and Currell Prolific.

"Varieties of hard winter wheat have not produced a uniform quality of marketable grain, although the yield is frequently high."

A preliminary report of a fertilizer test is also given.

Spring wheat in the Great Plains area: Relation of cultural methods to production, E. C. CHILCOTT, J. S. COLE, and W. W. BURR (*U. S. Dept. Agr. Bul. 214 (1915), pp. 43, fig. 1*).—The study of the yields obtained under various methods of seed bed preparation in the Great Plains region as here presented deals only with spring wheat and is made in such a way as to show the effect of cropping and cultivation in only the year preceding its growth. There is also given a study of the comparative cost of production of wheat under each of the methods studied and the resulting profit or loss.

The work here reported from 14 stations covers an aggregate of 73 station years, embodies the data from a total of 1,683 plat years, and includes parts of ten States. Data for each station regarding yield and cost of production cover the items of fallow, plowing, disking, listing, subsoiling, green manuring, summer tilling, and previous crop.

It is shown that "some seasons are so unfavorable as to result in failure of the spring wheat crop without regard to the cultural methods under investigation. Extremely unfavorable climatic conditions can not be overcome by cultural methods. It is only in those seasons when the rainfall deficit is so small that it can be overcome by moisture stored in the soil that the cultural methods under investigation have shown important effects upon yields. . . .

"Reducing the cost of production has in most cases in these investigations proved a more important factor in determining profits than increasing yields by cultural methods.

"Northern Colorado and Kansas seem from these investigations to be the southern limit of profitable spring wheat production on the Great Plains. This limitation does not apply to winter wheat and other crops under investigation.

"Disked corn ground has given consistently high yields. This, together with the low cost of preparation, has resulted in its showing the highest average profit or lowest average loss of any of the methods tried at all of the 14 stations except one. These profits are based on the assumption that the corn crop was so utilized as to pay for the cost of its production. Furrowing with a lister and leaving the surface ridged through the winter has resulted in a small increase in yield over plowing at seven of the eight stations where it has been tried. As it is a somewhat cheaper method of preparation than plowing, it has consequently been more profitable. The average difference in the yields of spring wheat following fall plowing and spring plowing are very small. At most stations the advantage of one over the other depends upon the season.

"Subsoiling has been of doubtful utility as a means of increasing yields. As a means of overcoming drought it is without value. Summer tillage without crop has given the highest average yields of any method under trial at 12 of the 14 stations. However, on account of its high cost, due to extra labor and alternate year cropping, it has not been the most profitable practice. The most expensive method under trial is green manuring. It has produced less profit or greater loss than any other method under investigation."

Tillering of spring wheat, S. I. VOROBEV (*Bezenchuk. Selsk. Khoz. Opytn. Stantsīīa, No. 29 (1912), pp. 3; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 4, pp. 405–407*).—This gives the results of experiments conducted in 1912 to study factors influencing the tillering of wheat.

The author concludes that soil fertility, available light, and moisture, as influenced by the spacing of the plants, are the chief determining factors of tillering in the variety studied (Poltavka). In wide spacing the tillering period continued 13 days, while with close spacing no new shoots were sent up after 8 days. It was found that the grain produced on the early appearing tillers was superior to those produced on later tillers. The data are given in tabular form.

Pure seed law, T. P. COOPER (*North Dakota Sta. Rpt. 1914, pt. 1, pp. 14–17*).—This gives results of the examination of 5,577 samples of seeds for purity and germination. Tables show the approximate purity and the number of samples received of a given grade of germination and of hard seed, and the number which contained prohibited seeds.

Pure seed law (*Cheyenne, Wyo.: State Dairy, Food, and Oil Comr. [1913], pp. 11*).—The text of the Wyoming pure seed law is given.

Weed seeds in farm lands, J. R. FRYER (*Agr. Gaz. Canada, 2 (1915), No. 1, pp. 21–23*).—This article gives results of tests to determine the prevalence of weed seeds in farm lands and to discover the relation of their prevalence to cultural conditions. Samples of soil were taken from fields in Ontario, Saskatchewan, and Alberta.

The average number of vital seeds per square yard 1 in. deep was found to be in the surface inch 1,107, in the second inch 457, and at from 5 to 7 in. below the surface 331. The average number of vital seeds in 20-oz. samples of sod aged 5 to 10 years was in the first inch 18, in the second inch 14, and at a depth of from 5 to 7 in. 7½. In sod 10 to 15 years old the seeds at the respective depths were 15½, 6, and 3⅓, and in sod 15 to 20 years old, 20, 2½, and 2½, respectively.

In a field which had grown barley and oats continuously from 1904 to 1912 20 oz. of soil in the surface inch showed 134 weed seeds, the second inch showed 133, and at from 5 to 7 in. 112 seeds were found. A field under a good cropping system since 1905 showed only about one-fourth as many weed seeds as one under continuous grain cropping.

The destruction of weeds by the use of sulphuric acid, E. Rabaté (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 3, pp. 59–67*).—This article discusses the work of several years (E. S. R., 30, p. 441) on weed destruction, and gives results of recent trials in which sulphuric acid was successfully used in the destruction of wild mustard, buttercups, shepherd's purse, whitlow grass, wallflower, feverfew, bindweed, knotgrass, trefoil, and *Medicago apiculata* in fields of cereals.

Weeds: How to control them, H. R. Cox (*U. S. Dept. Agr. Farmers' Bul. 660 (1915), pp. 29, figs. 27*).—This gives methods of control of weeds and a descriptive list of the 50 worst weeds of the United States.

HORTICULTURE.

Experiments in growing greenhouse crops on muck or humus soils, H. C. Thompson (*Jour. Amer. Peat Soc., 7 (1914), No. 4, pp. 191–207, figs. 7*).—The results are given of experiments conducted by the author during the seasons 1912–13 and 1913–14 to determine the value of muck or humus soils in growing greenhouse crops and the adaptation of different crops to these soils. The work the first season was confined to one representative type of pure muck soil taken from a cultivated field in northern New Jersey and the growing of lettuce, cauliflower, and tomatoes. An additional type of muck from a cultivated field near Kalamazoo, Mich., was used the second season and roses and carnations were also grown on the New Jersey muck. Yields for the various plats are here presented in tabular form and discussed.

No definite conclusions are drawn, but the results for two seasons indicate that a good type of cultivated muck soil is valuable for greenhouse crops. Raw muck soil gave much lower yields than the cultivated soil. The greatest value of muck is for crops grown for their foliage, such as lettuce, although cauliflower and tomatoes produced large yields on pure muck and on mixtures containing from 25 to 75 per cent of muck. Pure muck should not be used with roses, as the foliage growth is too great and the flowers not satisfactory. A mixture of muck soil and clay produced large numbers of flowers of good color with long stems and excellent foliage. With carnations the muck soil did not give as good results as a clay-sand-manure mixture. The flower stems on plants in the plats containing 50 per cent or more of muck were longer and heavier than on the plants in the regular greenhouse soil, but the number of blossoms produced was not as large.

Grafting the eggplant on Solanum torbum, H. A. van Hermann (*Modern Cuba, 3 (1915), No. 3, pp. 54–57, fig. 1*).—The author calls attention to the practice employed at the Cuba Experiment Station of grafting eggplants on a wild species of Solanum. This is said to be the only practical way in which eggplants may be grown during the rainy season in Cuba.

Tomatoes for North Dakota, H. O. WERNER (*North Dakota Sta. Bul. 111* (*1915*), *pp. 209–232, figs. 3*).—This bulletin reports the first season's results of a variety and strain test of tomatoes, in which 87 varieties, comprising 122 strains, were used. Certain cultural tests conducted in connection with the variety tests are also reported, and directions are given for growing and canning tomatoes.

A comparison of the various strains tested showed as great a variation in earliness, total yield, size of fruit, etc., within a variety as between varieties. The plants were grown from seed secured from a number of localities. The more northern grown seed generally gave the best results. It was noticed, however, that in many cases some of the more southern grown seed produced better results, indicating that a northern location can not be substituted for good breeding in tomatoes. The varieties best adapted to the section were the Earliana, Bonny Best, Chalk Jewel, June Pink, and a few other early varieties.

A test of various planting times showed that to secure the maximum crop the seed must be sown late in March, either in the hotbed and then transplanted into pots or cans, or must be sown about the same time directly in the pots, in which the plants may be grown until set in the fields during the latter part of May.

An experiment was conducted in root pruning tomatoes by pulling the plants so as to loosen the main roots and disturb the root system to a considerable extent. This was done on July 23, August 17, and September 1. The results indicate that the roots should not be disturbed too early in the summer, but that when done toward the end of the season the total yield will be increased, as the root injury tends to check vegetative growth and cause the ripening of all fruit that has already been set. Pruning the top appears to stimulate the production of early and large fruit, although the total production may be somewhat decreased.

The pollination and fertilization of fruit trees, E. E. PESCOTT (*Fruit World Austral.*, *16* (*1915*), *No. 2, pp. 33–35*).—A brief review of the literature of the subject.

Fruits for Minnesota planting (*Minn. Hort.*, *43* (*1915*), *No. 4, p. 187*).—A list is given of orchard and small fruits and nuts adopted by the Minnesota State Horticultural Society in 1914.

An orchard survey of Jefferson County, R. R. JEFFRIES (*West Virginia Sta. Bul. 147* (*1914*), *pp. 3–31, pl. 1, figs. 5*).—Results are here given of an orchard survey of Jefferson County, W. Va., conducted during the summer of 1913. The survey was limited to orchards over four or five acres in extent and reports were secured on 181 orchards.

The county has approximately 195,524 apple trees, of which 52.3 per cent are of bearing age. The size of the orchards is as high at 320 acres, the typical size being 10 acres. The larger orchards as a rule show a greater yield and income per acre than the smaller orchards. The square system of planting is generally used, the typical distance being 30 by 30 ft. The chief commercial varieties are York Imperial, Ben Davis, Grimes, Arkansas, Stayman Winesap, and Winesap. Many of the recent plantings are of Jonathan, Winesap, Delicious, and Gano. Plantings of Ben Davis have decreased during the last few years.

As to soil management the young orchards are generally planted to a hoed or cultivated crop in rotation with a grass or grain crop. Sod culture is generally practiced in bearing orchards, although cultivated orchards are more profitable. About 30 per cent of the bearing orchards have been in sod for 5 years or more. Sod orchards are pastured chiefly by hogs. Sheep are used to a considerable extent. The data secured indicate that it pays to fertilize orchards and that a combination of manure and commercial fertilizer is the most profitable.

Seventy-five per cent of the orchards are pruned in the spring and annual pruning is practiced in 62.5 per cent.

The chief orchard insect pests are the codling moth and San José scale and the most prevalent diseases are cedar rust and bitter rot. Forty per cent of the orchards are sprayed three times and 10.4 per cent are never sprayed. Lime-sulphur and arsenate of lead is the mixture generally used. Spraying orchards three times produced an average income of $101.13 per acre. Orchards sprayed twice yielded an increase of $69.26 per acre, while orchards sprayed once gave practically the same results as unsprayed orchards, viz. $39.32 for the former and $39.38 in the latter instance.

Fire pots as a protection against frost, M. B. DAVIS (*Agr. Gaz. Canada, 2 (1915), No. 1, pp. 9–13, fig. 1*).—As the result of a test of fire pots conducted at the Canadian Central Farm with special reference to the protection of vegetables from frost the author concludes that for ordinary purposes, such as a frost of 5 or 6°, 100 heaters per acre are ample to raise the temperature above the danger point. In the test the cost of the heaters and other equipment was $61 and the operating expenses per acre about $16.

Some common spray mixtures, O. S. WATKINS (*Illinois Sta. Circ. 160 (1913), 2. ed., rev., pp. 19; (1915), 3. ed., rev., pp. 19*).—Revised editions of this circular (E. S. R., 28, p. 48).

To the third edition is added a spraying schedule for Illinois peach orchards, together with the results of some experiments in spraying apple orchards conducted during 1914. These experiments included a test of the efficiency of various brands of arsenate of lead and a test of five and six sprayings of arsenate of lead during the season for the control of the codling moth as compared with the usual four sprayings. The results of the latter test show the beneficial influence of additional spraying in a season when the codling moth is unusually bad. The fruit which received only four sprayings was over 50 per cent wormy, whereas the fruit which received the six sprayings was less than 5 per cent wormy.

Cost of distributing, G. H. POWELL (*Cal. Cult., 44 (1915), No. 11, pp. 326–331*).—This address, which was delivered before a convention of the Western Fruit Jobbers, comprises a concise survey of the various factors entering into the cost of distributing citrus fruits. The cost data given are based upon investigations conducted under the direction of the California Fruit Growers' Exchange.

The results of this investigation, combining 30 representative markets and including 5,485 reports extending over the year 1914, show that of each dollar paid for oranges and lemons the grower receives 26.7 cts. for the fruit on the tree. The remainder of the dollar is divided as follows: Picking, hauling, and packing, 9.8 cts.; freight and refrigeration 20.5; grower's selling cost 1.5; jobber's distributing cost 8.2; and retail distributing cost 33.3 cts.

[Papain extraction experiments], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta. [etc.] Antigua, 1913–14, pp. 18–20*).—An experiment was conducted with papaya trees at the Antigua station to secure reliable information relative to the yield of papain per tree and the best method to adopt of drying the product. Data are given showing amount of juice obtained from three trees at various tappings. It was demonstrated early in the experiment that but little papain can be obtained by bleeding the stems and leaf stalks of papayas.

The data secured deal entirely with the papain obtained from the fruit. Twenty bearing trees yielded 180 oz. of juice from which was obtained approximately 35 oz. of dried papain. It is concluded that under normal circumstances the growing of papayas for the production of papain would be lucrative.

Strawberry growing in Arkansas, W. H. Wicks (*Arkansas Sta. Bul. 122 (1915), pp. 5–48, figs. 22*).—A practical treatise on strawberry culture with special reference to Arkansas conditions, the subject matter being based upon a survey of cultural methods in various districts of the State in 1914.

The phases discussed include soils; location; preparation of soil; varieties; fertilizers; the sex of the strawberry; propagation; setting time and care of plants; system of planting and setting the plants; cultivation, mulching, and picking; practical carriers; packing; marketing; renewing the plants; cost of production; yields; and returns. Information is also given relative to a strawberry grading plan, loading a refrigerator car, by-laws of a fruit growers' association, and instructions to shippers.

Strawberry varieties, O. M. Taylor (*New York State Sta. Bul. 401 (1915), pp. 165–192; abridged ed., pp. 8*).—This bulletin comprises a report of varieties of strawberries tested at the station during the past few years. The kinds grown include newer varieties, with standard commercial kinds for purposes of comparison. In addition to a general descriptive list of all varieties showing essentially distinguishing characters, the varieties are listed with reference to blooming season, season of ripening, sex of flowers, plant makers, productiveness, vigor of the plant, resistance to disease, size of the fruit, quality, and desirable kinds.

Strawberry supply and distribution in 1914, W. A. Sherman, H. F. Walker, and O. W. Schleussner (*U. S. Dept. Agr. Bul. 237 (1915), pp. 10, pl. 1, fig. 1*).—A statistical review of the strawberry supply and distribution in the United States in 1914, based upon data secured from 466 shipping stations. The information, which is presented in the form of a table, a map, and a chart, shows the number of carloads shipped by States and by shipping districts, and also shows the districts which have overlapping shipping seasons. The data are presented with a view to criticism for the purpose of perfecting methods of securing information of this nature.

Grape culture, with special reference to commercial production under irrigation in eastern Oregon, R. W. Allen (*Oregon Sta. Bul. 126 (1915), pp. 3–31, figs. 12*).—This comprises a practical treatise on commercial grape growing, the subject matter being based upon an investigation and study of the grape industry in the Columbia River basin, and of various factors bearing upon the successful development of a commercial industry.

Introductory considerations deal with the present status of the grape industry in eastern Oregon and possibilities of commercial production. Consideration is then given to methods of establishing the vineyard, including descriptions of the more desirable varieties; planting operations; training and pruning; tillage and care of the vines; and harvesting and marketing.

A short bibliography of literature dealing with grapes and grape culture is appended.

Pruning and training young vines, L. Ravaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 7, pp. 145–154, figs. 8*).—A popular discussion of methods of pruning and training young vines of *Vitis vinifera*.

Preventable causes of grape loss, F. T. BIOLETTI (*Pacific Rural Press, 89 (1915), No. 14, p. 421*).—A concise summary of causes leading to unsuccessful grape growing with suggestions for their prevention.

The partridge berry (Vaccinium vitis-idæa), G. S. TORREY (*St. John's, Newfoundland: Dept. Agr. and Mines, 1914, pp. 12*).—An account of the mountain cranberry with reference to its range, relationship, synonyms, habit of growth, method of fruiting, environment of the plant, soil requirements, insect and fungus enemies, picking and packing, cultivation, and methods of starting a plantation.

Some recent literature on nuts and nut growing (*North. Nut Growers Assoc. Proc., 5 (1914), pp. 124, 125*).—This comprises a short bibliography of literature dealing with different phases of nut culture.

Preliminary report on the Persian walnut, W. C. DEMING (*North. Nut Growers Assoc. Proc., 5 (1914), pp. 114–117*).—This comprises a preliminary catalogue of bearing Persian walnut trees observed in different sections of the United States and Canada east of the Pacific coast region.

Conifers: Their usages, plantings, and enemies, H. KELLY (*Gard. Chron. of America, 19 (1915), No. 3, pp. 120–123, figs. 4*).—This comprises suggestions relative to the use and care of ornamental conifers, together with a descriptive list of varieties hardy in northern United States.

Tree planting in streets, J. B. FARMER (*Surveyor, 47 (1915), No. 1208, pp. 380–382*).—This comprises suggestions on methods of planting street trees, the subject matter being based primarily on a study of the problem for London streets.

The amateur garden, G. W. CABLE (*New York: Charles Scribner's Sons, 1914, pp. IX+199, pls. 32*).—A popular work on ornamental gardening, the successive chapters of which discuss My Own Acre, The American Garden, Where to Plan What, The Cottage Gardens of Northampton, The Private Garden's Public Value, and The Midwinter Gardens of New Orleans.

The development of orchid cultivation and its bearing upon evolutionary theories, J. CONSTANTIN (*Scientia, 10 (1911), No. XIX+3, pp. 84–100; Ann. Rpt. Smithsn. Inst., 1913, pp. 345–358*).—The author gives a résumé of the cultural technique which has been evolved in growing and breeding orchids of various species, and advances the opinion that Mendelian laws do not seem applicable to cases of two parent species of an offspring differing from each other by numerous characters. The evidence deduced from the development of orchid culture indicates that new characters may be brought about through exterior influences.

FORESTRY.

Some observations on the variation in length of coniferous fibers, H. B. SHEPARD and I. W. BAILEY (*Proc. Soc. Amer. Foresters, 9 (1914), No. 4, pp. 522–527, fig. 1*).—The authors have studied the stems of *Pinus strobus*, *P. palustris*, *Picea rubens*, *Tsuga canadensis*, and *Abies concolor* with reference to the variation in length of tracheids in succeeding rings of the cross sections of stems; the variation in length of the tracheids of an annual ring at various heights in the stem; and the influence of the width of annual rings and "rothholz" or compression wood upon the length of tracheids. The results are here presented in tabular form and summarized.

Attention is called to the fact that fiber length varies to a marked degree in different parts of the plant, hence the average fiber length for a given region of the tree is not representative of a species. Since the fiber length in young and old wood may also vary considerably, it is concluded that average fiber lengths are of relative value, and often of doubtful significance for the purpose of identifying woods of economic importance.

Seed production of western white pine, R. Zon (*U. S. Dept. Agr. Bul. 210* (*1915*), *pp. 15*).—In this paper the author points out different problems involved in determining forest seed production, describes a method of measuring the seed crop as applied in 1911 to the study of seed-bearing characteristics of the western white pine in Idaho on the Kaniksu and Cœur d'Alene National Forests, and presents the results of this study in tabular form.

Although no final conclusions are drawn from the data secured, some deductions have been made chiefly to point out the still unknown factors involved in the problem of seed production and to demonstrate the suitability of the described method for solving them.

Ash in North Carolina, W. D. Sterrett (*N. C. Geol. and Econ. Survey, Bien. Rpt. State Geol., 1913–14, pp. 77–83*).—This comprises a short report on a study of the distribution and cut of ash in North Carolina. The six different species of ash occurring in the State are discussed with reference to their silvicultural possibilities and data are given showing the cut of ash by regions, species, and counties in 1910, together with data showing the rate of growth of green ash on typical green ash sites in North Carolina and South Carolina, and of white ash growing under favorable conditions in New York. A table is also given showing the yield possibilities of pure, even-aged, well-stocked stands of ash such as could be grown under management on different qualities of locality.

The forests of Chile, F. Albert (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 12, pp. 1535–1541*).—A short descriptive account of the forest regions and trees of Chile.

Fifth biennial report of the state forester of the State of California, G. M. Homans (*Bien. Rpt. State Forester Cal., 5* (*1913–14*), *pp. 202, pls. 2, figs. 32*).—In addition to a review of forest activities in the State during the biennial period 1913–14, this report is chiefly directed toward the support of the principle of initiating a state forest protective system. It presents arguments, endorsements, and data as to legislative measures operative in other States having special bearing on forest protection.

[Report on Indiana Forest Reserve for 1914] (*Ann. Rpt. Ind. Bd. Forestry, 14* (*1914*), *pp. 17–34, figs. 4*).—This report comprises a brief description of the reserve; a record of several newly planted tracts, including cost data; brief notes on forest cleaning, insect damage, and forest fires; rainfall data; and a progress report on previously planted forest tracts.

Eleventh annual report of the state forester of Massachusetts, F. W. Rane (*Ann. Rpt. State Forester Mass., 11* (*1914*), *pp. 111, pls. 8*).—A review of forest activities in Massachusetts during 1914, including the work at the state nurseries and plantations, assistance rendered to woodland owners with special reference to cutting and marketing species subject to moth infestation and reforestation with species immune from moths, forest mapping, fire protection work, suppression of the gispy and brown-tail moths, parasite work in connection with the control of these moths, assistance in controlling the army worm outbreak, new legislation, and financial statements for the year.

A paper on The Massachusetts State Forest Policy read before the Society for the Promotion of Agricultural Science (E. S. R., 32, p. 95) is included.

Forest fires in North Carolina during 1913 and state forest fire prevention in the United States, J. S. Holmes (*N. C. Geol. and Econ. Survey, Econ. Paper 37* (*1914*), *pp. 75*).—This paper gives a statistical account of forest fires occuring in North Carolina during 1913, shows the inadequacy of the present forest fire laws of the State, and gives a résumé of state fire protective legislation and activities in the United States.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1913–14, with a summary of progress during the five years, 1909–10 to 1913–14, H. CARTER (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1913–14, pp. VI+60–3, pl. 1*).—A report on the administration and management of the state forests in the Province of Bihar and Orissa for the year 1913–14, including a financial statement for the year. All important data relative to alterations in forest areas, forest surveys, working plans, protection, and miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form. A brief summary is also given of progress made during the 5-year period.

Forestry in the British Empire, W. SCHLICH (*Quart. Jour. Forestry, 9 (1915), No. 2, pp. 95–112*).—A paper read at the Forestry Conference of the Anglo-American Exposition, London, July 16, 1914, in which the author sketches the progress of forestry in the United Kingdom and in the various British colonies.

DISEASES OF PLANTS.

Fungus diseases of plants and their treatment, C. O. FARQUHARSON (*Bul. Agr. Dept. South. Prov. Nigeria, No. 2 (1914), pt. 1, pp. 8*).—This, the first of a series, is a very brief and general discussion of fungus diseases and means of protection therefrom in this region.

On the cause of spore formation in rusts, particularly in Puccinia malvacearum, L. BLARINGHEM (*Bul. Soc. Bot. France, 61 (1914), No. 1–3, pp. 149–157*).—In continuation of a study on the relation between *P. malvacearum* and its host, *Althæa rosea* (E. S. R., 30, p. 453), the author gives an account of experiments to force the production of spores by the fungus, and the results obtained are believed to have a bearing on spore formation of rusts in general. The conditions for spore formation are said to be external and result from changed osmotic tension of the tissues.

By means of cultures of Althæa plants in sugar and salt solutions, dehydration through injury to roots, freezing, etc., it was found possible to break down the symbiosis held to exist between the host and its parasite and to compel the production of spores by the fungus.

Some Scottish rust fungi, M. WILSON (*Jour. Bot. [London], 53 (1915), No. 626, pp. 43–49*).—Notes are given on the occurrence of *Puccinia prostii* on cultivated tulips, *P. borealis* and *P. septentrionalis* on *Thalictrum alpinum*, *P. anthoxanthi* on *Anthoxanthum odoratum*, and *Melampsora alpina* on *Salix herbacea*.

Ustilago, A. POTEBNIA (*Iuzh. Russ. Selsk. Khoz. Gaz., No. 45 (1911); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 3, p. 305*).—The author emphasizes the fact that in combating Ustilago treatment of the seeds with copper sulphate or formalin is ineffective. *U. tritici* and *U. nuda* are best combated by treatment with hot water.

On the propagation of rust in cereals in Sweden and France, L. BLARINGHEM (*Bul. Soc. Bot. France, 61 (1914), No. 1–3, pp. 86–94*).—The author discusses the mycoplasma theory of Eriksson (E. S. R., 14, p. 770) and the more recent publications by Beauverie (E. S. R., 30, p. 241) and others, and gives an account of his investigations since 1912, the previous experiments having been already reported (E. S. R., 31, p. 841). He agrees with Beauverie that the rust pustules on the seed grain have a very important bearing on the distribution of disease in France. Autumnal and early spring infections of *Puc-*

cinia glumarum do not seriously reduce the yield of grain, but where the pustules appear on the stalks and glumes between the period of flowering and maturity there is considerable injury done to the plants.

Report on barley diseases, 1913, J. Appl (In *Bericht über die in den Jahren 1911–1913 durchgeführten Sorten-Anbauversuche mit Gersten* [etc.]. *Brünn: Mähr. Landw. Landesversuchsanst., 1913, pp. 39–44, pls. 3*).—The year 1913 was particularly favorable to the development and spread of fungus diseases, barley suffering severely in this region, especially from loose smut (*Ustilago hordei nuda*) and stinking smut (*U. hordei tecta*), although the varieties bred by this station were almost entirely free from these diseases.

The report also deals briefly with *Puccinia graminis, P. rubigo vera, Erysiphe graminis, Cladosporium herbarum, Helminthosporium gramineum, Claviceps purpurea*, and the several fungi noted in connection with foot or stalk disease (Ophiobolus, Leptosphæria, etc.), besides some diseases due to animal pests.

Corn stalk and corn root diseases in Iowa, L. H. Pammel, Charlotte M. King, and J. L. Seal (*Iowa Sta. Circ. 21 (1915), pp. 8, figs. 2*).—A brief account is given of a new disease of corn found early in the fall of 1914 on an experimental plat. A field study showed it to be present in about 30 localities distributed in 15 counties of the State, reducing the yield in infected fields from 25 to 30 per cent.

The disease attacks roots, stalks, and ears, being easily discoverable by the falling of the corn. This often, however, is attributed to other causes. The stalks usually break near the joints. The diseased stalks have small ears, if any. The pith is frequently destroyed more or less completely, the small axillary shoots are often found to be rotten, and the roots are destroyed so that the stalk pulls up easily.

It has not been determined whether the same organism attacks all parts of the plant. The disease appears to be spread by the mold on the seed corn or on diseased stalks left in the field, and may have existed for some time in the State.

A disease of cattle is ascribed to a fungus found on the stalks. This also is under investigation. The only preventive or remedial measures suggested are rotation of crops and soaking the seed corn in formalin, 1 pint to 45 gal. of water for 15 minutes.

Downy mildew of the cucumber, R. A. Jehle (*Modern Cuba, 3 (1915), No. 2, pp. 33–38, figs. 5*).—This is a description, with discussion, of downy mildew (*Plasmopara cubensis*) of cucumbers, which is said to be perennial in Cuba and Florida, and very destructive to melons, cucumbers, and squash, especially during periods of wet weather or heavy dews.

Experiments are referred to which tend to show that Bordeaux mixture sprayed on at intervals during the growing season, preferably just before rains, offers a fair degree of protection.

Bacterial ring rot of potato, A. Spieckermann and P. Kotthoff (*Landw. Jahrb., 46 (1914), No. 5, pp. 659–732, pls. 7*).—The cause of bacterial ring rot of potato plants and tubers is claimed to be *Bacterium sepedonicum*, a biological and agricultural study of which is reported in some detail. The organism is known to attack, under natural conditions, only *Solanum tuberosum*, though a few inoculations succeeded with four other species of Solanum. All other Solanaceæ, as well as all other plants, gave negative results.

Destruction of all affected plants is advised.

Powdery scab of the potato, H. C. Sands (*N. Y. Dept. Agr. Circ. 111 (1914), pp. 10, pls. 5*).—This is mainly a compilation of information obtained from practical growers regarding the distribution, diagnosis, and treatment of powdery scab of potatoes, discovered in New York State in June, 1914, and at present thought to be confined to the counties of Franklin and Clinton.

The disease is contrasted with common scab. It seems to be favored by low, wet, alkaline soils and to be made worse by the use of lime.

Field studies of the crown gall of sugar beets, C. O. Townsend (*U. S. Dept. Agr. Bul. 203 (1915), pp. 8, pls. 2, fig. 1*).—The results are given of a study of galls produced on sugar beets, two distinct types being recognized which are caused by bacteria. One of these forms is said to be due to *Bacterium tumefaciens*, while the other is produced by *B. beticolum*.

The effect of galls on the sugar content of beets was studied, and it was found that the gall tissue was very low in sugar content and in purity and that therefore their presence is detrimental. Sugar beet galls are said to sometimes cause the beet roots to decay, but so far as general field observations can determine, they do not appear to otherwise affect the tonnage.

The author states that the disease may be held in check by a proper system of rotation with grain crops.

Potato and tomato diseases, E. Molinas (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 26, pp. 813–818, figs. 3*).—This is a brief discussion of several potato and tomato diseases of bacterial or fungus causation, and of some preventive or remedial measures recommended.

Wart disease of potatoes, W. Cuthbertson (*Gard. Chron., 3. ser., 57 (1915), No. 1469. pp. 97, 98, fig. 1*).—This is a brief historical sketch of potato canker, noting some cases of infection showing the dangerous character of the disease, also some cases of apparent breakdown of resistance, with a list of known resistant varieties recommended for planting on suspected soil. Nearly all of such varieties are white flowered.

Phoma destructiva, the cause of a fruit rot of the tomato, Clara O. Jamieson (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 1, pp. 1–20, pls. 8*).—The author reports receipt of specimens of tomatoes affected with fruit rot from Florida in March, 1912, which led to an investigation of the cause of the trouble.

When received, some of the fruit was green, some ripe, and some just beginning to color, but most of the tomatoes had conspicuous dark spots on the side and stem end. A microscopic examination of the tissues showed the presence of a fungus, which has been isolated, and by means of infection experiments the disease has been produced on green and ripe fruit and foliage in the greenhouse and upon tomato plants in the field. Cross inoculations between the tomato fruit and leaf have shown that the trouble was caused in both organs by the same fungus.

Inoculation experiments with the organisms were made on eggplant, potato, sugar beet. Jimson weed, garden pea, bean, and pepper plants, but only on the eggplant and potato were any infections obtained.

A technical description of the fungus causing the disease is given. The fungus has been proved to be an active wound parasite of green and ripe tomato fruit and also capable of causing leaf spotting of tomato and potato plants.

Blue mold in tobacco, T. A. J. Smith (*Jour. Dept. Agr. Victoria, 12 (1914), No. 11, pp. 641–643*).—The author states that considerable loss is sustained in Victoria by the attacks of the blue mold (*Peronospora hyocyami*) in seed beds.

Accounts of some investigations for the control of this trouble are given, in which formalin, toluol, boiling water, and lime were applied to plats with satisfactory results. All of the seed beds in the experiments were covered with a coarse bagging, which is considered to be an important factor in controlling temperature and reducing the amount of loss.

A bacterial disease of fruit blossom, B. T. P. BARKER and O. GROVE (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1913, pp. 76–79*).—This is a detailed account of investigations, a preliminary account of which has been noted elsewhere (E. S. R., 32, p. 148).

For several seasons, according to the authors, pear trees have been subject to a disease which is first characterized either by the tips of the sepals turning gray and later blackening, or by the appearance of small black dots on the receptacle of the flower. Occasionally the stigma and style of the pistil of the flower are first attacked, and sometimes the attack occurs on the petals. Occasionally the leaves are attacked, the disease appearing on them in the form of small blackened areas which eventually dry up and fall away.

The organism which is believed to be the cause of this trouble has been isolated and appears to be a species of Pseudomonas which has not been identified with any other form previously described. In addition to occurring in pear flowers, it has been isolated from apple, plum, and cherry flowers. Inoculations have been made on young shoots of apples, pears, plums, and gooseberries by means of needle punctures, but without causing any serious injury to the surrounding tissues.

Infection and immunity studies on the apple and pear scab fungi, S. P. WILTSHIRE (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 335–350, pls. 4*).—This is a study of the method by which *Venturia inæqualis* and *V. pirina* attack their hosts, and the history of the parasite after penetration, in order to investigate eventually the question of relative immunity.

The facts as noted seem to show that the appressorium penetrates the cuticle, upon which it feeds, and reaches its normal habitat between the cuticle and epidermis, where it flourishes if the attacked variety is susceptible. Immunity apparently does not depend upon any protection afforded by the cuticle, and indications are noted which suggest a general antagonism of the cell sap for the fungus.

Wind scorch of apple foliage, B. T. P. BARKER and C. T. GIMINGHAM (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1913, pp. 67, 68*).—For several seasons attention has been paid to a severe scorching of the foliage of apple trees, and the possibility of the trouble's being due to a fungus or to spray injury was considered.

It was also suggested that wind might be responsible for the trouble by causing a constant rubbing of adjacent leaves on each other, and a careful examination has shown that this is the cause of the injury, the rough edge of one leaf irritating the cells of another at points of contact, finally resulting in the development of a slightly purplish coloration suggesting a slight bruise. Later these discolored patches begin to turn brown, dry up, and present the typical scorched character. It is thought probable that much of the injury that has been attributed to spray mixtures may really be due to the action of wind.

Sources of the early infections of apple bitter rot, J. W. ROBERTS (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 1, pp. 59–64, pl. 1*).—As a result of studies made in the Ozark region of Arkansas, the author has shown that in apple orchards where infections had been severe the fungus *Glomerella cingulata* may winter over on almost any cankered or dead parts of the tree, including the canker due to *Nummularia discreta*, dead tips of fruit spurs, dead parts of limbs due to injury by freezing or to death of roots, branches injured by mechanical means, cankers caused by the pear blight organism, and twig cankers due to *Phyllosticta solitaria*.

The eradication of cankers greatly reduced the number of early infections of the disease, although the removal of all small dead parts, such as the tips of fruit spurs and small mechanically injured places, is not considered practicable.

The natural modes of distribution of pear blight in California, B. J. JONES (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 12, pp. 505–511, figs. 2*).—The principal carriers of pear blight discussed are honeybees, flies, ants, pear thrips, apple aphids, some insects living in the soil, of which several are named, and the drip during rains.

Black rot in Spain, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 30, pp. 114, 115*).—The author reports having found the characters distinctive of black rot on both grapes and leaves of specimens sent for examination from the Province of Valencia, Spain, showing that this region has now been invaded by this disease.

Fungus and other diseases of citrus trees, G. P. DARNELL-SMITH and E. MACKINNON (*Agr. Gaz. N. S. Wales, 25 (1914), No. 11, pp. 945–954, pls. 4*).—In connection with appropriate fungicides and other remedial measures the authors discuss briefly blue mold (*Penicillium* and *Aspergillus*), sooty mold (*Capnodium citricolum*), melanose (*Phomopsis citri* and *Cladosporium brunneo-atrum*), russeting (*Colletotrichum glœosporioides*), Maori (supposedly physiological), black spot (*Phoma citricarpa*), brown spot (*C. glœosporioides*), honey fungus (*Armillaria mellea*), collar rot (*Fusarium limonis*), scabbing (Cladosporium), withertip and dieback (Phoma and Colletotrichum), and exanthema and chlorosis (both physiological).

Pseudomonas citri, the cause of citrus canker, CLARA H. HASSE (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 1, pp. 97–100, pls. 2*).—During the summer of 1914 diseased material of grapefruit showing the canker was received, and the author presents a preliminary report on the cause of the canker.

A microscopic study of the material showed the presence of bacteria and these were isolated and proved pathogenic to grapefruit seedlings. A study of the organism indicates that it is apparently a new species, and a technical description is given of it under the name *P. citri* n. sp.

A number of investigators have reported the disease due to fungi, and the author states that the open surface of the canker and the spongy character of its structure afford an excellent lodging place for spores of all sorts and that possibly fungi may play a minor part in the later stages of the disease.

Citrus canker in Florida and the Gulf States, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 12, pp. 512, 513*).—This is mainly a summation of information contained in several communications appearing in 1914 regarding the appearance and progress of citrus canker. This has not yet reached California, and it is thought that the drier climate would probably prove unfavorable to its power of destructiveness as shown in the eastern citrus-growing region.

The citrus canker situation in Florida, L. S. TENNY (*Fla. Growers and Shippers League Bul. 1 (1914), pp. 16*).—This is a summary of the papers and discussions presented at the citrus seminar held at Gainesville, Fla., September 22–24, 1914. The speakers discussed the history of citrus canker in Japan and in the United States, the favoring conditions, its appearances, spread, effects, and dangers. The disease infects and matures quickly in warm, wet periods. After infection nothing is known that will prevent the development of the disease, though Bordeaux mixture and corrosive sublimate have been found to prevent infection.

Fungus diseases of limes, J. B. Rorer (*Proc. Agr. Soc. Trinidad and Tobago, 15* (*1915*), *No. 1, pp. 14, 15*).—This gives a brief discussion of damping-off in lime seedlings, as preventable by the employment on the seed bed of heat (212° F.) for 20 minutes, or of formaldehyde (4 per cent under confinement for 24 hours), or utilization of subsoil which is sterile, thoroughly disinfected tools, etc. Collar rot and root rot of full-grown lime trees are not very common, but where these diseases appear they are controlled by cutting out the affected tissue.

A preliminary investigation as to the cause of rotting of oranges from Brazil, W. Rushton (*Ann. Appl. Biol., 1* (*1915*), *No. 3-4, pp. 365-369, fig. 1*).—Tests with oranges variously treated before shipment from Brazil to England seemed to show that the best protection is given by wrapping the fruit in thin paper and packing in dry sawdust, also that the worst results follow exposure to moisture and heat. The oranges were attacked by *Penicillium italicum* and some member of the Mucorineæ. The changes occurring are described.

Discoloration of tissue precedes the advance of the Penicillium in the orange and in orange gelatin cultures. The fungus was not observed to pierce the cuticle, but moisture on the surface probably multiplied the chances of attack through injured cuticle.

Growth of the fungus on cut surfaces was checked by the use of 2 per cent copper sulphate or 5 per cent formalin, but another form of rot appeared after the formalin treatment.

A remedy for the coconut bud rot, J. R. Johnson (*Modern Cuba, 3* (*1915*), *No. 3, pp. 76-80*).—The author calls attention to the measures that have been taken in Jamaica and Trinidad for the control of the coconut bud rot, and urges that similar methods be adopted in Cuba to prevent the destruction of coconuts in that island.

Observations on Rhizina inflata, J. R. Weir (*U. S. Dept. Agr., Jour. Agr. Research, 4* (*1915*), *No. 1, pp. 93-96, pl. 1*).—The author states that this fungus is usually found as a saprophyte on burned forest soil, but an attempt has been made to demonstrate its parasitism on certain seedlings.

In 1912 a number of seedlings of pine, hemlock, and larch were observed to be dying, and upon being pulled up the roots were found closely matted together by a white mycelium. Later, near the border of the infected areas and at the base of the stems of the dead seedlings, fruiting bodies of *R. inflata* were observed. An attempt was made to produce the disease by inoculating pine seedlings with spores of the fungus, and, while the experiments were not performed under controlled conditions, the results indicate that *R. inflata* occurs as a parasite in the Northwest.

A new disease of plantation rubber in Malaya, F. T. Brooks (*Agr. Bul. Fed. Malay States, 3* (*1914*), *No. 3, pp. 105-107*).—The author reports having had under observation for several months a hitherto unrecorded rubber disease in Malaya.

The part of the tree principally affected is the collar, and in this region the bark on one side of the tree dies and the wood beneath it becomes brown. Examination showed the presence of mycelium, and investigations indicated that the fungus is different from the fungi usually reported on rubber trees.

As a result of study the author has come to the conclusion that it is similar to, if not identical with, *Ustulina zonata*. Pure cultures of the fungus have been made and successfully used in inoculating rubber trees, apparently demonstrating that it is the cause of the trouble in question.

It is recommended that all diseased trees be isolated by trenches and cut down and destroyed as soon as they cease to yield latex in paying quantities.

Pink disease, F. T. Brooks and A. Sharples (*Dept. Agr. Fed. Malay States Bul. 21 (1914), pp. 27, pls. 13*).—The present paper embodies the results of an investigation begun early in 1914 regarding the pink disease of rubber trees on Malayan rubber estates, where it has developed considerably since 1912, some estates showing attack in from 10 to 25 per cent of the trees. A preliminary account of this work has already been noted (E. S. R. 32, p. 54).

The causal fungus, *Corticium salmonicolor*, has been known by various names since 1897 and is said to have been found on as many as 141 species of plants distributed among 104 genera and many families. It is supposedly native in most countries where it is found. *Hevea brasiliensis* appears to be the most often attacked of its hosts in Malaya, the chief centers named being at present in the district of heaviest rainfall, where large areas of jungle are still found.

Trees over two years of age are the ones most attacked. Favorite points are the forks, the shady portions of the trunk, and, in general, healthy bark wherever moisture lingers, the attack decreasing in dry weather, with partial or total recovery of the trees. The external manifestations, which may vary considerably, are described, also the effects on the deeper tissues. The spread of the fungus into the trunk affects the water supply, browning and killing the foliage and in the end sometimes the tree. The fungus readily passes from one host to another under favorable conditions in wet weather.

Spraying is impracticable in most cases, owing to the size of the trees affected, the heavy rainfall, and the burrowing habits of the fungus. Precautionary painting of young trees with Bordeaux mixture has been found to reduce the percentage of attack. Estates infected to the extent of 1 per cent would, it is thought, better be dealt with by cutting out or by tarring as directed. When burning is impracticable, infected branches cut away should be disinfected with 10 per cent copper sulphate, then removed and buried. The utmost vigilance is necessary in regions affected.

A study on a "mottled" disease of the black wattle, P. A. van der Byl (*Union So. Africa Dept. Agr. Sci. Bul. 4 (1914), pp. 20, figs. 9*).—Mottling in *Acacia mollissima*, decreasing its tannin content and economic value, is described and discussed in its several aspects and bearings. It is said to be due to physiological derangements caused by unfavorable conditions of growth.

Control of dry rot, Moormann (*Gsndhts. Ingen., 37 (1914), No. 28, pp. 533–536, figs. 9*).—Some observations are described to show that *Merulius lacrymans* may be dried out and its activity arrested completely by providing free circulation of air through the spaces beneath floors, etc., within which the fungus otherwise flourishes.

The dry-rot question, R. Falck (*Gsndhts. Ingen., 37 (1914), No. 51, pp. 846–849, fig. 1*).—This is a discussion, partly critical, supplementing the above report.

Internal therapy of plants, A. Dement'ev (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 4, pp. 282–293*).—In experiments with plants taking up through cut surfaces salts from solutions under pressures of one to eight atmospheres, and under other conditions, the author found that these substances are taken up at different rates and concentrations, both by the same and different plants, and often in other concentrations than those existing in the solutions offered. He is convinced that these facts may be utilized in combating parasites by a system of internal therapy.

Investigations on Bordeaux mixtures, B. T. P. Barker and C. T. Gimingham (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1913, pp. 56–66*).—This is a summary of a number of papers by the same authors, which have been previously noted (E. S. R., 25, p. 458; 31, p. 541; 32, p. 243).

As a result of their observations the authors find that cells with readily permeable walls, such as the germ tubes of fungus spores, root hairs, the interior tissues of leaves, etc., exert a considerable solvent action on the particles of copper compounds with which they may come into contact. There is a rapid absorption of such dissolved copper followed by the death of the cells. The amount of interaction, if any, between other types of cells and the copper compounds is determined by the nature of the cell wall. Direct absorption of copper by leaves of certain types can take place with or without injury, depending on the nature of the leaf surface. Translocation of the absorbed copper to other parts of the plant may follow. Copper may be absorbed through the roots of certain plants, such as potatoes and beans, with local injury to the root. The absorbed copper can be translocated to the aerial parts of the plant without injury to the cells through which it passes.

Burgundy mixture, FONZES-DIACON (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 29, pp. 70–80*).—This is a discussion of the composition, application, and action in acid, alkaline, or neutral form of Burgundy mixture designed for use as a fungicide.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Economic zoology report for the year 1913, W. M. ADERS (*Reprint from Zanzibar Protect. Med. and Sanit. Rpt., 1913, pp. 75–102*).—This report deals with entomology in relation to public health and medicine, to veterinary medicine, and to agriculture; birds, beneficial and otherwise; helminthology; blood parasites of mammals, birds, reptiles, and other animals of economic importance; etc.

A pocket list of the mammals of eastern Massachusetts with especial reference to Essex County, C. E. BROWN (*Salem, Mass.: Peabody Academy of Science, 1913, pp. 53, pls. 5*).—This handbook gives brief descriptions of the mammals of eastern Massachusetts, together with notes on their occurrence, habits, etc.

The pocket gopher of the boreal zone on San Jacinto Peak, J. GRINNELL and H. S. SWARTH (*Proc. Cal. Acad. Sci., 4. ser., Zool., 4 (1914), No. 6, pp. 153–159*).—The pocket gopher here dealt with is described as *Thomomys jacinteus* n. sp.

Food habits of the skunk, F. C. PELLETT (*Proc. Iowa Acad. Sci., 20 (1913), pp. 307–309, pl. 1*).—Investigations conducted during a period of five years during which skunks were reared and kept under close observation, lead the author to conclude that the skunk is of considerable value in reducing rodent pests and destroying insects, especially grasshoppers, crickets, and June beetles. Its habit of killing poultry is considered accidental and unusual, and to be confined to a small percentage of the individuals of either the northern plains skunk (*Mephitis hudsonica*) or the little spotted skunk (*Spilogale interrupta*).

The value of birds to man, J. BUCKLAND (*Ann. Rpt. Smithsn. Inst., 1913, pp. 439–458*).—This is a discussion of the subject in its many phases.

Birds that destroy grapes, A. W. BUTLER (*Proc. Ind. Acad. Sci., 1912, pp. 53–55*).—This brief report of observations of the birds that attack grapes supplements the information presented in the author's work on the Birds of Indiana.[a]

Species which have reared young and hybrids which have been bred in captivity in Great Britain, W. T. PAGE (*Ashbourne, England: The "Avian*

[a] Ind. Dept. Geol. and Nat. Resources Ann. Rpt., 22 (1897), pp. 515–1187.

Press," 1914, pp. VII+55, pls. 5, figs. 7).—The introductory chapters of this work discuss breeding hints and observations. Lists of the species of birds which have reared young in captivity in Great Britain (pp. 10–28) and the hybrids which have been bred in captivity in Great Britain (pp. 30–39) follow. The appendixes include lists of species and hybrids which have been bred on the Continent but not in Great Britain, and a list of the species which have been crossed successfully with the domestic canary. An index is included.

Insects: Their life histories and habits, H. BASTIN (*New York: Frederick A. Stokes Co., 1913, pp. XII+349, pls. 46*).—This is a popular work dealing with the subject under the following chapter headings: The dominant insect; the young insect; the origin of insects; mouth parts, wings, and legs; the classification of insects; the senses of insects; the behavior of insects; protective resemblance; warning colors and mimicry; the problem of defence; carnivorous insects; plant-eating insects; insects and flowers; the enemies of insects; the courtship of insects; the insect as a parent; insect communities; insects in the water; and mankind and the insect.

Injurious insects, R. T. NEAL (*Hampton Leaflets, 7 (1915), No. 3, pp. 53, figs. 49*).—A brief popular account of insects, particularly those injurious to fruits, shade trees, vegetables, field crops, stored grains, and to health.

Report of the Kansas State Entomological Commission for 1913 and 1914 (*Rpt. Kans. State Ent. Com., 1913–14, pp. 16*).—Brief reports are presented by G. A. Dean and S. J. Hunter on nursery, orchard, and apiary inspection work.

Report of the entomological department of the Rhode Island State Board of Agriculture, 1913, A. E. STENE, C. W. LOVELAND, and A. C. MILLER (*Ann. Rpt. Bd. Agr. R. I., 29 (1913), pp. 23–54*).—This report includes notes on some of the important insect pests of the year, work with the elm leaf beetle and San José scale, and nursery and orchard inspection. A report on apiary inspection, by A. C. Miller (p. 43), and a report on the gipsy and brown-tail moth work are appended.

Report of the entomologist, W. H. PATTERSON (*Govt. Gold Coast, Rpt. Agr. Dept., 1913, pp. 18–27*).—This is a report of the work of the year, particularly as relates to the two major pests of cacao, namely, "Sankonuabe" (*Sahlbergella singularis* and *S. theobroma*) and "cocoa mosquito" (*Helopeltis* sp.), the damage caused by which is said to be enormous.

Insect pests of Nigeria, W. A. LAMBORN (*Bul. Agr. Dept. South. Prov. Nigeria, No. 1 (1914), pp. 8*).—This is the first of a series of leaflets dealing with the insect pests of Nigeria and measures for their control.

The agricultural pests of the southern Provinces, Nigeria, W. A. LAMBORN (*Bul. Ent. Research, 5 (1914), No. 3, pp. 197–214, pls. 9, figs. 4*).—This paper, based upon observations made during the year 1913–14, lists the insect pests under the various crops attacked, namely, cotton, cacao, kola, coffee, maize, rubber, peanuts, beans, pigeon pea, oil palms, and sweet potatoes.

Pests of cotton in Fergana, according to observations made in 1913, I. V. VASSILIEW (*Trudy Bûuro Ent. [St. Petersb.], 10 (1914), No. 10, pp. 23, figs. 13; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 5, pp. 311–314*).—A report of observations of insect pests made by the author in 1913 in Fergana, the principal cotton-growing district of Russian Turkestan.

Report of the entomologist and vegetable pathologist, H. TRYON (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1913–14, pp. 114–120*).—Work with insects for the year ended June 30, 1914, is briefly reported upon.

Among the pests discussed is a fly, *Musca octustissima*, which has been given the name "eye fly." It has been found to harbor a larval parasite, apparently a species of Habronema, the adult form as well as the final host of which remains to be discovered. It is thought that this may represent *Onchocerca gibsoni*, the cause of the verminous nodules in cattle, accounts of which by others have been previously noted (E. S. R., 31, p. 182; 32, p. 376).

Insect pests of coconuts (*Agr. News [Barbados], 14 (1915), No. 333, pp. 42, 43*).—A summarized account of coconut insect pests, particularly the black or rhinoceros beetle (*Oryctes rhinoceros*), and the red beetle or Asiatic palm weevil (*Rhynchophorus ferrugineus*).

Insects affecting the lime, F. W. URICH (*Proc. Agr. Soc. Trinidad and Tobago, 15 (1915), No. 1, pp. 16–18*).—Brief notes on the more important enemies of the lime in Trinidad.

In regard to the poisoning of trees by potassic cyanid, F. SANFORD (*Science, n. ser., 41 (1915), No. 1049, pp. 213, 214*).—A supplement to the article previously noted (E. S. R., 32, p. 152).

Homemade lime-sulphur concentrate, E. W. SCOTT (*U. S. Dept. Agr. Bul. 197 (1915), pp. 6*).—This is a report of work conducted at Berryville, Winchester, and Vienna, Va., Hagerstown, Md., and Benton Harbor, Mich., for the purpose of encouraging orchardists in the preparation of concentrates for their own use, or for the use of the neighborhood.

The results of cooking different lots of lime and sulphur in the different localities are reported in tabular form. The best methods of preparing the lime-sulphur concentrate and the relative cost are described.

Concerning some medico-entomological problems, E. MARTINI (*Arch. Schiffs u. Tropen Hyg., 18 (1914), Beihefte 7, pp. 67–76, fig. 1*).—This article deals especially with the habits of mosquitoes.

The effect of Coccobacillus acridiorum on Pachytylus migratorius, D. BORODIN (*Ent. Viestnik [Kief], 2 (1914), No. 1, pp. 54–86, fig. 1*).—During the summer of 1913 the author conducted experiments in the Government of Stavropol in North Caucasus, during the course of which *C. acridiorum* was injected into the abdominal cavity of several Orthoptera, namely, *P. migratorius*, *Œdaleus nigrofasciatus*, *Stauronotus maroccanus*, *Arcyptera flavicosta*, and *Tmetis muricatus*.

The results are summarized as follows:

These injections were pathogenic for all these insects and brought about death in 83 hours. The virulence had been increased by passing the infection through many series of *P. migratorius*. The increase of the pathogenic strength of the culture was ascertained, and in the first two series death resulted in 83 hours, while in the following series (up to the fourteenth) the time decreased to six hours. All the insects do not die in the earlier series; some continue to live and may possibly acquire immunity. Death results more or less quickly, depending upon the conditions of the experiment (temperature and amount of culture injected). If the infection is introduced by the mouth, death results very slowly and all the insects do not die. These results show that the bacteriological method of locust destruction should be avoided until the question has been more thoroughly studied. So far the method of destruction by poisoned baits has given by far the best results.

Nysius senecionis as an enemy of newly planted vines, F. PICARD (*Vie Agr. et Rurale, 3 (1914), No. 22, pp. 610, 611; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 9, pp. 556, 557*).—This lygeid, previously nearly unknown, is reported to have injured newly planted vines in Aude, Hérault, and Gard in 1912 and 1913. In one locality some 12 acres of newly planted vines were so thickly infested by this bug that in places the plants and ground appeared black. One-third of the vines are said to have withered and to have been apparently destroyed.

The sugar cane scale (Chionaspis tegalensis) and its control, P. VAN DER GOOT (*Arch. Suikcrindus. Nederland. Indië, 22 (1914), No. 43, pp. 1545–1578, pl. 1; Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 30, pp. 655–688, pl. 1*).—An account of the biology, natural enemies, and control measures for this pest in Java.

The gipsy moth in the Crimea, I. SHTCHEGOLEV (*Sadovod, 1914, Jan., pp. 18–30; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 5, pp. 274, 275*).—A short report of an outbreak of *Lymantria dispar* which took place in the Crimea in 1913.

The apple-tree tent caterpillar, A. L. QUAINTANCE (*U. S. Dept. Agr., Farmers' Bul. 662 (1915), pp. 10, figs. 7*).—A popular account of this important pest including methods of control.

A new cotton-seed moth (Mometa zemiodes) from West Africa, J. H. DURRANT (*Bul. Ent. Research, 5 (1914), No. 3, p. 243*).—*M. zemiodes* belonging to the family Gelechiidæ, which attacks cotton seeds in Southern Nigeria, is described as representing a new genus and species.

The fight against Cydia (Carpocapsa) pomonella and C. (Grapholita) funebrana, N. KOSTAREV (*Plodovodstvo, No. 1 (1914), pp. 32–38; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 5, pp. 291, 292*).—The author reports that the codling moth causes an enormous amount of damage to apples, as high as 60 per cent occurring in the Crimea, while in the Governments of Astrakhan and Ekaterinoslaf and elsewhere it is as high as 90 per cent. The injury by *C. funebrana* is more indirect than direct, since its attack induces the development of rot fungi (*Monilia fructigens* and *M. cinerea*).

Cydia (Grapholita) funebrana, its bionomics and methods of fighting it, K. KOSTROVSKY (*Turkest. Selsk. Khoz., 1914, pp. 133–138; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 5, p. 318*).—The author states that *C. funebrana* is as serious an enemy of plums in Turkestan as is the codling moth of apple trees.

Experiments on the artificial infestation of Agrotis segetum with parasitic Hymenoptera, W. POSPIELOW (*Ztschr. Wiss. Insektenbiol., 10 (1914), No. 2, pp. 52–58*).—This is a report of experiments with the Wintersaateule (*A. segetum*), conducted by the author in Voronezh. The parasites employed included an ichneumonid (*Amblyteles vadatorius*), a braconid (*Macrocentrus collaris*), and a chalcidid (*Pentarthron semblidis*). Particular success was met with in the parasitism of the eggs by *P. semblidis*.

The Hessian fly, R. L. WEBSTER (*Iowa Sta. Circ. 22 (1915), pp. 4, figs. 6*).—A popular account of this pest with control measures. The most severe outbreak ever experienced in Iowa is said to have occurred in 1914 over a large part of the southern half of the State, particularly the southwestern portion.

The sorghum midge in Tucumán, A. H. ROSENFELD and T. C. BARBER (*Rev. Indus. y Agr. Tucumán, 5 (1914), No. 2, pp. 85–87*).—The cecidomyiid *Contarinia* (*Diplosis*) *sorghicola*, an account of which by W. H. Dean, of this Department, has been previously noted (E. S. R., 23, p. 364), is reported as the source of considerable injury in Argentina.

The prophylaxis of malaria with special reference to the military service, C. F. CRAIG (*War Dept. [U. S.], Off. Surg. Gen. Bul. 6 (1914), pp. 115, pls. 13, figs. 7*).—Chapter 2 of this work deals with the malaria mosquitoes (pp. 41–57), chapter 3 with prophylactic measures based upon the destruction of malaria mosquitoes (pp. 58–71), and chapter 4 with prophylactic methods based upon the protection of man from the bites of mosquitoes (pp. 72–79).

Mosquito-borne diseases (*Washington: Health Dept. Canal Zone, 1914, pp. 19*).—A popular account issued by the Health Department for use in the public schools of the Canal Zone.

A clinical, pathological, and experimental study of the lesions produced by the bite of the "black fly" (Simulium venustum), J. H. STOKES (*Jour. Cutaneous Diseases, 32 (1914), Nos. 11, pp. 751–769, figs. 5; 12, pp. 830–856, pls. 3; abs. in Jour. Amer. Med. Assoc., 63 (1914), No. 22, p. 1981; 64 (1915), No. 3, p. 274*).—The first part of this paper consists of a brief account of simulids, a review of the literature, and a description of the lesions with their associated manifestations. The second part comprises studies of the pathology of the lesions in man and experimental studies in the reproduction of the lesions from preserved material, together with observations on the behavior of the toxic agent.

The temperature in a small child which was bitten by *S. venustum* 25 or more times in one afternoon never went above normal, although the lymphadenitis was marked and the child fretful and restless. It is stated that several persons under the author's observation reported having felt "tired and stiff all over" after being severely bitten by the flies early in the season. Nothing comparable to the severe reactions described in the literature has come under the author's observation.

"A distinctive satellite adenopathy of the cervical glands develops in the majority of susceptible persons within 48 hours after being bitten in the typical sites. This adenopathy is marked, discrete, and painful, the glands often exquisitely tender on pressure. It subsides without suppuration. Immunity may be developed to all except the earliest manifestations by repeated exposures. Such an immunity in natives of an infested locality is usually highly developed. There are also apparently seasonal variations in the virulence of the fly and variations in the reaction of the same individual to different bites."

The experiments performed do not identify the nature of the toxic agent. The theories suggested as to its nature are: (1) The toxin may be an alkaloidal base, toxic as such, and neutralized after injection by antibodies produced for the occasion by the body; (2) the injected saliva of the fly may not contain an agent toxic as such, but, like many foreign proteins, becomes toxic only when broken down; (3) lytic agents in the blood serum may play the chief rôle in the liberation of the toxic agent from its nontoxic combination (to this view the author is inclined); or (4) the initial injection of a foreign protein by the fly at the first bite may sensitize the body to that protein.

A list of references to the literature accompanies both parts.

Proposal of new muscoid genera for old species, C. H. T. TOWNSEND (*Proc. Biol. Soc. Wash., 28 (1915), pp. 19–23*).—This paper relates to species of economic importance.

A maggot trap in practical use; an experiment in house-fly control, R. H. HUTCHISON (*U. S. Dept. Agr. Bul. 200 (1915), pp. 15, pls. 3, figs. 4*).—The demonstration during the season of 1913 of a most pronounced migratory habit of house-fly larvæ just before pupation led to experiments with maggot traps, which have shown that as high as 98 or 99 per cent of the larvæ can be captured. The results of an attempt during the season of 1914 to apply the principles of the maggot trap to practical use and to test its efficiency when used to destroy maggots in large masses of manure are here reported.

The maggot trap designed and constructed consisted of a concrete floor with a concrete rim and a pipe in one corner through which water could be drained. A wooden platform supported by legs was constructed over the floor, upon which the stable litter could be thrown. Each day, after the addition of manure and litter from the stable, the manure on the platform was sprinkled with enough water to moisten it thoroughly without causing any leaching. The results obtained during August and September seemed to show that at least 98 per cent of the larvæ breeding in this manure were destroyed by migrating from the manure and dropping into the water below. Fly counts made before and after the trap was installed indicated an average reduction of from 67 to 76 per cent. That the reduction of flies did not correspond to the percentage of larvæ destroyed is thought to have been due to the presence of several other breeding places well within the range of flight.

"Two difficulties were experienced in the practical working of the trap, viz, the accumulation of a certain amount of straw and débris on the floor under the platform and the breeding of mosquitoes in the water used to drown the fly larvæ. It was also found that low air temperatures hinder migration, and consequently decrease the efficiency of the trap."

Among the merits of the maggot trap mentioned are (1) the comparatively small initial cost and absence of money outlay necessary for its maintenance; (2) the very small amount of additional time or labor required in its operation; (3) the ease with which wagons or manure spreaders can be loaded from the platform; and (4) its adaptability for use at stables where the daily production of manure is large. The conditions which render the trap most effective are the ones which tend to preserve the value of the manure.

A list of nine references to the subject is included.

Observations on blow flies; duration of the prepupal stage and color determination, P. W. WHITING (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 26 (1914), No. 3, pp. 184–194*).—The studies here reported upon relate to experiments with the various species of blow flies common in New England, especial attention being given to the common green bottle fly (*Lucilia sericata*).

The author finds that the length of the prepupal period of blow flies is determined by environmental rather than hereditary factors. In general, dryness, cold, or agitation due to crowding tend to prevent pupation, while change from dryness to dampness or the reverse induces it. "The prepupal stage may be extended for a long period, four months in one experiment, in warm temperature without injury to the development of adult flies, which emerge from the pupæ in normal condition. Lack of opportunity for the larvæ to bury themselves does not inhibit pupation. Exhaustion of the food supply before the larvæ have attained full size has a tendency to produce undersized but normally formed flies. The causes producing misshapen and imperfectly expanded flies are more obscure, but may be in part due to drying of the pupæ. Delayed pupation in Lucilia larvæ is evidenced by a change from white to pink in the fat bodies, but in two genera of larger flies, Cynomyia and Calliphora, the white color is maintained although considerable shrinkage of the whole body occurs. There is no evidence that overfeeding delays pupation, but much evidence that larvæ will pupate immediately despite the fact that they have had abundant opportunity to overeat."

A tachinid parasite with an intracuticular stage, W. R. THOMPSON (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 2, pp. 83–86, figs. 2*).—This article relates to an undetermined tachinid parasite, probably belonging to the genus Epalpus, the first larval stage of which is parasitic on noctuid caterpillars taken by the author on witch-hazel (*Hamemalis virginiana*) brush at Ithaca, N. Y.

Sarcophagidæ of New England: Males of the genera Ravinia and Boettcheria, R. R. PARKER (*Proc. Boston Soc. Nat. Hist., 35 (1914), No. 1, pp. 77, pls. 8*).—This first paper deals with seven species belonging to three genera, of which the genus Boettcheria and three species belonging to it and three species of Ravinia are described as new. The paper is devoted in large part to the external anatomy of the family. The observations of Kelly (E. S. R., 32, p. 60) and others have shown members of this family to be of considerable economic importance as parasites, particularly of grasshoppers.

Appearance of the Colorado potato beetle (Leptinotarsa decemlineata) in Germany (*Illus. Landw. Ztg., 34 (1914), No. 57, pp. 538, 539, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, p. 1248; Mo. Bul. Com. Hort. Cal., 3 (1914), No. 12, p. 534*).—The presence of the Colorado potato beetle, which has not been observed to occur in Germany since 1887, has been reported from Hohenwedel, near Stade (Hanover), and its eradication is being undertaken by the Government.

The rose beetle (Adoretus vestitus) and the injury it causes in the Samoan Islands, E. Friederichs (*Ztschr. Wiss. Insektenbiol., 10 (1914), No. 2, pp. 41–47, figs. 6; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1252, 1253*).—A descriptive account of this pest which is very abundant in the island of Upolu. In addition to roses it feeds on leaves of the cacao in a characteristic manner, leaving only the outer edges and the ribs untouched. The author recently observed many young cacao plants in a cacao plantation that had been destroyed by this pest. "Even large trees were seriously injured by these insects. Other frequent host plants are *Coffea liberica*, *Hibiscus tiliaceus* ('fau' of the Samoans; almost every plant had its leaves completely devoured), *Terminalia litoralis* ('talie' of the natives), and others. The injury caused by these beetles, with the exception of that to roses (which have no economic importance in Samoa), has not hitherto been very severe; the insect and the injury that it does are, however, on the increase and perhaps before long it may become dangerous."

A trap for turnip fly, H. M. Lefroy (*Jour. Roy. Hort. Soc., 40 (1914), No. 2, pp. 269–271, pl. 1*).—The author describes the structure of a trap devised for use in combating the blue flea-beetle (*Phyllotreta consobrina*) and the yellow striped flea-beetle (*P. undulata*), important enemies of turnips, swedes, cabbages, and allied cruciferous plants in the seedling stage in Great Britain. The trap consists of two boards (coated with Morlar Hop Wash) set at a slope on a pair of runners, like those of a sledge or toboggan, with a space between. The trap is drawn along the drill so that the plants pass down the space in the middle. In order to disturb the beetles a loop of string hangs from a crowbar and brushes the plants. Thus disturbed the flea-beetles always leap sideways, alight on the sticky boards, and perish.

The cotton and corn wireworm (Horistonotus uhlerii), A. F. Conradi and H. C. Eagerton (*South Carolina Sta. Bul. 180 (1914), pp. 16, pls. 4*).—A detailed report of studies of *H. uhlerii* conducted largely at Ruffin, Colleton County, S. C., in cooperation with the Bureau of Entomology of the U. S. Department of Agriculture. Preliminary accounts of investigations of this pest by Thomas (E. S. R., 25, p. 560) and by Conradi (E. S. R., 30, p. 545) have been previously noted, as have studies of *Monocrepidius vespertinus* by Eagerton (E. S. R., 33, p. 63), which is associated with and often mistaken for this species.

This species is always found on upland sandy soil and apparently can not live in soil through which the water does not percolate rapidly. Its injury is occasioned through cutting off the feeding roots of plants. Practically all farm crops are attacked, including corn, cotton, cowpeas, oats, rye, peanuts, tobacco, watermelons, etc. The pest has spread from near Snider's Cross Roads, where it was first noticed, until an area of 200 square miles in that vicinity is more or less severely infested. The greatest loss occasioned has been near Snider's

Cross Roads, where the area of heavy infestation covers about 16 square miles. It is thought, however, that when the distribution records are completed the infested territory will be found to include the sandy uplands of the lower and upper pine belts, together with the coastal lands.

Oviposition is thought to continue from June 1 to September 15, the main period being from June 15 to August 10. From 11 to 15 days are required for the incubation of the egg. In a seasonal life history chart the authors indicate that the larvæ may continue feeding up to July of the following year. While the exact number of larval instars has not been determined, it is suggested that there may be 8 or 9. They live almost exclusively within 4 in. of the surface, except when driven to lower depths by either high or low temperatures or lack of moisture in the upper soil and do not appear to range over a very large area, 20 to 30 sq. ft. apparently being the limit. In the laboratory the pupal stage lasted from 9 to 15 days, apparently varying very little with the time of the year.

The numbers of the larvæ appear to be lessened more by cannibalism while in the deep soil than by any other cause. The natural enemies do not appear to be sufficiently numerous to affect their numbers materially. Artificial control measures which include fallowing, crop rotation, etc., have been dealt with more at length by Thomas (E. S. R., 25, p. 560).

Life history notes on the plum curculio in Iowa (Conotrachelus nenuphar), R. L. Webster (*Proc. Iowa Acad. Sci., 20 (1913), pp. 313–315*).—A record of observations made in Iowa in 1889 (by C. P. Gillette) and in 1910 which relate especially to the dates of appearance of the adults in the spring, emergence of larvæ from apples, and emergence of adults from July 26 on.

Four new injurious weevils from Africa, G. A. K. Marshall (*Bul. Ent. Research, 5 (1914), No. 3, pp. 235–239, figs. 3*).—*Eremnus fulleri* n. sp., found attacking the leaves of maize at Pretoria; *Hyperoides fragariae* n. g. and n. sp., which injures strawberries in Cape Province; *Tychius gossypii* n. sp., found on cotton at Cairo, Egypt; and *Cyllophorus rubrosignatus* n. sp., injurious to cultivated figs in Natal, are described.

Results of cooperative experiments in apiculture, M. Pettit (*Ann. Rpt. Ontario Agr. and Expt. Union, 35 (1913), pp. 39–51*).—This article reports the results of cooperative experiments in 1912 and 1913 relative to the prevention of natural swarming.

Inheritance in the honeybee, W. Newell (*Science, n. ser., 41 (1915), No. 1049, pp. 218, 219*).—A brief discussion based upon the author's investigations at the Texas Experiment Station of crosses between the Italian and Carniolan races.

A new species of Habrobracon sp., parasitizing caterpillars of Chloridea obsoleta. Its biology and agricultural importance, S. Bogoljubov (*Turkest. Selsk. Khoz., No. 3 (1914), pp. 281–291, figs. 5; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 7, pp. 423, 424*).—Biological notes are presented by the author on a new species shortly to be described by Kokujev that has been found by the author to parasitize *C. obsoleta*.

On the parasitic acari found on the species of rodents frequenting human habitations in Egypt, S. Hirst (*Bul. Ent. Research, 5 (1914), No. 3, pp. 215–229, figs. 14*).—Eight acarids are here dealt with, of which three are species of Dermanyssus.

The rat trypanosome, Trypanosoma lewisi, in its relation to the rat flea, Ceratophyllus fasciatus, E. A. Minchin and J. D. Thomson (*Quart. Jour. Micros. Sci. [London], n. ser., 60 (1915), No. 240, pp. 463–692, pls. 10, figs. 24*).—In the introduction to this paper the authors present notes on *C. fasciatus*, its anatomy (including methods of dissection), parasites, histological structure of its stomach, and technique. The development of *T. lewisi* in the flea is considered at length and an experimental study of the problems of transmission and development is reported upon. A list of bibliographical references is appended.

FOODS—HUMAN NUTRITION.

Kansas flours—chemical, baking, and storage tests, C. O. SWANSON, J. T. WILLARD, and L. A. FITZ (*Kansas Sta. Bul. 202* (*1915*), *pp. 135, figs. 21*).—In the first part of this bulletin the equipment used and methods followed in baking tests are described in detail.

The second part of the publication gives the results of baking tests and chemical analyses made of 35 samples of commercial flour collected from Kansas mills, together with the results of chemical analyses of 21 wheats representing those from which the flours were made. The flours examined were divided into three grades designated as short patent, long patent, and straight. In the baking tests, which showed all these flours to be of good quality and strength, a comparative study was made of the following factors: Loss in mixing and rising, time for proving, expansion of the dough, rising in the oven, loss in baking and cooling, weight of the loaf, pounds of bread per barrel of flour, volume of the loaf, texture of the crumb, and color of the loaf.

The following quotations from the discussion of the results of the baking tests of commercial flours are of interest:

"The dough from the short patent ripens sooner. This is one of the qualities in the short patents which make these flours more valuable for family baking where the same flour is used for various purposes, such as cakes and pastries aside from bread making. The gluten is of a softer, more pliable nature and lends itself more readily to different conditions. The dough from a short patent is always softer, and has a smoother, more even feel than the dough from a straight flour. Hence it is easier to work and is much preferred by the housewife. . . .

"The final weight of the loaf, and consequently the amount of bread per barrel of flour, is influenced more by the losses in making than by the variation in materials used. . . .

"Large loaf volume is not of itself an indication of a particularly desirable flour. Sometimes . . . a weak flour may produce a larger loaf than a strong flour. The loaf volume must be judged together with absorption, maximum volume of dough, rise in the oven, and texture. If two loaves are equal in these other factors, then the one with a larger loaf volume is the more desirable. . . .

"That the average loaf volume is greater for the long patent flours than for the other two brings out the fact that loaf volume alone does not necessarily indicate a flour of the highest commercial grade. . . .

"If two loaves have the same volume but one has a larger oven spring, the latter indicates a stronger, stiffer gluten, while the gluten of the former would be weaker or more 'runny.'"

In judging texture of the crumb, "large holes and uneven distribution indicate a weak gluten. Thickness of cell wall or an appearance of coarseness indicates a stiff and inelastic gluten. Such a flour would be good for blending with a weaker flour, but would not be a desirable flour to be used along for household purposes. Weakness of gluten shown by large and uneven distribution of holes is one of the worst faults in a flour. As a rule, the bread from short patent flours differs from the longer patents and straights by the finer cell walls and more delicate structure. . . .

"One difficulty in judging color is to distinguish true color from the color appearance as influenced by texture. The desired color is white with a delicate creamy tint. . . . A yellow tint is much less objectionable than a grayish tint or a chalky white. The yellow is due to the color inherent in the wheat kernel, while a grayish tint shows faulty cleaning of the wheat or imperfect dressing of the flour."

The third part of the bulletin presents the results of a study of the chemical composition and baking qualities of 19 flours from a four-break mill, and 26 samples from a five-break mill.

In the chemical analyses of the commercial flours and of the samples from the two mill streams, determinations were made of ash, protein, gliadin, gluten, acidity, total and water-soluble phosphorus, and of hygroscopic moisture. It was found that a definite relationship existed between the acidity and phosphorus content, that the variation in the moisture content of the flour was more affected by the water used in tempering than by a variation of the moisture originally present in the wheat, and that the protein content of the flour depended upon that originally present in the grain and on the method of milling.

"That the proteins of a wheat flour strongly influence the baking qualities of the same is undoubtedly true, but the question is more complex than merely ascertaining the ratio between gliadin and the rest of the proteins. . . . The other proteins may have as much to do with the baking qualities as gliadin, and it is not only the proteins present in the sound wheat kernel which determine the baking qualities, but also the protein decomposition products. . . .

"The short patent has the lowest per cent of ash, while the low grade has the highest. The ash content is lowest in those streams which come from the interior of the kernel, while it is highest in those streams which are taken from that portion next the bran. . . .

"The protein content follows almost the same law of variation as the ash. . . .

"There is a gradual increase in acidity in the flour streams in proportion as they contain material next to the bran. . . .

"The percentage of ash furnishes a very good indication in regard to the quality of a flour as far as that is related to the method of milling . . . the feed contains ten times as high percentage of ash as the flour. Consequently, the presence of fibrous materials in the lower mill streams influences the ash content more than any other factor. The composition of the ash is also important in judging the baking qualities of a flour. . . .

"The patent has a lower percentage of protein than the wheat, while both the clear flours and the low-grade flours have a higher percentage. The break flours have a regular increase in protein percentage corresponding to the break number, the fifth break being the highest in percentage of protein in all these flours, while the bran-duster flour and the fourth break have the next highest percentages. In the middlings there is almost the same regular increase in protein content corresponding with the number of reductions."

In the fourth part of the publication is considered the effect of storage upon flour as determined by chemical analyses and baking tests. The work, which extended over two seasons with bleached and unbleached flours stored in a steam-heated room, a nonheated room, and in sealed cans, showed that on storage flours may lose 2 per cent of their original weight, the loss being mostly one of hygroscopic water. The chemical composition and baking quality are otherwise very little affected by storage.

[Wheat and flour analysis] (*Ann. Rpt. Dept. Agr. and Stock* [*Queensland*], *1913–14, pp. 100–107, pls. 2*).—The results are given of chemical analyses and the grading of a number of samples of wheat and wheat flour. The samples were graded according to a point system based upon the appearance of the grain, its yield in bushels per acre, its weight in pounds per bushel, the appearance and composition of the gluten, and the color, chemical composition, and baking quality of the flour

Bleached flour, F. L. Haley (*Biochem. Bul., 3 (1914), No. 11–12, pp. 440–443*).—Analyses showed the presence of nitrites in bleached flour. From the results of experiments with laboratory animals (guinea pigs), to which were administered doses of potassium nitrite, the author concludes that bleached flour is not detrimental to health.

The physico-chemical properties of the alcohol-soluble proteins of wheat and rye, J. Gróh and G. Friedl (*Biochem. Ztschr., 66 (1914), No. 1–3, pp. 154–164, fig. 1; abs. in Zentbl. Physiol., 29 (1914), No. 5, p. 225*).—Wheat gluten contains only one protein which is soluble in alcohol, namely, gliadin. Rye flour contains a mixture of several proteins, but apparently not any gliadin.

The physical chemistry of bread, Lorenz (*Chem. Ztg., 37 (1913), No. 78, p. 783*).—From studies of the structure of both fresh and stale bread the author concludes that as the loaf ages the structure of the starch granules is modified and the starch gives up its water content to the protein part of the loaf. He regards the fresh loaf as an unstable form and the modified starch grains as a permanent characteristic of stale bread.

German agricultural breads, E. Parow (*Ztschr. Spiritusindus., 37 (1914), No. 53, pp. 593, 594*).—Surveying the German food supply, the author recommends an increase in the amount of sugar in bread making as a means of increasing its nutritive value and at the same time saving the grain supply.

War bread, H. Strube (*Deut. Landw. Presse, 42 (1915), No. 12, pp. 87, 88*).—The author discusses the production and use of this product, which is defined as rye bread containing more than 20 per cent of potato flour.

The use of potatoes in bread making, M. P. Neumann and A. Fornet (*Ztschr. Gesam. Getreidew., 6 (1914), No. 10–11, pp. 193–205*).—Commercial methods are described for the preparation of potato flakes, potato flour, and potato starch. From analyses of bread prepared with the addition in varying proportions of potato flour and starch to rye and wheat flour the author concludes that the best bread is prepared by the addition of 5 per cent of potato flour to the rye or wheat flour, though 10 per cent is often used and even 20 per cent may yield a satisfactory product. When more than 10 per cent of the potato flour is used it is difficult to obtain a good bread, as considerable water is absorbed by the starch in making the dough and the resulting loaf is too soggy.

Composition of Euchlœna mexicana, J. Pieraerts (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 9, pp. 655–660*).—A description is given of a grain commonly occurring in Mexico and other tropical countries which is said to have considerable food value. Its approximate chemical composition is given as follows: Protein 24.57 per cent, fat 4.80 per cent, and carbohydrate, 61.38 per cent.

Nutritive value of frozen meat, E. Valenti (*Gior. R. Soc. Ital. Ig., 35 (1913), No. 4, pp. 148–153; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 17–18, p. 656*).—Comparative analyses are reported of American and Italian frozen meats. In the case of meat which had remained at a temperature of —10° C. for 40 days, an increase was noted in the percentage of dried residue and nitrogenous substance, while a decrease was noticed in the water content. It is suggested that the results may vary if a gradual thawing of the meat is brought about.

Utilization of pork in provisioning the army, A. C. Girard (*Bul. Soc. Nat. Agr. France, 75 (1915), No. 1, pp. 44–51*).—An increase in the use of pork as a substitute for beef is urged, chiefly from the standpoint of economy.

The toxicity of some ducks' eggs, P. Carles (*Ann. Falsif., 7 (1914), No. 70–74, pp. 443, 444*).—Three cases of food poisoning were attributed to the presence of bacteria in ducks' eggs. Sterilization by long-continued boiling before eating is urged as a necessary precaution.

The influence of the fat content of milk on the rate of digestion, A. Kreidl and E. Lenk (*Biochem. Ztschr., 63 (1914), No. 2–3, pp. 151–155, figs. 3; abs. in Zentbl. Physiol., 29 (1914), No. 5, p. 223*).—Experimental data are recorded which tend to show that the rate of digestion of milk decreases with the increase of fat content.

The nutritive value of boiled skim milk, Klein (*Milchw. Zentbl., 43 (1914), No. 14, pp. 381–384; abs. in Zentbl. Biochem. u. Biophys., 17 (1915), No. 16, p. 632*).—Animal-feeding experiments, here reported, would indicate that there is no difference between the nutritive values of boiled and unboiled skim milk.

Cow's milk and vegetable milk; difference in gastric digestion with special reference to the problem of cow's milk intolerance, A. Fischer (*Arch. Verdauungskrank., 20 (1914), No. 1, pp. 13–48; abs. in Ztschr. Kinderheilk., Ref., 8 (1914), No. 3, p. 114*).—Comparative experiments with laboratory animals (dogs) are reported in which was studied the digestibility of a vegetable milk prepared from almonds and Brazil nuts as compared with that of cow's milk. The vegetable milk caused a smaller and less prolonged secretion of gastric juices than did cow's milk, but was more readily digested owing to its finely divided condition. The following conclusions are drawn:

Vegetable milk is an emulsion similar to cow's milk and contains carbohydrates, protein, and mineral matter in solution or suspension. The particular vegetable milk studied was characterized by a small content of carbohydrate and salts, especially sodium salts, and when coagulated with acid or rennet the vegetable milk protein formed a more finely divided curd than that formed when cow's milk was treated in the same way.

The food value of the vegetable milk depends upon its method of preparation, the one studied having an energy value of 90 to 115 calories per 100 cc.

The reaction of cow's milk modified for infant feeding, W. M. Clark (*Jour. Med. Research, 31 (1915), No. 3, pp. 431–453, figs. 2*).—The results are reported of a study of the hydrogen ion concentration of both human and cows' milk as compared with the hydrogen ion concentration of modified cow's milk made up in accordance with various formulas. In the opinion of the author, the practice sometimes followed in modifying milk of adding alkalis to neutralize the acid of cow's milk is based upon wrong principles. This is regarded not only as an unnecessary procedure but one involving possible inhibition of gastric proteolysis and lipolysis. It is further stated that the addition of alkalis tends to replace the normal bacteriological fermentation of the intestine with a putrefactive process which may cause digestive disturbance.

The comparative nutrient value of cod liver oil and cod liver oil cordials, J. P. Street (*Jour. Amer. Med. Assoc., 64 (1915), No. 8, pp. 638–643*).—The author reports results of a series of feeding experiments undertaken to compare the nutritive values of cod liver oil preparations, some of which were the so-called "oilless" extracts of cod livers. In conclusion he states that cod liver oil exhibited marked superiority as a food over the commercial extracts studied, and also had the power of restoring growth to laboratory animals (rats) which had suffered from nutritive deficiency when fed upon the commercial preparations.

The mineral constituents of honey, KAPELLER and A. GOTTFRIED (*Ber. Nahrmtl. Untersuch. Amt. Magdeburg, 1913, pp. 15, 16; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 29 (1915), No. 2, p. 98*).—The analytical data presented show that the ash of honey contains from 10 to 58 per cent of phosphoric acid.

Tomato conserves, P. CARLES (*Les Conserves de Tomates. Bordeaux: Feret & Sons, 1914, pp. 22*).—A discussion supported by analytical data on the composition of normal tomato conserves, their common adulterations, and the hygienic facts pertaining to their use as food.

Observations on mango rash, ISABELO CONCEPCIÓN (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 6, pp. 509–513*).—The author reports some clinical observations which apparently confirm the belief that the so-called mango rash is produced by eating the mango fruit.

The organic flavoring compounds, G. COHN (*Die Organischen Geschmacksstoffe. Berlin: Franz Siemenroth, 1914, pp. XI+936*).—This book is an extended treatise on the organic chemistry of the flavoring compounds. The first part of the volume is composed largely of a general classification. A discussion is given of the influence of chemical composition and constitution upon the degree and kind of taste, and the physiology of taste is also considered somewhat at length. Detailed information is given regarding the more important synthetic sweet flavors, such as saccharin, dulcin, and glucin.

[Inspection and analyses of foods, drugs, and stock feeds], W. A. MCRAE ET AL. (*Bien. Rpt. Dept. Agr. Fla., 13 (1913–14), pp. 190, pl. 1*).—A report of the work carried on under the state food laws during the years 1913–14. Various regulations adopted by the board are reprinted, and general analytical data regarding the samples inspected and the text of the pure food and feed laws are given.

[Food inspection], W. B. BARNEY (*Iowa Dairy and Food Com. Bul. 10 (1915), pp. 27+1, figs. 3*).—General information upon this topic is given and the results shown of prosecutions brought under the state pure food law.

Annual report of the food and drug commissioner [of Missouri], F. H. FRICKE (*Ann. Rpt. Food and Drug Comr. Missouri, 1914, pp. 86*).—The work carried on under the state food and drug laws during the year ended December 31, 1914, is reviewed. This included the analysis of 820 samples of miscellaneous food products, of which 299 did not meet the requirements of the existing standards, and the inspection of establishments where food was prepared and sold—restaurants, hotels, dairies, etc.

[Food and drug inspection], W. M. ALLEN (*Bul. N. C. Dept. Agr., 35 (1914), No. 12, pp. 120*).—This report covers work carried on under the state food laws during the year 1914. Data are given regarding 1,323 samples of miscellaneous foods and food products which were examined.

Eleventh annual report of the food commissioner of the North Dakota Agricultural Experiment Station: Food, Drugs, and Sanitation, E. F. LADD ET AL. (*North Dakota Sta. Rpt. 1914, pt. 2, pp. 41*).—The work of the food commissioner and state chemist during a period of approximately 18 months, ended July 1, 1914, is reviewed, including brief discussions of different phases of the work, reprints of notices and warnings, reports from various members of the staff, etc.

Twenty-eighth annual report of the dairy and food division, S. E. STRODE (*Ann. Rpt. Dairy and Food Div. Ohio, 28 (1913), pp. 128, figs. 6*).—The work carried on during the year 1913 is reviewed, general information being given regarding the inspection of dairies and canning factories, the inspection of drugs, and the examination of eggs. Tabulated data are given regarding the samples inspected, and a summary of the prosecutions brought by the board completes the report.

Ninth biennial report of the state dairy and food commissioner of the State of Utah, W. Hansen (*Bien. Rpt. Dairy and Food Comr. Utah, 9 (1913–14), pp. 227*).—General information regarding the work carried on under the state food and drug laws during the years 1913 and 1914 is given. The publication also contains the reports of the sealer of weights and measures, the hotel inspector, and the state dairy and food bureau, the last-named containing general data regarding the inspection and sanitation of slaughterhouses and other places where food is prepared and sold. The report of the state chemist presents analyses of 1,539 samples of miscellaneous food products, of which 1,122 met the requirements of existing standards, and 132 samples of water and ice.

Adulteration of food, A. McGill (*Rpts. [etc.] Inland Rev. Canada, 1913–14, pt. 3, pp. 519*).—During the year ended March 31, 1914, 3,825 samples of miscellaneous foods and food products were analyzed, most of the results of which have been reported in bulletins issued by the department. In the appendix to the report 27 of these bulletins are reprinted.

Laws relating to hotels, restaurants, etc., and inspection thereof (*[Tallahassee, Fla.], 1913, pp. 8*).—The text is given of a statute enacted by the State of Florida providing for the licensing and inspection of hotels and restaurants, the requirements which such places must meet being specified.

[Inspection of canneries], L. G. Bingham (*Agr. Com. Ohio, Food Bur. Bul. 2 (1914), pp. 16*).—A list is given of the canneries inspected, together with their rating. The sanitary code adopted by the state agricultural commission for the regulation of canning and packing factories is given.

Anglo-American cooking. Central-American cooking, S. C. Goy (*La Cuisine Anglo-Américaine. La Cuisine de l'Amérique Centrale. ([New York: L. Weiss & Co.]), 1915, pp. 489*).—This book contains a large number of recipes for the preparation of dishes common to the United States and Central America.

California Mexican-Spanish cookbook, Bertha Haffner-Ginger (*[Los Angeles, Cal.: Citizen Print Shop], 1914, pp. 111+12, pls. 20*).—A book of recipes for the preparation of numerous Spanish dishes, which also contains illustrations of native processes of cooking, ovens, kitchens, etc.

Army rations (*Rev. Sci. [Paris], 53 (1915), I, No. 3, p. 43*).—A note upon the composition of the rations furnished the French and British armies.

Army ration during war time, A. Gautier (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 5, pp. 159–167*).—Considerable data are presented regarding the present ration supplied to the French Army. This is stated to consist of the following foods: Bread, 750 gm.; fresh meat, 500 gm.; condensed soup, 50 gm.; dried vegetables, 100 gm.; sugar, 31 gm.; lard, 30 gm.; coffee, 24 gm.; and wine, 250 cc. From the results of several typical dietary studies made with peasant laborers in France the author concludes that this ration, supplying 3,190 calories of energy, is insufficient to meet the body requirements during an active campaign. The recommendation is made that the energy value of this ration be increased to 4,077 calories, by the addition of the following food materials: Bread, 150 gm.; potatoes, 350 gm.; sugar, 32 gm.; fat, 30 gm.; and wine, 500 cc.

The French Army ration in time of war, A. Gautier (*Rev. Sci. [Paris], 53 (1915), I, No. 5, pp. 65–70*).—This article contains essentially the same material as the above article except that the results of final dietary studies are cited in support of the author's contention.

Historical review of meat prices in Germany during the past 400 years, G. Badermann (*Ztschr. Fleisch u. Milchhyg., 25 (1914), No. 6, pp. 84–87*).—A summary and digest of data.

[The cost of living in Australia], G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust., Labor and Indus. Branch Rpt. 5 (1914), pp. 16–67, 100–131*).—A summary and digest of data regarding income and cost of living during the years 1913 and 1914. Information is given regarding the wholesale and retail prices of food and clothing and the cost of rent as compared with other years and other countries.

Cost of living in Australia, G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust., Labor and Indus. Branch Rpt. 4 (1914), pp. 36*).—A study of the budgets of 392 different families, which includes information regarding family conditions, the relation of income to expenditure, and the distribution of the expenditure.

Feeding the masses, H. KRANOLD (*Massenernährung Agrarpolitik Kolonisation. Munich: George C. Steinicke, 1914, pp. 95*).—A treatise upon some of the economic problems involved in feeding the poorer classes. Statistical data are also included.

Influence of protein consumption on muscular work, G. C. TESTA and G. SORMANI (*Atti. Soc. Lombarda Sci. Med. e Biol., 1 (1912), No. 3, pp. 363–380, figs. 5; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 7–8, p. 253*).—Experimental study, by means of an ergograph, of the work performed by the gastrocnemius muscle of frogs indicated that the work varied within narrow limits but was considerably increased by the consumption of nucleoproteins.

Studies of the origin of cholesterin, S. DEZANI and F. CATTORETTI (*Arch. Farmacol. Sper. e Sci. Aff., 19 (1915), No. 1, pp. 1–9*).—Experiments carried out with laboratory animals (rats) indicate that the animal organism possesses the ability to synthetize cholesterin when this substance is excluded from the diet.

Absorption of fat and lipoids, E. S. LONDON and M. A. WERSILOWA (*St. Petersb. Med. Wchnschr., 37 (1912), No. 22, pp. 325–327; abs. in Zentbl. Biochem. u. Biophys., 14 (1913), No. 15–16, p. 561*).—In experiments performed on dogs with bilocular fistula below the pancreatic duct or with unilocular fistula in the middle of the small intestine, palmitic acid was 22 per cent absorbed before reaching the distal fistula, though only 7 per cent was absorbed when introduced directly into the intestine instead of per os. Stearic acid was more completely absorbed; in the upper half of the intestine stearin soap was more readily absorbed than fatty acid. The feeding of neutral fat or free fatty acid produced no appreciable change in the fatty acid content of the intestinal mucosa. Neither cleavage nor absorption of cholesterol occurred up to the end of the small intestine.

Further observations on the physiological properties of the lipins of the egg yolk, E. V. MCCOLLUM and MARGUERITE DAVIS (*Proc. Soc. Expt. Biol. and Med., 11 (1914), No. 3, pp. 101, 102*).—The addition of small amounts of the ether or petroleum ether extract of cooked egg yolk to a diet of casein, dextrin, and inorganic salts brought about a resumption of growth in the case of laboratory animals (rats) which had ceased to grow on the diet of casein, dextrin, and inorganic salts.

Lecithids contained in cod liver oil, H. ISCOVESCO (*Compt. Rend. Soc. Biol. [Paris], 76 (1914), No. 1, pp. 34, 35*).—Experiments with laboratory animals indicated that repeated doses of olive oil and cod liver oil administered hypodermically in the neck muscles were utilized and caused an increase in weight. Cod liver oil seemed to be better tolerated than olive oil. The author attributes the peculiar properties of cod liver oil to the lecithids it contains. All of the phosphorus, as well as most of the nitrogen compounds in the oil, are said to belong to the group of lecithids and lecithalbumins.

The phosphorus content of the animal organism, W. HEUBNER (*Arch. Expt. Path. Pharmakol., 78 (1914), No. 1–2, pp. 24–82*).—Analytical and feeding experiments are reported in which was studied the phosphorus content of the bodies of laboratory animals (dogs). In young animals of from 2 to 7 lbs. weight the total phosphorus content of the organism showed very little variation and averaged 0.6 per cent of the total body weight. Of the total phosphorus content 0.15 per cent was found in the muscle, 0.2 per cent in the central nervous system, liver, and kidneys, and most of the remainder in the bones. Lack of phosphorus in the diet decreased the percentage of phosphorus in the body only when growth was indifferent. Under this condition the greatest loss occurred in the bones.

The chemical investigation of the phosphotungstate precipitate from rice polishings, J. C. DRUMMOND and C. FUNK (*Biochem. Jour., 8 (1914), No. 6, pp. 598–615*).—The authors have failed to isolate the curative substance which occurs in rice polishings, but have confirmed the presence of considerable amounts of cholin and nicotinic acid and have detected betain, adenin, guanin, and possibly guanidin.

Experimental polyneuritis in birds as compared with human beri-beri, R. TASAWA (*Ztschr. Expt. Path. u. Ther., 17 (1915), No. 1, pp. 27–46*).—From this summary and digest of experimental data the author concludes that the etiology and effects of experimental polyneuritis are not identical with those of beri-beri.

Transactions of the National Association for the Study of Pellagra (*Trans. Nat. Assoc. Study Pellagra, 2 (1912), pp. XXVIII+409, pls. 7*).—Among the papers included may be mentioned: The Problem of Pellagra in the United States, by R. Blue; The Prevalence and Geographic Distribution of Pellagra in the United States, by C. H. Lavinder; Pellagra—Some Facts in its Epidemiology, by R. M. Grimm; Can Pellagra Be a Disease Due to Deficiency in Nutrition, by F. M. Sandwith; Contribution to the Alimentary Balance in Pellagra, by J. Nicolaidi and U. Grillo; and Metabolism in Pellagra, by V. C. Myers and M. S. Fine.

The presence of toxic bodies in expired air, G. FARMACBIDIS (*Policlin., Sez. Med., 20 (1913), No. 3, pp. 116–138, pl. 1, fig. 1; abs. in Zentbl. Biochem. u. Biophys., 16 (1914), No. 11–12, p. 417*).—The injection of the condensation liquid of expired air into laboratory animals gave no toxicity with guinea pigs, but with mice a tendency toward toxicity was apparent when compared with the negative results obtained by injections of distilled water or physiological salt solution.

An automatic balance for use in metabolism experiments, E. ABDERHALDEN (*Skand. Arch. Physiol., 29 (1913), pp. 75–82, figs. 2*).—An illustrated description is given of a balance which records and registers photographically the weight of small laboratory animals.

[Report of the] nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Washington Year Book, 13 (1914), pp. 285–297*).—A brief summary and review of the investigations being carried on. Notes regarding changes and improvement in equipment, together with a brief review of the publications issued during the year 1914, complete the report.

ANIMAL PRODUCTION.

Annual review of investigations in general biology, compiled by Y. DELAGE (*Ann. Biol. [Paris], 14 (1909), pp. XXXIV+545; 15 (1910), pp. XIX+578; 18 (1913), pp. XX+603*).—A bibliography of literature published in 1909, 1910, and 1913 on the cell, reproduction, heredity, variation, the origin of species, and related topics, with abstracts of the more important publications, and continuing similar work (E. S. R., 26, p. 470).

Handbook of comparative physiology, edited by H. WINTERSTEIN (*Handbuch der Vergleichenden Physiologie. Jena: Gustav Fischer, 1911–1914, vol. 3, 1. half, pp. 2041+XIII, pls. 2, figs. 567; 1910, 1912–1914, vol. 3, 2. half, pp. 1060+XII, pl. 1, figs. 456*).—The first half of this very extensive and complete review of work on comparative physiology includes chapters on Physiology of Motion, by R. du Bois-Reymond (pp. 1–248); The Production of Sound and Noise, by O. Weiss (pp. 249–318); Physiology of Supportive and Skeletal Substances, by W. Biedermann (pp. 319–1188); The Color Variation and Chromatic Skin Function of Animals, by R. F. Fuchs (pp. 1189–1656); and Color and Design of Insects, by W. Biedermann (pp. 1657–1994). The second half contains chapters on The Production of Heat, by R. Tigerstedt (pp. 1–104); The Production of Electricity, by S. Garten (pp. 105–224); The Production of Light, by E. Mangold (pp. 225–392); Physiology of Formation, by H. Przibram (pp. 393–456); and Physiology of Reproduction, by E. Godlewski (pp. 457–1022).

Review of experimental breeding investigations in zoology since 1900, A. LANG (*Die experimentelle Vererbungslehre in der Zoologie seit 1900. Jena: Gustav Fischer, 1914, pp. VII+892, pls. 4, figs. 244*).—This comprises a large number of papers reviewing investigations on the theory of inheritance and discussing the biometrical phases of variation and correlation. The latter portion of the volume reviews crossbreeding experiments with animals of the rodentia, carnivora, and ungulata families. Under the latter heading are included the equidæ, ruminants, and swine. The topics treated include the inheritance of coat coloring, points of conformation, horns, breed characteristics, milking capacity, and similar items. The papers have been previously reported from other sources.

German zootechny (*Jour. Heredity, 6 (1915), No. 3, pp. 109–116*).—This article is a review of a book by G. Wilsdorf on animal breeding (E. S. R., 27, p. 469), in which he shows the important part the science of genetics has played in the development of the live stock industry of Germany.

Sex determination and sex control in guinea pigs, G. PAPANICOLAOU (*Science, n. ser., 41 (1915), No. 1054, pp. 401–404*).—The author concludes from his observations that "the sex of a guinea pig is determined sometimes by two and sometimes by three factors, depending upon whether the mother has previously borne young. The first factor is the sex tendency of the father. If the father has a male sex tendency, his sons will have a female tendency and his daughters a male tendency. If, on the contrary, the father possesses a female tendency, his sons will have male tendencies and his daughters female tendencies.

"The second factor is the sex tendency of the mother. A mother with a male tendency gives her daughters a female and her sons a male tendency. The mother with a female tendency gives her daughters a male and her sons a female tendency. The third factor is confined to the female and is a change of sex tendency from litter to litter. This change in tendency manifests itself in the following way: If the first litter contains only males, the mother acquires a female tendency for the next litter and vice versa. This new tendency varies in strength, depending upon the number of young of one sex contained in a litter. The greater the number of males in a litter, the stronger the female tendency will be for the next litter. This tendency is still more emphasized if the mother is successively mated with males of a definite tendency, and therefore forced to produce more and more young of one sex.

"In the sons the tendency received from the father is stronger than that coming from the mother, while in the daughters the opposite is true. When one examines the descendants of animals whose fathers had a male tendency and mothers a female tendency, a higher difference in the relative number of males and females is found than from those cases in which the fathers alone had a male tendency. . . .

"Should one select males whose fathers had a female tendency and whose mothers had a male tendency and mate these with females whose fathers had a male tendency and whose mothers had a female tendency, a higher difference in the relative number of males and females will be found in their descendants than in any other possible case."

This regulation in the inheritance of the sex tendency affords an explanation of the manner in which the equilibrium is maintained between the number of male and female offspring of a given species.

A new era in the science of nutrition, R. L. KAHN (*Sci. Amer. Sup., 79 (1915), No. 2046, pp. 182, 183*).—A review of the work of Osborne and Mendel on problems of animal nutrition.

A chemical study of two drought-resisting forage plants, S. LOMANITZ (*Jour. Indus. and Engin. Chem., 7 (1915), No. 3, p. 220*).—Analyses of the two drought-resisting plants *Chloris virgata* and *Phalaris nodosa*, which have recently been introduced into Mexico, are given as follows: Moisture 8.3 and 9.15, protein 6.87 and 10.54, fat 1.64 and 2.66, nitrogen-free extract 43.38 and 39.06, fiber 28.42 and 25.82, and ash 11.39 and 12.77 per cent, respectively. It is said that both plants are readily eaten by cattle without harmful effect upon the milk.

Feeding sugar-beet tops, F. REDLICH (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 3, pp. 375–404, figs. 6; abs. in Chem. Zentbl., 1914, II, No. 5, pp. 430, 431*).—The average analysis of fresh sugar-beet tops (from September to November) is given as water 85.47, protein 1.69, fat 0.28, nitrogen-free extract 7.81, fiber 1.53, ash 1.65, and sand 1.57 per cent. It is deemed a desirable feed for ruminants, more especially milch cows. The beet tops were found to contain from 0.11 to 0.42 per cent of oxalic acid, which is said to have the effect of increasing the milk-fat yield without any unfavorable influence on the milk yield. There was a decline in the lime content of the milk, necessitating the feeding of phosphoric lime in quantities of from 40 to 60 gm. per day. A number of cows fed 43 days on the fresh material made an average daily gain per head of 0.4 kg. in weight.

A drying apparatus is described.

Fish meal as a feedstuff (*Jour. Bd. Agr. [London], 21 (1914), No. 8, pp. 689–692*).—English experiments carried out with pigs at the Seale Hayne College with fish meal are reported and seem to show that the addition of from 14 to 29 per cent of the meal to other feeds will lead to a marked increase in the weight of the pigs so fed, as compared with those fed on a diet containing no fish meal.

It is suggested that the following quantities might be given daily to the different kinds of stock: Cattle, 2 lbs. per 1,000 lbs. live weight; pigs, $\frac{1}{4}$ to $\frac{1}{2}$ lb., according to weight; sheep, $\frac{1}{10}$ to $\frac{1}{5}$ lb. per 100 lbs. live weight; poultry, adult fowls should receive not more than 10 per cent and chickens not more than 5 per cent of their whole diet in this form. Fish meal with low percentages of oil and salt should be selected and the birds should be gradually accustomed to the feed. The above quantities should in no case be given at once but the fish meal should be introduced into the ration gradually. It is important that decomposition should not have set in.

Feeding experiments with lupine and horse chestnut flakes, E. Reisch, F. Ewald, F. Lilienthal, and Hansen (*Illus. Landw. Ztg., 34 (1914), Nos. 42, pp. 391, 392; 43, pp. 399, 400; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 8, pp. 1047–1049*).—The composition of lupine flakes and horse chestnut flakes is given as dry matter 82 and 85, protein 25.7 and 6.7, fat 4 and 3.9, nitrogen-free extract 36.3 and 67.8, fiber 9.1 and 3.5, and ash 7.2 and 3.2 per cent, respectively.

Two lots of 12 yearling lambs each were fed a basal ration of meadow hay, mangels, and barley meal, lot 1 receiving in addition 0.4 lb. of bean meal and peanut meal, and lot 2 1.1 lbs. lupine flakes per 100 lbs. live weight. Lot 1 made an average total gain in 73 days of 28.82 lbs. per head and lot 2 of 28.38 lbs., both dressing 47.9 per cent.

Two lots of 12 lambs were fed a basal ration of meadow hay, dried-beet slices, and soy-bean meal, lot 1 receiving in addition 1.1 lbs. wheat bran and 0.66 lb. of corn, and lot 2 2.64 lbs. chestnut flakes per 100 lbs. live weight. Lot 1 made an average total gain during the 73 days of 24.42 lbs. per head and lot 2 of 15.84 lbs., the one dressing 48.8 per cent and the other 45.6. On the whole the chestnut flakes proved unsatisfactory.

Four cows were fed a basal ration of hay, dried-beet slices, and soy-bean meal, and during three periods from 0.8 to 3 lbs. of corn meal and 2 lbs. wheat bran per 1,000 lbs. live weight, in comparison with 2 lbs. chestnut flakes fed during one period and 4 lbs during another. The chestnut flakes appeared to have no influence on the milk yield. When more than 2 lbs. of the flakes were fed per cow per day the cows suffered from scours. The cows refused lupine flakes because of their bitter taste.

Food for animals and process for the manufacture of the same (*English Patent 24,912, Nov. 1, 1913; abs. in Jour. Soc. Chem. Indus., 33* (*1914*), *No. 23, p. 1168*).—"Amylaceous material, such as middlings or maize residue, is treated with 2 per cent of its weight of sulphur dioxid in the form of an aqueous solution, and heated for 15 minutes under a pressure of four atmospheres. The steam and acid are then blown off, any remaining acid is neutralized by the addition of calcium carbonate or sodium carbonate, and the product is dried and ground."

Feeding stuffs, Loges (*Jahresber. Landw. Königr. Sachs., 1913, pp. 114–124*).—Protein and fat analyses are given of the following feeding stuffs: Rice meal, millet bran, brewers' grains, linseed meal, rape-seed meal, peanut meal, palm-kernel cake, sunflower-seed cake, sesame cake, hemp-seed meal, and fish meal.

[State feeding-stuff laws of the] American Feed Manufacturers' Association, compiled by L. F. Brown (*Milwaukee: Author, 1914, pp. 86*).—This is a brief of the state laws relating to the sale of feeding stuffs.

Feeding of cattle, S. B. Lima (*Bol. Dir. Geral Agr.* [*Portugal*], *11* (*1913*), *No. 4, pp. 244*).—This is a compilation of reprints of articles on methods of feeding cattle, the nutritive value of various feeds, and methods of calculating rations.

Wintering store cattle (*Dept. Agr. and Tech. Instr. Ireland Jour., 15* (*1914*), *No. 1, pp. 28–33*).—Four seasons' experiments are reported in which 3 lots of from 8 to 10 each of 21-month-old crossbred bullocks and heifers were fed five months, beginning December 1, as follows: Lot 1, housed all winter and fed roots, cake, and straw; lot 2, outwintered in the pasture and fed hay and cake; lot 3, outwintered in the pasture and fed hay only. The cake consisted of soy bean and cotton cake. The average gains per head made for the period were 134, 72, and 43 lbs., respectively; the cost per head $21.22, $14.96, and $10.07, respectively.

At the close of the winter feeding the cattle were grazed during the summer for three months under similar conditions, with a resulting average gain per head of 84, 163, and 177 lbs., respectively.

The weight of calves, C. D. Stewart (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, No. 4–5* (*1912–13*), *pp. 72, 73*).—From careful records taken of 19 Shorthorn cows it was found that the average gestation period of cows bearing bull calves was 288.91 days; of cows bearing heifer calves, 283.75 days. The longest period in the former was 297 days and the shortest period 280 days; in the latter 293 and 274. The average weight of the bull calves was 89.45 lbs.; that of the heifer calves, 82.5 lbs. It was found that the longer the period the heavier the calf in each case. It was noted that the heavier calves are produced from cows in their prime; that is, ranging from 5 to 7 years of age; after this age the calves appeared to become smaller at birth. It is thought safe to take an average of 285 days as the period of gestation and 84 lbs. as the average weight of a Shorthorn calf at birth.

Rye and blue grass pastures, with and without grain, for ewes suckling lambs, H. Hackedorn (*Missouri Sta. Circ. 73* (*1915*), *pp. 33–40, figs. 2*).—This circular supplements material previously reported (E. S. R., 32, p. 669).

Four lots of 8 mature western ewes, each with their 7 to 10, 20 to 22-day-old suckling lambs, were fed 56 days as follows: Lot 1, rye pasture and grain; lot 2, rye pasture; lot 3, blue-grass pasture and grain; and lot 4, blue-grass pasture, the grain mixture consisting of equal parts of cracked corn, oats, and bran. The ewes lost 1.96, 10.19, 2.26, and 11.64 lbs. per head, respectively. Although the ewes in lots 2 and 4 lost heavily, they were thrifty and in healthy condition. The average daily gains of the lambs were 0.468, 0.449, 0.597, and 0.45 lb. per head. The grain consumed by the lambs per 100 lbs. gain was 42.55, 39.33, 41.57, and 49.33 lbs. for the respective lots. The average total grain consumed per ewe in lots 2 and 4 was 99.78 and 110.93 lbs., respectively.

Studies on the variations in the results of factory, microscopic, and breeders' methods of wool sorting, P. Kereszturi (*Kisérlet. Közlem.*, *17* (*1914*), *No. 5, pp. 835–866*).—This is a discussion of the advantages of the microscopic method of wool grading, suggesting that it be adopted by manufacturers and breeders, thus obviating the variations in the results obtained by their methods.

Goats and their ancestors, L. Boutan (*Bul. Soc. Etude et Vulg. Zool. Agr.*, *13* (*1914*), *Nos. 10, pp. 168–171; 11, pp. 173–177; 12, pp. 196–201*).—A general discussion of the origin and development of the various breeds of goats in Europe, Asia, and Africa, more especially the Angora, and the importation of this breed to America.

Swine-feeding experiments with chick-peas, O. Schmidt (*Fühling's Landw. Ztg.*, *63* (*1914*), *No. 23, pp. 714–725*).—Chick-peas (*Cicer arietinum*) were fed to pigs and found to compare favorably with barley meal as a feed, the pigs making somewhat greater gains at a slightly lower cost.

Influence of meat and bone meal feeding on the chemical composition of the bony framework, J. K. Gjaldbæk (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *83* (*1913*), *pp. 26; abs. in Zentbl. Agr. Chem.*, *43* (*1914*), *No. 10–11, pp. 630–632*).—Three 2-month-old pigs were fed three months, No. 1 receiving an ordinary feed of corn, barley, and skim milk, No. 2 receiving in addition 100 gm. per day of bone meal, and No. 3 from 100 to 400 gm. of bone meal. The control pig increased in weight from 8.1 kg. to 30.9 kg., No. 2 from 9 kg. to 28.3 kg., and No. 3 from 10.3 kg. to 20.5 kg. The head of the femur bone was analyzed and the ash, CaO, and P_2O_5 content found to be greatest in pigs 2 and 3, from which it is concluded that the feeding of bone meal has a material influence on the development of the bony framework of pigs.

The swine industry in New York State (*N. Y. Dept. Agr. Bul. 64 (1914), pp. 200, figs. 56*).—This includes a number of general articles by various authors on the feeding, care, and management of swine.

Prairie farmer's hog book, C. V. GREGORY (*Chicago: Prairie Farmer, 1914, pp. 126, figs. 65*).—This booklet gives complete and practical information on the breeding, feeding, care, and management of hogs for profit.

Horse breeding in relation to national requirements, A. PEASE (*Jour. Farmers' Club [London], 1915, Feb., pp. 21–42*).—This is a discussion of the requirements of horses for the English army service and of methods of increasing the supply of available horses.

Horses, S. B. LIMA (*Bol. Dir. Geral Agr. [Portugal], 11 (1913), No. 10, pp. 468, fig. 1*).—This is a collection of reprints of articles treating of the various breeds of horses in Portugal, their development and improvement, and methods of breeding in vogue, more especially with regard to racing and remount stock.

The retention of the amino acids in the metabolism of the fowl, K. SZALAGYI and A. KRIWUSCHA (*Biochem. Ztschr., 66 (1914), No. 1–3, pp. 139–148*).—The feeding to ducks of 2 gm. per day of asparagin in addition to corn slightly lowered the amino acid quotient $\left(\frac{\text{amino acid nitrogen}}{\text{total nitrogen}}\right)$ of the urine as compared with the amino acid quotient of the urine of ducks fed corn alone. On feeding 2 gm. of glycocoll the quotient was somewhat increased, while on feeding molasses high in amino acid content to a hen the quotient was slightly decreased.

On the asparagin feed no amino acid nitrogen was found unresorbed in the feces of the two ducks, while on the glycocoll feed 4.84 and 3.76 per cent remained unresorbed. On the molasses feed 9.03 per cent remained unresorbed in the feces of the hen. The amino acid nitrogen found in the urine of the ducks fed asparagin was 3.77 and 2.83 per cent, respectively; 6.5 and 4.75 per cent, respectively, in the urine of the ducks on glycocoll; and 6.9 per cent in the urine of the hen on molasses feed.

The fact that the values calculated from the relation of the amino acid nitrogen to the nonprotein nitrogen agree gives additional proof that the amino acid resorbed by the organism is not retained, since the oxidation products are found again in the urine quantitatively.

Correlation between egg-laying activity and yellow pigment in the domestic fowl, A. F. BLAKESLEE and D. E. WARNER (*Science, n. ser., 41 (1915), No. 1055, pp. 432–434*).—The results tabulated in this paper indicate that a close correlation exists between the yellow pigmentation in a hen and her previous egg-laying activity, and that in Leghorns the color of the ear lobes is perhaps a better criterion of laying activity than either legs or beak and is more readily recorded. It is believed that laying removes yellow pigment with the yokes more rapidly than it can be replaced by the normal metabolism, and in consequence the ear lobes, the beak, and the legs become pale by this subtraction of pigment.

Fancy points vs. utility, A. F. BLAKESLEE (*Jour. Heredity, 6 (1915), No. 4, pp. 175–181, figs. 2*).—The author points out the necessity for a revision of standards for judging poultry, showing that very little attempt is made to use characters in the score card indicative of yield, and that in some cases standards are used that are directly opposed to the natural development of the bird. As an example, barring in Plymouth Rocks is cited. It is shown that whereas the males are naturally lighter than the females, poultrymen, in order to win prizes for exhibition pens, have resorted to so-called double mating, breeding males from dark strains and females from light strains, since judges give preference to pens in which the males and females are matched in shading.

It is further shown that whereas yellow pigment in the beak and the legs of Leghorn and Wyandotte pullets disappears when they begin to lay and returns again when they cease laying (see abstract above), the Standard of Perfection demands yellow in the beak and legs, thus penalizing production. It is suggested that the show-room standards be changed and greater account taken of yield; that judges disqualify for characters indicating low yield; that efforts be made to discover to what extent visible characters are correlated with high production; and that points be allowed commensurate with the degree of this correlation.

Method of selecting the high-producing hens, O. B. KENT (*Cornell Countryman, 12 (1915), No. 6, pp. 481–484, fig. 1*).—The author states that the characters to be used in a study of egg production are time of molting, color of shank, texture of comb, and color of ear lobes. Late molting is the accompaniment of late laying, but late molting does not appear to affect the earliness of spring laying; those hens that molted late molted much more rapidly than those that molted early and hence lost less time. It has been found at the New York Cornell Experiment Station that all of the high producers and some of the low vitality low producers have pale shanks, but that any bird with yellow shanks after a year of laying, whether it be the first, second, or third year of egg production, has been a poor producer for that year. If a bird starts with pale shanks, the shanks will not grow darker, and nothing can be told of the egg production from the shanks alone.

It was further found that those birds which had soft pliable combs in the fall were in general better producers than those with hard or dried-up combs. It was found that there was a very close correlation between a combination of the three factors (time of molting, color of shank, and texture of comb) and egg production.

Studies at the Connecticut Storrs Station (see above) tend to show that those birds that normally have a considerable amount of yellow pigment in their ear lobes before they begin to lay will lay this yellow color out. By means of the ear lobes it is a comparatively easy matter to go through a flock of utility White Leghorn pullets eight months after they are hatched and pick out those that have not laid. The ear-lobe test simply indicates whether the bird is laying or not and does not necessarily indicate that a bird will or will not lay heavily throughout the year.

California poultry practice, SUSAN SWAYSGOOD (*San Francisco: Pacific Rural Press, 1915, pp. 157, pls. 8, figs. 5*).—A general treatise on poultry management.

A poultry survey of Jackson County, F. S. JACOBY (*West Virginia Sta. Bul. 148 (1914), pp. 3–38, pl. 1, figs. 13*).—This is a general résumé of the poultry industry in Jackson County, W. Va., said to be the greatest poultry-producing county in that State. Methods of breeding, feeding, marketing, and general management are described.

Profitable squab breeding, C. DARE (*Des Moines: Author, 1914, pp. 70, pls. 4, figs. 18*).—This booklet contains general information on squab breeding and management.

Breeding for horns, F. N. MEYER (*Jour. Heredity, 6 (1915), No. 2, p. 96*).—This is an account of an industry in Siberia in which stags are bred for their antlers. The antlers are sawed off, boiled in salt water several times, and allowed to dry, in which state they are sold. The average price paid for the antlers is between $4 and $6 per pound.

Rabbit culture and standard, W. F. Roth and C. T. Cornman (*Sellersville, Pa.: Poultry Item Press, 1914, pp. 95, pls. 12, figs. 6*).—This booklet deals with the various breeds of rabbits and their feed, care, and management.

DAIRY FARMING—DAIRYING.

Cattle-feeding experiments in Denmark, H. E. Annett (*Agr. Jour. India, 10 (1915), No. 1, pp. 63–75*).—This reviews the general plan of conducting cattle-feeding experiments in Denmark. The experiments are largely cooperative and carried on with considerable care. Feeding trials were begun in 1887 and have been continued to the present time, more than 4,000 cows having been utilized.

The general results of the trials have shown that wheat, corn, and bran give much the same results in milk production, while oil meal is slightly better. One lb. of wheat, corn, or bran has been found to be equivalent to 0.75 lb. sunflower cake, 0.67 lb. cottonseed cake, 1.2 lbs. molasses, 2.5 lbs. hay, 5 lbs. straw, or 10 lbs. mangel wurzels. The experiments have indicated that changes of feed have practically no effect on the chemical composition of either the fat or the milk. Variations in the composition of the milk are caused, to a much greater extent, by the individuality of the animal.

Experiments have also been conducted to determine to what extent mangel wurzels can take the place of concentrated feed in the ration. The results indicate that the protein requirements, as determined by the Wolff-Lehmann, Kellner, and other tables, are too high, and that it is possible to substitute during the winter less expensive feeds, such as mangels, for expensive feeds such as cottonseed cake, without decreasing the milk yield or endangering the health of the cattle.

Feeding experiments in Denmark with dairy cattle, W. Helms (*Agr. Gaz. N. S. Wales, 26 (1915), No. 1, pp. 41–47, fig. 1*).—The author gives data collected by him during a visit to Denmark. Two lots of six cows each were put out on grass and tethered within large measured circles, and at the end of the day the grass left within the circle was cut and weighed. This method of investigation occupied 14 days.

It was found that the quantity of grass consumed by cows was about 155 lbs. per head per day. It varied somewhat, not only as between cows but also in the individual cow from day to day. This variation was not entirely dependent on weather conditions, such as wet, cold, or very warm weather, when the consumption was smaller, but also independently of such conditions. The cows consumed about the same quantity whether they were dry or in milk or whether giving a smaller or greater milk yield. A reduction in the milk yield took place in time, even when the grass was young and fresh.

From these and later trials it is concluded that "feeding with, and on, grass alone, quite apart from the loss sustained by letting the cows themselves decide how much grass to consume, can not give us the most profitable results with dairy cattle, and even if other fodder be added to the grass feed a loss of nourishing organic matter can hardly be avoided.

"On account of the varying quality of the grass, especially as it gets older and its digestibility alters, it is difficult to recommend any certain fodder composition when grass also is given. The feeding in summer time must be even and based on similar systematic principles to the winter feeding, viz, in proportion to the condition and milk production of the various cows in the various periods between 'in calf' and 'calving.' On no account must the change from paddock feed to stable feed, or vice versa, be too sudden."

Some results from the fattening of dairy cows, C. HUTCHINSON (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 161–169*).—In disposing of cows to the butcher it is said that the milk yield of a barren cow should not be allowed to reach an unprofitable level before a fattening ration is allowed. The introduction of such a ration will arrest the normal decline in milk yield. However, it is not thought advisable to allow the cow to dry off completely before sale as beef, but to sell the fat cows direct from the milking herd.

The development of the dairy industry in Hungary, I. KOERFER (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1542–1546*).—A statistical review of the development of the dairy industry in Hungary.

The hygienic importance of acid-rennet bacteria in the udder of cows, C. GORINI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 37 (1914), No. 17, pp. 707–711*).—This is an account of acid-rennet-producing bacteria, called *Bacillus minimus mammæ*, found in the lactiferous ducts of the udder, and causing the premature coagulation of milk even before it is drawn from the udder and before external contamination.

A zymoscopic or fermentation test appears to be the most practicable method of detecting the presence of the organism. It is said that to prevent the abnormal development of the acid-rennet microflora in the udder it is advisable to milk the cow dry so as to empty completely the lactiferous ducts. In zymoscopic testing of milk the type of coagulum produced by the bacteria may be used as a guide by both cheese maker and veterinarian for indicating faulty milking and abnormal conditions of the udder.

A reinvestigation on the nature of the cellular elements present in milk, R. T. HEWLETT and C. REAVIS (*Lancet [London], 1915, I, No. 17, pp. 855–857*).—This paper deals with methods of preparing, fixing, and staining films preparatory to determining the nature of the cellular elements in milk.

The yellow color in cream and butter, L. S. PALMER (*Missouri Sta. Circ. 74 (1915), pp. 41–46*).—A popular discussion, based on the material previously reported (E. S. R., 31, p. 273).

Butter prices, from producer to consumer, N. H. CLARK (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 164 (1914), pp. 59*).—A compilation of statistical data showing the prices paid to the farmer for milk fat as contained in milk and cream, and the prices received for butter by the creameries, wholesale dealers, and retail dealers in the years 1904, 1910, and 1911, for the months of June and December, these being selected as representing the season of high production and low prices and the season of low production and high prices, respectively. Among the topics discussed are seasonal variation in production and the effect of cold storage, movement of wholesale prices in different markets, and butter prices and margins.

Studies on the manufacture of cheese, 1913, 1914, C. GORINI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 12 (1913), No. 8–12, pp. 80–86; ditto, Ser. B, 13 (1914), II, No. 3, pp. 36–48*).—This treats of the methods of manufacturing the various types of Italian and Swiss cheese, and on the bacteriological phases of cheese making.

The manufacture of cheese from "heated" milk, II, M. BENSON (*Jour. Bd. Agr. [London], 21 (1915), No. 10, pp. 878–889*).—This is a continuation of work previously noted (E. S. R., 29, p. 674).

It was found that to obtain a typical Cheddar cheese from pasteurized milk the pasteurizing temperature should not be higher than 190° F. when the milk is heated very rapidly, or 170° when the period of heating is from 15 to 30 minutes. A blue-veined cheese of good quality was obtained when the milk was heated for about 15 minutes to 190 to 200°. This is thought to be due either to the fact that the loss of elasticity of the curd at the higher temperatures produced a less dense cheese with more widely distributed air spaces, and consequently greater growth of blue mold, or that inhibitory organisms were destroyed in the milk, thus permitting the freer growth of the mold. Cheeses prepared from heated milk contained water 33.61 to 36.22 per cent, fat 32.36 to 34.53, insoluble nitrogen (probably unaltered casein) 2.49 to 2.91; and determinations of acidity, expressed as normal sodium hydroxid per 100 gm. of cheese, 13.2 to 20 cc. The heating resulted in a higher percentage of water in the ripened product. The fat is consequently a slightly lower percentage, and the higher acidity in the heated cheese may be due to the fact that more starter was added in making the cheese.

In the case of very rapid heating, the number of organisms in the milk was not effectively reduced below 170°, but at this point the number was reduced to one-fiftieth of the total, at 180° to one eighty-fifth, and at 200° practically all the organisms were destroyed. There was a much greater reduction when the milk was maintained at 150° for 15 minutes than when it was heated very rapidly to 170°. Complete sterility was not obtained at any temperature.

It was found that there was a definite increase in the number of organisms in the milk from the vat before any starter had been added and the number in the milk as it came from the cooler, indicating that milk once pasteurized should be handled as little as possible before it is put to the use for which it is intended.

The manufacture of condensed milk, milk powders, casein, etc.—Discussion of methods of analysis, R. T. MOHAN (*Jour. Soc. Chem. Indus., 34 (1915), No. 3, pp. 109–113*).—This is a discussion of the analysis of these various products and the factors influencing their composition and quality.

It is said that milk of different seasons will stand different temperatures, fortunately the highest in the summer. The fresh milk varies in composition with the seasons, and hence the concentration also has to be varied to bring the product up to standard. In June the solids in the fresh milk average 12.68 per cent, in the condensed milk 25.81; in August 11.75 and 26.01; in November 13.40 and 26.62. It is said that swells, flat sours, and sweet curdling in evaporated milk are due to understerilization. Curdiness (other than sour curd) is due to precipitation of the curd as a hard mass under the action of heat on a product of high solids and acidity. The hard grains sometimes found in the bottom of the cans consist of mineral matter, mostly calcium phosphate, precipitated owing to overconcentration.

VETERINARY MEDICINE.

Collected papers from the Research Laboratory, Parke, Davis, and Company, Detroit, Michigan (*Collected Papers Research Lab. Parke, Davis & Co., Reprints, 2 (1914), pp. IV+289–590, pl. 1, figs. 100*).—These papers, which have been previously published in various scientific journals, include articles on hog cholera by W. E. King, R. H. Wilson, G. L. Hoffmann, and F. W. Baeslack (E. S. R., 28, pp. 381, 482, 587; 29, p. 681; 30, p. 383); on canine distemper and equine influenza by N. S. Ferry (E. S. R., 29, p. 682); and on tetanus by C. T. McClintock and W. H. Hutchings (E. S. R., 29, p. 679). Other papers of interest are: The Employment of Protective Enzyms of the Blood as a Means of Extracorporeal Diagnosis.—I, Serodiagnosis of Pregnancy, by C. P. McCord; Standardization of Disinfectants.—Some Suggested Modifications, by H. C. Hamilton and T. Ohno; and Correcting Water, by H. C. Hamilton.

Castration of domesticated animals, F. S. SCHOENLEBER and R. R. DYKSTRA (*New York: Orange Judd Company, 1915, pp. X+154, figs. 53*).—A small handbook intended for the use of stock owners, students of agriculture, and veterinarians. The work is presented in such a manner as to be of interest to those not having a knowledge of anatomy or surgical technique.

Chemical studies upon the genus Zygadenus, C. L. ALSBERG (*Abs. in Science, n. ser., 39 (1914), No. 1017, p. 958*).—Alkaloids similar to those occurring in the "veratrin" group were obtained in crystalline form from *Zygadenus venenosus*, *Z. elegans*, and *Z. coloradensis*. All were very toxic and had similar pharmacodynamical properties. From a member of a closely related genus, *Amianthium muscætoxicum*, a similar active principle was obtained in the pure state. Apparently many of the species of Liliaceæ contain veratrin.

Zygadenus, or death camas, C. D. MARSH, A. B. CLAWSON, and H. MARSH (*U. S. Dept. Agr. Bul. 125 (1915), pp. 46, pls. 6, figs. 4*).—This monograph includes a detailed report of feeding experiments with sheep, horses, and cattle carried on in 1909 and 1910 at Mount Carbon, Colo., and in 1912, 1913, and 1914 at Greycliff, Mont.

This plant grows abundantly on many of the stock ranges of the West and is one of the most important sources of loss to sheepmen. Apparently all species of the genus Zygadenus are poisonous throughout the whole season of their growth, although the tops are somewhat more poisonous at the time of flowering. The toxicity of the bulbs and tops is about the same, but the seeds are much more toxic than other parts of the plant. Cases of poisoning are more likely to occur before the maturity of the plant for at that time other forage is scanty.

Investigations have shown that the toxic dose varies according to conditions of feeding. In drenched animals it is put at about 0.5 lb. for an animal weighing 100 lbs. In fed animals it varied from 1.6 to 5.6 lbs. The poisonous principle is an alkaloid or alkaloids allied to veratrin and cevadin. Sheep, cattle, and horses are poisoned by the plant but the fatalities are almost entirely confined to sheep. The principal symptoms are salivation, nausea, muscular weakness, coma, and sometimes attacks of dyspnœa.

No satisfactory medical remedy has been discovered, notwithstanding the fact that the authors did considerable experimental work with different drugs. As a preventive it is important that the plant be recognized and grazing upon it avoided. When animals become sick they should be kept quiet and under such treatment many will recover.

A list of the literature cited, consisting of 30 titles, is included.

The examination of milk by the practicing veterinarian. Testing the protein and sugar content for the purpose of noting single abnormal milks, GLAGE (*Berlin. Tierärztl. Wchnschr., 30 (1914), Nos. 12, pp. 204–206; 14, pp. 234–236*).—After pointing out the various methods whereby the practical veterinarian may detect abnormal milks, especially those of pathological origin, the author shows that sugar and the amorphous protein constituents have not been considered (or only rarely so). When examining milk in these respects a normal amount of protein and sugar point to the healthfulness of the cow from which the sample under consideration was obtained. The protein test recommended consists of making a mixture of 3 cc. of milk and 3 cc. of a 10 per cent ammonia solution, adding an excess of water, and shaking. A healthy milk will show no coagulation, not even on boiling the mixture.

The sugar test is as follows: Boil a mixture made of three parts of milk and three parts of a 15 per cent potassium hydroxid solution, shake, and allow to stand for 10 minutes. A healthy milk gives a brown coloration while pathological milk will show a yellowish or orange color or at the most a yellowish brown. The test is best conducted on skim milk.

See also a note by Fetzer (E. S. R., 27, p. 878).

The comparative action of nucleinate of sodium upon the coagulation of blood and milk, M. DOYON and F. SARVONAT (*Compt. Rend. Soc. Biol. [Paris]*, *74 (1913), No. 13, pp. 765, 766; abs. in Zentbl. Expt. Med., 4 (1913), No. 10, p. 454).*—Sodium nucleinate hinders the coagulation of the blood, but has no effect upon the coagulation of milk.

On the nature of the opsonic substances of normal sera, H. ZINSSER and E. G. CARY (*Jour. Expt. Med., 19 (1914), No. 4, pp. 345–361, pl. 1*).—There is still much difference of opinion regarding the nature of antibodies by which phagocytosis is increased in normal and immune sera. Lack of agreement has centered chiefly upon the question of whether the opsonins are separate antibodies, independent of those previously known, or whether opsonic effects can be attributed to the activities of the alexin and sensitizer, acting individually or in cooperation.

In the experiments 24-hour cultures of the *Staphylococcus pyogenes aureus* were used in salt solution emulsions. The experiments do not point to a differentiation of normal opsonin from alexin, but the authors believe that they indicate that the so-called end piece can enter to a slight extent into nonspecific relationship with unsensitized bacteria, "and it is therefore active, whereas it can not enter into a similar relation to unsensitized cells. This conception, however, is tentatively made, since we are studying further the nonspecific absorption of alexin or complement by unsensitized bacteria."

Studies on the propagation of bacteria, spirilla, and spirochetes, E. MEIROWSKY ET AL. (*Studien über die Fortpflanzung von Bakterien, Spirillen und Spirochäten. Berlin: Julius Springer, 1914, pp. VII+95, pls. 19, fig. 1*).—This is a biological and morphological study of the tubercle bacillus (obtained from the sputum), leprosy bacillus, and *Bacillus enteritidis* (Gärtner), *B. paratyphosus B.; Spirillum rubrum* and *S. tyrogenum;* and spirochetes (fowl spirillosis, balanitis, stomatitis, lues). Spirochetes are deemed members of the plant kingdom.

A bacteriological study of methods for the disinfection of hides infected with anthrax spores, F. W. TILLEY (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 1, pp. 65–92*).—This is a report of experimental work that was undertaken primarily to determine the value of the Seymour-Jones method of disinfecting hides as compared with other methods, especially the Schattenfroh method. The work includes a review of the literature relating to the subject, a list of 16 references being appended.

The Seymour-Jones method, which consists in the use of mercuric chlorid 1:5,000, plus 1 per cent of formic acid, was not found to be efficient, even without neutralization of the disinfectant. A dilution of 1:2,500, plus 1 per cent of formic acid, was found to be efficient where no neutralization was attempted, but the latter strength was not sufficient to prevent fatal infection of guinea pigs by disinfected material when the disinfectant was neutralized by a 1 per cent sodium-sulphid solution three or four days after the completion of the process of disinfection. No infection was caused by the inoculation of material which had been kept for a week or more after disinfection. It appears that this method might be employed when hides are disinfected at foreign ports before shipment to this country.

The Schattenfroh method, which consists in the use of hydrochloric acid and sodium chlorid in the proportions of 2 per cent of the acid and 10 per cent of the salt and with 48 hours' exposure, proved efficient in every instance. While this method can not be regarded as perfect it seems to be far superior to other methods and well worth a trial as a standard method for the disinfection of hides.

From information furnished by F. P. Veitch of the Bureau of Chemistry in regard to the tanning of small pieces of normal hide treated by the Seymour-

Jones and Schattenfroh processes of disinfection it appears that neither exerts any injurious effect upon hides or leather.

Bacteriological tests were also made with formalin and phenol and the pieces of hide treated by these disinfectants examined and tanned in the Leather and Paper Laboratory of the Bureau of Chemistry. So far as could be determined by a limited number of tests 2½ per cent of formalin is efficient bacteriologically, both against anthrax spores and against other organisms, while 5 per cent of phenol is fairly efficient against nonspore-bearing organisms but is practically useless against anthrax spores. Pieces of hide disinfected by formalin in 2½ per cent solution were so seriously affected by the disinfectant that it was almost impossible to tan them, while pieces treated with carbolic acid were uninjured.

During the course of the investigation the author noted considerable variation in the vitality and virulence of anthrax spores from different sources.

The susceptibility of animals to infectious bulbar paralysis, S. von Rátz (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 2, pp. 99–106; abs. in Amer. Vet. Rev., 46 (1915), No. 6, pp. 587–589*).—The author finds that wild boars and carnivora (foxes) are susceptible to Aujeszky's disease.

Curative experiments with salvarsan in infectious bulbar paralysis, F. Hutyra (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 82, pp. 578, 579*).—In the first series of experiments conducted use was made of a virus obtained from artificially infected rabbits, pieces of brain the size of a pea being emulsified in 8 cc. of bouillon. Each of four rabbits was subcutaneously injected with 1 cc. of the emulsion, followed at different intervals by the intravenous injection of 0.01 gm. of salvarsan per kilogram of body weight. In a second series of seven rabbits use was made of a virus obtained through emulsifying 0.5 gm. of brain substance in 100 cc. of physiological salt solution. Ten cc. of this emulsion was injected, and the dosage of salvarsan was increased to from 0.04 or 0.08 gm. per kilogram of body weight.

All four of the animals in the first series succumbed to the disease but three of the seven in the second series, two in which the salvarsan was administered at once after the infection and one in which it was administered 24 hours after the infection, recovered. It is suggested that the cure of the last-mentioned rabbit may have been due to a particularly high natural resistance.

Foot-and-mouth disease, J. W. Connaway and D. F. Luckey (*Handy and Pract. Farm Libr. [Missouri], Mo. Bul., 12 (1914), No. 11, pp. 5–36, figs. 5*).—A description of the disease, its ravages in the United States and abroad, with special reference to the most recent epizootic. Diseases which may be mistaken for foot-and-mouth disease are also discussed.

Virus carriers as factors in the spread of foot-and-mouth disease, J. R. Mohler and A. Eichhorn (*Amer. Jour. Vet. Med., 10 (1915), No. 5, pp. 310–315, 340*).—The authors here review the literature relating to virus carriers of foot-and-mouth disease, the number of which appears to be relatively small. It appears that animals which have apparently recovered from the disease must be kept separated from healthy cattle for at least seven months until all danger of their being virus carriers has passed. It still remains to be determined what part of the body harbors the virus.

Hay as a carrier of the virus of foot-and-mouth disease (*Landw. Umschau, No. 9 (1914); abs. in München. Tierärztl. Wchnschr., 65 (1914), No. 12, p. 279; Vet. Rec., 27 (1915), No. 1385, p. 390*).—An outbreak of foot-and-mouth disease on a farm in the district of Aurich is thought to have originated in hay that had been cut and kept in a stack for nearly 2.5 years.

Transmission of foot-and-mouth disease to a dog, MARTIN (*München. Tierärztl. Wchnschr., 57 (1913), No. 38, p. 708; abs. in Vet. Rec., 27 (1915), No. 1385, p. 390*).—The author records a case of foot-and-mouth disease in a St. Bernard dog that ate pieces of horn from the claws of animals affected with the disease.

Mastitis complicating foot-and-mouth disease as a secondary infection of the udder, RAMELLA (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 37 (1914), No. 3, pp. 121–123; abs. in Vet. Rec., 27 (1915), No. 1385, pp. 389, 390*).—An outbreak of foot-and-mouth disease in the autumn, winter, and spring of 1913–14, although benign in form, is said to have presented the predominant feature of predisposing the patients to secondary infection, particularly mastitis, with which from 10 to 20 per cent, or even more, of the cows became affected.

Through the systematic disinfection of the udder of cows affected with foot-and-mouth disease for a period of about 20 days with a tepid 5 per cent solution of lysoform the cases of mastitis became fewer in number and milder. Since the losses from mastitis are sometimes greater than those caused by foot-and-mouth disease itself, the author considers the disinfection of the udder necessary whenever foot-and-mouth disease appears and the sole means of averting this complication.

Remarks on the serodiagnosis of glanders, W. PFEILER, G. WEBER, and F. SCHÖMMER (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 19, pp. 320–322*).—One horse out of seven tested by the conglutination (E. S. R., 28, p. 478), agglutination, and complement-fixation methods failed to react by both the conglutination and complement fixation methods. This animal when tested by the ophthalmic mallein test gave a positive reaction and on slaughter was found to be glandered. This and other reasons led the authors to modify some of the features of the conglutination test with a view to obtaining greater accuracy.

Investigations on the utility of the conglutination method for the serodiagnosis of glanders in horses, O. WALDMANN (*Arch. Wiss. u. Prakt. Tierheilk., 40 (1914), No. 4–5, pp. 382–394*).—The method was studied on three horses artificially infected with the glanders bacillus. The agglutination and complement fixation tests were carried out at the same time, the procedure prescribed by Pfeiler and Weber for conducting the conglutination tests (E. S. R., 28, p. 478) being adhered to closely.

The conglutination and complement fixation tests showed inhibition on the same day and it reached its maximum on about the eleventh day in each case. As a rule inhibition was more distinct in the conglutination test. The optimum amount of serum required for the conglutination test was 0.05 cc.

The mechanism of the conglutination reaction is discussed.

Johne's disease, A. L. SHEATHER (*Vet. Rec., 27 (1914), No. 1375, pp. 276–281*).—This paper was presented at the Tenth International Veterinary Congress, held at London in 1914.

The diagnosis of rabies by the detection of sugar in the urine and hemorrhages in the gastric mucous membrane, N. MICHIN (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 35, pp. 622–624*).—The tests were made with the urine of rabbits infected with passage or street virus. Sugar was not noted in all of the cases, but the findings of sugar in the urine might, under certain conditions, be used in diagnosing rabies. Hemorrhages in the mucous membrane of the stomach were also noted, but not in all cases.

Experiments on the cultivation of rinderpest virus as described by Baldrey, W. H. BOYNTON (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 3, pp. 259–268*).—In the case of two animals that died in less time than the incubation period of rinderpest after injection of Martin's broth culture, the autopsy findings of the tissues indicated death from a bacterial infection and not from rinderpest. "All evidence points to the conclusion that the Martin's broth employed in these two cases was contaminated by bacteria prior to injection in the animals. The results are attributed to poor aseptic technique, and greater care in the subsequent inoculations, where no such toxemias were induced in the injected animals, support the conclusion.

"The symptoms, lesions, and other circumstances stated by Baldrey (E. S. R., 27, p. 380) resemble the results obtained in the two animals in question, and there is justification for belief that his results were due to the same cause. In all the other animals injected with mixtures of blood and culture medium after incubation, no immediate ill effect followed, in either susceptible or immune animals.

"With the exception of the animals noted . . . all those injected with the so-called 24 and 48 hour cultures of rinderpest in neutral or alkaline Martin's broth contracted rinderpest after the usual incubation period and died. These observations do not support Baldrey's belief that there occurs a rapid formation of rinderpest toxin in the broth during the 24 hours with resulting death of the virus. The experiments have included tests of Martin's broth after incubation as long as 72 hours. Rinderpest virus does die in Martin's broth culture after incubation for 72 hours, but there is no evidence that rinderpest toxin was formed, much less that rinderpest toxin caused the death of the virus.

"The experiments reveal the fact that rinderpest virus will survive in neutral or alkaline Martin's broth at 37° C. for at least 48 hours, but not for 72 hours. Two cases were tested at 24 hours, two at 48 hours, and three at 72 hours. Rinderpest virus kept in acid Martin's broth or in 5 per cent potassium citrate solution did not survive after 48 hours at 37°."

Abderhalden's dialysis method in pulmonary tuberculosis, M. Wolff and K. Frank (*Berlin. Klin. Wchnschr., 51 (1914), No. 19, pp. 875–877*).—The tests were conducted with the sera of man and the substratum employed was prepared from tuberculous lung, tubercle bacilli, normal lung, dog's lung, or human muscle. It is concluded that the test in its present form can not be considered of value for diagnostic or prognostic purposes.

Experimental studies on blood serum of cows immunized against tuberculosis, E. R. Baldwin (*Arch. Int. Med., 13 (1914), No. 5, pp. 682–700; abs. in Jour. Amer. Med. Assoc., 62 (1914), No. 23, p. 1842*).—These experiments relate to the properties of the serum of a cow repeatedly immunized against tuberculosis over a period of ten years. The cow was given six intravenous injections of living human tubercle bacilli, both virulent and slightly virulent, besides numerous injections of various forms of tuberculin. Specific agglutinins, opsonins, and complement-fixing antibodies were developed in the serum, but never to a very great degree. Bacteriolysin was never noted nor was a bacillicidal effect recognized in either the serum or leucocytes.

"Living human tubercle bacilli 'sensitized' with the immune serum showed increased infective power in guinea pigs and rabbits as compared with normal cow serum. The increased infective power was manifested by earlier and more marked reactions or inflammation following inoculation, and a wider spread of the disease than in controls. This acceleration of infection was not manifest unless the cow had recently received injections of pulverized bacillus residue, but the immune serum agglutinin titer was not always greater than the normal cow serum. To explain the apparent paradoxical action of the immune serum, it is suggested that the strongly agglutinated bacilli were protected from injury by the leucocytes of the inoculated animal by reason of the clumping. The bacilli were presumably phagocyted in large masses, but more difficult of digestion for that reason. It may also be suggested that the bacilli laden with antibody (opsonin) were more rapidly phagocyted and scattered, but owing to the resistant wax were not digested in sufficient numbers.

"A sensitized living tubercle bacillus vaccine is not safe or practicable when prepared from immune bovine serums, considering the above-mentioned results."

Concerning the occurrence of nongas-producing paracolon bacilli in cases of paracolon bacillosis of calves, M. CHRISTIANSEN (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 74 (1914), No. 5–6, pp. 474–481*).—A nongas-producing bacillus of the enteritidis subgroup closely related to the paracolon bacillus was found by the author to be the cause of bacillosis in 19 calves from 10 different herds.

What is hog cholera? K. SCHERN and C. STANGE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 2, pp. 107–116*).—At the present time much confusion prevails as to what constitutes hog cholera. In this article an endeavor is made to analyze the subject from various view points. Generally speaking, it is the disease caused by a mixed infection, namely, filterable virus and *Bacillus suipestifer*. The virus is in most cases the primary cause of the disease, and from a practical standpoint we could almost say "no filterable virus, no hog cholera."

The following classification is suggested: (a) Pest, the disease caused by virus and *B. suipestifer* and other bacteria; (b) para pest, caused by *B. suipestifer* and other bacteria; and (c) virus pest, the disease caused by the filterable virus.

The hog-cholera problem, K. SCHERN and C. H. STANGE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 5, pp. 341–349*).—At the outset objections are raised against the use of the term shoat typhoid (Ferkeltyphus), in this respect the authors agreeing with Miessner. The Glässer bacillus and *Bacillus voldagsen* belong to the pestifer group, and at the present time they are of no more significance than *B. suipestifer*. In Iowa there are many cases which at first sight might be considered cases of so-called shoat typhoid (E. S. R., 32, p. 378), but on closer study one finds that the filterable virus also has a hand in the infection. A clinical and pathological distinction between shoat typhoid and hog cholera is difficult to make. Shoat typhoid is not a new disease in pigs and belongs to the form described as parapest. See above.

Hog cholera and its suppression in North America, K. SCHERN (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 46, pp. 756–759, figs. 2*).—An abstract of the article noted above.

Preventive measures other than vaccination in combating hog cholera, N. S. MAYO (*Amer. Jour. Vet. Med., 9 (1914), No. 7, pp. 481–483*).—The author maintains that in spite of the general and extensive use of antihog-cholera serum, the animal losses from hog cholera are greater than before the introduction of the serum treatment. He suggests that sick hogs be given a good purge of salts, followed with intestinal antiseptics freely, such as sulphocarbolates, salicylic acid, naphthalin, turpentine, and carbolic acid. "The hygiene and diet should be carefully regulated, as provided for the isolated hogs showing no symptoms of disease. This treatment should always be given, even if serum is administered. The quarters must be cleaned and disinfected and all dead animals burned or buried deeply. It is not claimed that this treatment is a specific for true hog cholera, but it is a valuable adjuvant to the serum treatment for the filterable virus disease, and it is a practical, economical, and successful treatment for some swine diseases that closely resemble true cholera in both symptoms and post-mortem lesions.

"A large percentage of loses from hog cholera can be prevented. A strict quarantine against all transmissible swine diseases should be maintained and the general health of swine should be preserved by clean, comfortable quarters.

Avoid bedding hogs with old straw that is easily broken up into a fine dust that causes much irritation of the respiratory passages when inhaled. If there are hog wallows, keep them as clean as possible and disinfected. A better way is to have a cement wallow that can be cleaned and supplied with fresh water, to which a nonpoisonous disinfectant can be added. Swine should have a variety of good food, with good pasture when possible, and plenty of mineral elements supplied. Above all, keep the quarters clean. . . .

"The past three years of disaster should convince the skeptical that something beside antihog-cholera serum, as it has been used, is needed to control swine diseases."

Inoculation against swine fever, F. Hutyra (*Deut. Tierärztl. Wchnschr., 22 (1914), No. 31, pp. 489–493; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 42, p. 708; Amer. Vet. Rev., 46 (1914), No. 2, p. 196*).—The author believes that hog cholera may be successfully combated by injecting serum and by simultaneous inoculations.

"A potent serum confers immunity against both experimental and natural infection with the filterable swine fever virus, and indirectly against secondary bacterial infections (mixed infections). Animals that are injected with serum and simultaneously or shortly afterwards exposed to natural infection acquire a permanent active immunity. Serum injection is therefore indicated in the case of recently infected premises, and if the injections are made as soon as the presence of the disease is recognized they have the effect of rapidly cutting short the outbreak. By the simultaneous methods pigs immediately acquire an active immunity which is lifelong. On previously healthy premises the simultaneous method, as a rule, causes little or no loss, but excessively severe inoculation reactions can not be avoided. Until the inoculation reactions are passed great care must be exercised to prevent the spread of the disease."

The paratyphoid bacilli of abortion in mares, T. van Heelsbergen (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1914), No. 3, pp. 195–201*).—A discussion of the probable relation of the paratyphoid bacilli described by various workers as the cause of abortion in mares.

A reinvestigation of Konew's protective vaccination against the pectoral form of influenza in horses, Thienel and Jäger (*Ztschr. Veterinärk., 26 (1914), No. 3, pp. 125–131; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 33, pp. 601, 602*).—Konew's vaccine is directed against the disease caused by the *Bacillus pleuro-pneumoniæ contagiosæ equorum*. The horses treated by the vaccine did not react except in a few instances where there were temperature rises of from 0.3 to 0.5 cc. The micro-organisms isolated by Konew could not be found in the blood stream of animals affected with the typical form of the disease. An immunity was not produced in the animals and from 45 to 66 per cent died from typical influenza. Horses reinfected with the disease showed no improvement after being given the vaccine. It is believed that good results can be obtained with Konew's vaccine only in those establishments where the disease has been prevalent for a long time and where the larger number of the horses have gone through the cycle of the infection.

RURAL ENGINEERING.

The flow of water in irrigation channels, F. C. Scobey (*U. S. Dept. Agr. Bul. 194 (1915), pp. 68, pls. 20, figs. 9*).—This bulletin, treating the subject of the flow of water in irrigation channels, is based on extensive field tests made for the purpose of determining the proper values of the retardation factor in Kutter's formula under various conditions found in practice.

Tests were conducted in 10 States on channels ranging in size from small ditches carrying less than 1 second-foot up to canals carrying over 2,600 second-feet. The materials of these channels comprise wood, concrete, earth, rubble masonry, cobblestones, and a few special combinations. Test data were also obtained from other sources in cases where in the author's opinion there was not sufficient evidence obtained from his own experiments to warrant the drawing of conclusions.

The following conclusions are drawn from a study of the experiments and the data as assembled: "Kutter's formula is applicable to the design of any open channel. The recommendations of the earlier writers concerning the values of *n* to be chosen were in the main correct. Any weakness was due to the fact that there was not sufficient distinction made between the various categories and that materials of construction are now used which were not covered by the tests from which early deductions were made. The influence of curves was not as a rule included. Concrete lining covered but one value of *n*, whereas in practice there are many shades of roughness, all applicable under the general head of concrete. The factor *n* must include all the influences which tend to retard velocity. The principal of these influences are undoubtedly (*a*) rubbing friction between the water and the containing channels, and (*b*) vegetable growth extending into the main body of the water. . . . Of secondary importance but nevertheless deserving of careful consideration in about the order named are the following: (*c*) Angles and sharp curves in the alignment, (*d*) influences which tend to disturb parallel filaments of current, . . . (*e*) sand and gravel, . . . [and] (*f*) the prevailing wind direction. . . . There is a tendency toward a lower value of *n* as the velocity and hydraulic radius increase. . . . A value of *n* must be chosen that will apply to the canal in question at the critical period of the season. . . . In the design of earth channels having a trapezoidal form when constructed, the value of [the hydraulic radius] should be computed on the basis that the canal takes an elliptical form within a short time and thereafter maintains this shape unless altered artificially."

The values recommended for *n* in Kutter's formula, which are applicable for velocities up to about 5 ft. per second and with hydraulic radii to about 2 ft. are as follows:

For concrete lining "(1) $n=0.012$ for the highest grade of material and workmanship and exceptionally good conditions. The surface of the lining to be as smooth to the hand as a troweled sidewalk. The expansion joints to be so well covered that they practically fulfill the same condition. The climate and water to be such that moss does not accumulate to any great extent. The water to be practically free from shifting material. The alignment to be composed of long tangents, joined by spiraled curves, while the interior of the channel must be of uniform dimensions, true to grade throughout the cross section. (2) $n=0.013$ for construction as in type (1), but with curves as in the usual mountain canyon. Same construction and alignment as in type (1), but with small amount of sand or débris in water. Construction as in type (3), but in very favorable alignment or for water that carries a small amount of fine silt that will eventually form a slick coat. (3) $n=0.014$ for linings made by good construction under favorable conditions. The surface to be as left by smooth-jointed forms or to be roughly troweled. Joints to be good, but causing some retardation. Alignment about equal in curves and tangents, with no spirals between. The bed to be clean and sides free from rough deposits. . . . (4) $n=0.015$ for construction as in type (3), but with sharp curves and clean bottom or moderate curves and much débris on the bottom but clean-cut sides. (5) $n=0.016$ for concrete as constructed by the average gang of laborers, using forms that leave prominent lines at the cracks, no finish coat being applied. Bed to have the usual small amount of rock fragments and patches of sand and gravel. Average amount of curvature. . . . (6) n=0.017 for roughly coated linings with uneven joints. This value also is applicable where rough deposits accumulate on the sides and conditions of alignment are poor. (7) n=0.018 for very rough concrete with sharp curves and deposits of gravel and moss. A broken gradient, irregular cross section, and the like, contribute to such a high value of n."

For wooden flumes "(1) n=0.012 for well-constructed, clean flumes with surfaced lumber for both siding and battens. All lumber to run longitudinally. Alignment to consist of long tangents, with gentle curves between. Construction to be such that the grade line will remain uniform, preventing sags and wavy alignment. . . . (2) n=0.013 for well-constructed, clean flumes of surfaced lumber and battens, following mountain contours, where the alignment will consist of about equal gentle curves and tangents. . . . (3) n=0.014 for flumes of very smooth interior, but with many bends or sharp curves. . . . (4) n=0.015 for flumes of unplaned lumber, but otherwise as of type (2). . . . (5) n=0.016 for flumes of type (4) where sharp bends rather than curves are installed. For flumes lined with rough roofing material and for the ordinary grade of construction on a flume that is built and generally left to care for itself."

With reference to masonry lined channels, it is stated that "if [the bottom] be of smooth concrete and the sides are reasonably smooth, then the value of n approximating that in average concrete may be used."

For earth channels "(1) n=0.016 for excellent conditions of earth channels. The velocity to be so low that a slick deposit of silt may accumulate or the natural material be such as to become smooth when wet. The influence of vegetation at the edges to be a minimum. The water to be free from moss and other aquatic growth. The alignment to be free from bends and sharp curves. (2) n=0.02 for well-constructed canals in firm earth or fine, packed gravel where velocities are such that silt may fill the interstices in the gravel. The banks to be clean-cut and free from disturbing vegetation. The alignment to be reasonably straight. (3) n=0.0225 . . . for the average well-constructed canal in material which will eventually have a medium smooth bottom, with graded gravel, grass on the edges, and average alignment or silt at both sides of the bed and scattered stones in the middle, or a smooth bottom with an average amount of grass and roots forming the sides. Hardpan in good condition, clay, and lava-ash soil take about this value. (4) n=0.025 for canals where the retarding influence of moss, growths of dense grass near the edges, or scattered cobbles begins to show. . . . (5) n=0.03 for canals subject to heavy growths of moss or other aquatic plants. Banks irregular or overhanging with dense rootlets. Bottom covered with large fragments of rock or bed badly pitted by erosion. Values of n between 0.025 and 0.03 also cover the condition where the velocity is so high that cobbles are kept clean and unpacked in the center of the canal, but silt deposits near the sides."

For cobble bottom canals it is stated that "where the cobbles are graded in size and well packed the value of n is about 0.027, but the value rapidly increases as the larger rocks predominate and the lack of graded sizes prevents packing."

The values of n for metal flumes are given in a previous report by Cone, Trimble, and Jones (E. S. R., 30, p. 885).

Two sets of curve charts to aid in the design of irrigation channels are also included. An appendix contains abstracts of descriptions of canals on which similar tests have been made in recent years by other agencies than this office.

Ground water for irrigation in the Sacramento Valley, California, K. Bryan (*U. S. Geol. Survey, Water-Supply Paper 375–A* (*1915*), *pp. IV+49, pls. 2, figs. 6*).—This report, prepared in cooperation with the department of engineering of the State of California, describes the geography and geology and deals with the ground water resources of an area in California containing 15 per cent of the agricultural land of the State, with reference to their development and use for irrigation.

"The valley includes (1) sloping plains, (2) shallow basins of heavy soils, (3) low ridges of loam and silt soils along the rivers, and (4) higher plains of older alluvium laid down during a previous cycle of deposition and now raised above the valley floor in low hills and rolling plains. . . . Throughout the valley the alluvium at a depth of a few feet is saturated with water. . . . The water table slopes from the sides of the valley toward the center and from the north to the south. The grade is slightly less than that of the land surface, so that water is shallower in the basin area than toward the hills. . . .

"Although there are large areas in the valley with a shallow water table, favorable to evaporation and the accumulation of alkali, only comparatively small areas are unfitted for agriculture from this cause." This is explained as follows: (1) The ground waters are of good quality. . . . (2) The water table is very flat over the basins, and movements of the ground water are sluggish. Water is supplied more freely at the bases of the slopes, and for this reason the principal concentration of alkali occurs at the edges of the basins. This is particularly the case on the west side, where alkaline patches and areas of salt grass border the basin along its western edge. . . . (3) The heavy winter rains leach out much of the salts concentrated at the surface. Similarly flood waters wash out the salts in overflowed lands, and on the edges of the plains the same waters deposit mud or sediment, which often covers up the alkali."

The fluctuations of the water table are said to be large. "The total quantity of ground water in the valley is very great. The sands and gravels contain from 20 to 40 per cent of water, the clays perhaps more. Because the pore spaces of the sand and gravel are much larger than those of the clay the rate of flow through these materials is much greater and they become for practical purposes the water bearers. The sand and gravels are distributed through the alluvium, which thickens from less than 50 ft. at the edge of the valley to 500 ft. or more in the center. . . .

"Observations show that pumping produces only a local depression of the water table, and that the winter rise in normal years is rapid and effective. General lowering of the ground water may be expected in the summer, and it will be large during periods of deficient rainfall. Heavy pumping may be expected to create still further depression, which, if the whole valley were irrigated by pumping, would increase the general lowering. . . . In view of the high lifts common in southern California, where water is being pumped for irrigating alfalfa with a lift of 100 ft. and for irrigating citrus fruits with a lift of 200 to 400 ft., it would seem that a very considerable increase in the number of plants can be made in the present pumping districts of the Sacramento Valley. . . . Although it is possible from geologic evidence to determine for any part of the valley the general distribution and character of the water-bearing beds, the precise location of these beds and their value as sources of water can be determined only by sinking wells."

Considerable general information is given relating to well sinking and the pumping and distribution of irrigation water.

Statistics of ground water irrigation in the valley gathered by the author indicate that there are 1,664 pumping plants irrigating a total area of 40,859 acres. The total power is 15,142 horsepower, of which 10,685 horsepower is electrical and 4,457 horsepower is internal combustion or steam power. The average power per plant is 9.1 horsepower, and the average area irrigated for each plant is 24.5 acres.

Ground-water resources of the Niles cone and adjacent areas, California, W. O. CLARK (*U. S. Geol. Survey, Water-Supply Paper 345–H* (*1915*), *pp. IV+127–168, pls. 9, figs. 16*).—This report, prepared in cooperation with the department of engineering of the State of California, deals with the physiography, geology, and ground-water resources of an intensively cultivated area of 20,800 acres in the Santa Clara Valley, Cal.

"The ground water in the vicinity originates in the rain that falls upon the drainage basins tributary to this part of the Santa Clara Valley and to a small extent in the rain that falls upon the valley itself. The Niles-Irvington fault, which cuts off the reentrant of the valley between Niles and Irvington, has a profound effect on the surface drainage and on the circulation of the ground water. . . . It has also produced an underground dam which prevents the passage of ground water from the east to the west side of the fault except in small amounts. . . .

"The annual contribution of ground water to the Niles cone and the adjacent area under consideration west of the fault is believed to range between 2,600 and 59,000 acre-feet, or between somewhat wider limits, exclusive of the withdrawals during the replenishing period. . . . The estimated annual requirement of ground water for irrigation of all crops now grown on the Niles cone and on the adjacent area supplied by Alameda Creek west of the fault is between 16,000 and 24,000 acre-feet, the smaller quantity being approximately that now used for irrigation and the larger quantity that which will be required in the future. . . .

"The ground-water supply of the Niles cone and the adjacent area west of the fault is little, if any, greater than the amount required by present developments and is hardly adequate for the full irrigation of the area and the present-scale diversions by the Spring Valley and People's water companies. If further diversions are necessary for public supplies of San Francisco or the transbay cities, irrigation developments will probably have to be arrested unless provision can be made for conserving and utilizing the flood water which now runs to waste.

"The north end of the valley area east of the fault has a larger ground-water supply in proportion to its extent than the area west of the fault. Its supply is believed to be at least adequate for the irrigation of the arable land that it contains, but the portion of this area from the vicinity of The Lagoon southward is underlain by material that in general yields water too slowly for irrigation. There is little danger, even with heavy pumping, that the area under consideration will be seriously damaged by the encroachment of sea water."

Gazetteer of surface waters of Iowa, W. G. HOYT and H. J. RYAN (*U. S. Geol. Survey, Water-Supply Paper 345–I* (*1915*), *pp. 169–221*).—This gazetteer embraces descriptions of all the streams named on the best available maps of Iowa.

Surface water supply of Ohio River basin for the year ended September 30, 1913, A. H. HORTON, W. E. HALL, and H. J. JACKSON (*U. S. Geol. Survey, Water-Supply Paper 353* (*1915*), *pp. 264, pls. 5*).—This report, prepared in cooperation with the State of West Virginia, presents the results of measurements of flow made on streams in the Ohio River basin during 1913.

Surface water supply of St. Lawrence River basin, 1913 (*U. S. Geol. Survey, Water-Supply Paper 354* (*1915*), *pp. 136, pls. 2*).—This report, prepared in cooperation with the States of Minnesota, New York, and Vermont, presents the results of measurements of flow made on the streams in the St. Lawrence River basin in 1913.

The utilization of the subterranean reservoir of Egypt, V. M. Mosseri (*Bul. Union Agr. Égypte, 12 (1914), No. 104, pp. 61–97, pls. 3*).—The author reports an investigation of the underground waters of Egypt, and concludes that the quantities of subterranean water potable and suitable for irrigation that are lost annually to the sea during low water are immense. It is pointed out that Egypt could profitably use a part of this water either for extending summer cultivation or to obtain in certain years a quantity of water sufficient to provide the complement of water which the Nile has been unable to bring down at the time.

The author proposes that the Egyptian Government develop the subterranean water supply and suggests to this end that a subterranean barrier, consisting of a network of deep wells, be constructed to parallel the Mediterranean coast at a distance of 80 km. (50 miles) from it. He estimates that such a barrier will prevent the loss of the underground water to the sea and will conserve for use 1,500,000,000 cubic meters of water in the period extending from March to August. A quantity of water also will be placed at the disposal of a part of Egypt sufficient to provide the amount needed during the time of the winter cleaning of the canals. It is believed that the deduction of 1,500,000,000 cubic meters of water will hardly affect the subterranean flow of water toward the Nile during low water nor the amount needed by plants.

It is further shown that the natural subterranean water added to the water of the Nile is suitable for irrigation purposes, and that the cost of its elevation with proper and satisfactory apparatus is not excessive.

The value of large zinc pipes for carrying water, A. Rinck (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 2, pp. 99–103; abs. in Chem. Zentbl., 1914, II, No. 13, p. 844*).—Experiments showed that with long-continued exposure to water the zinc acquired a coating of basic carbonate, which rendered it considerably less soluble. After such pipes had been used a year, the solubility of the zinc varied from 2 to 3 mg. per liter of water remaining in contact with the zinc for several months.

Note on the bacteriotoxic action of water, R. Greig-Smith (*Proc. Linn. Soc. N. S. Wales, 39 (1914), pt. 3, pp. 533–537*).—Experiments in which suspensions of *Bacillus prodigiosus* and *B. typhi* were added to tap water, boiled and unboiled, and filtered through a Chamberland filter, showed that, as a rule, the growth of the organisms was retarded, especially in the case of the boiled water. The conclusion is reached that "ordinary tap water contains substances of the nature of bacteriotoxins, the toxicity of which is increased by boiling."

Watering devices for moorland pastures, von Schmeling (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 32 (1914), No. 21, pp. 390–393. figs. 2*).—Arrangements for obtaining clean water for stock are described.

The drainage of Jefferson County, Texas, H. A. Kipp, A. G. Hall, and S. W. Frescoln (*U. S. Dept. Agr. Bul. 193 (1915), pp. 40, pls. 2, fig. 1*).—This bulletin reports the survey and plans for the drainage of an area of about 612,000 acres in southeast Texas, the survey being completed December 1, 1912.

The topography of the area is generally flat and level, with few unusual physical features. The predominating surface soils are fine sandy loams, loams, clay loams, silt deposits, and muck, and all are underlain by a deep stratum of clay. Limited areas of fine sand also occur in certain parts of the county.

From observations of run-off and a consideration of factors affecting the same in the area it is thought advisable to design the drainage improvements to care for the run-off from a rainfall of 4 in. in 24 hours. A formula suggested by one of the authors for computing the run-off depth to be expected from any simple drainage area is as follows:

$$\text{“}D = CM\sqrt{PF}\frac{(B+L)^{\frac{3}{2}} - (B^{\frac{3}{2}}+L^{\frac{3}{2}})}{BL},$$

in which D= maximum rate of run-off, in inches per 24 hours, to be expected from the rainfall P; C = a coefficient depending solely upon the physical character of the soil, and determined by experiment; M= the ratio of total run-off to total rainfall for the precipitation P, varying with evaporation, deep percolation, lateral seepage from the drainage channels, and duration of flood; P=the depth of rainfall in inches in 24 hours (4 in. for Jefferson County); F= the average slope of the ground surface of the drainage area, in feet per mile; L= the mean length of the drainage area in miles; and B= one-half the mean width of the drainage area in miles. For drainage areas that contain storage reservoirs, a special calculation must be made to eliminate the effect of the reservoirs. Where the main watercourse is formed by the junction of two or more large tributaries, the formula is to be applied to each tributary separately, and the proper value of the run-off depth for the entire area will be the weighted mean of the values for the parts. . . .

"The general plan proposed for the drainage of that part of Jefferson County which can be wholly or partially drained by gravity consists in (1) dividing that part into its natural drainage units, (2) straightening and enlarging all the present water courses that will become the main outlets or arteries for a complete drainage system, and (3) constructing systems of parallel ditches, spaced one-half mile apart and running generally with the greatest slope of the land, reaching to the boundaries of each district. The plan proposed for the remainder of the county consists in (1) dividing it into convenient pumping districts, (2) straightening and deepening certain water courses and constructing the proposed Intercoastal Canal, all of which will serve as outlets for the pump discharges, (3) building levees to prevent the overflow of those districts by tides, backwater from the river, or run-off from higher lands, (4) constructing systems of parallel ditches spaced 1 mile apart and reaching to all parts of each district, and (5) erecting pumping plants to lift the water from such inclosures over the protection levees."

The proposed plan of drainage includes thirty-two drainage districts and water areas and areas outside of the districts covering 17,590 acres, all areas totaling 611,900 acres of which 530,670 acres will be benefited. The plan makes necessary 1,630.3 miles of ditches and the total cost is estimated at $5,598,249 or $10.55 per acre.

Road building in swamps, E. Krüger (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 32 (1914), No. 18, pp. 353–357*).—Problems involved in the construction of roads in swamp land under different conditions of drainage are discussed.

Machinery for construction and maintenance: State, municipal, contractors, traction haulage of stone, care of machinery; instructions to engineer and operator, T. R. Agg (*Good Roads, n. ser., 9 (1915), No. 1, pp. 21–24, figs. 2*).—Principles applicable to the selection, operation, and maintenance of road-building machinery are discussed.

Motor-vehicle registrations and revenues, 1914 (*U. S. Dept. Agr., Office Sec. Circ. 49 (1915), p. 1*).—This report, prepared by the Division of Road Economics of the Office of Public Roads of this Department, gives data for each State with reference to the 1,666,984 automobiles, 44,355 motor trucks, 152,945 motor cycles, and 1,812 cars for hire, licensed in 1914, the number of operators' licenses, and the revenues. The total fines amounted to $101,364, and the gross registration revenues to $12,270,035.78.

Trial of machine plowing in rice fields, A. Tarchetti (*Gior. Risicult., 4 (1914), Nos. 5, pp. 65–80; 7, pp. 103–107; 8, pp. 122–128; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1207–1209*).—Trials of mechanical cultivation in rice fields in which eight machines competed are reported. The machines included motor-hauled plows, self-contained motor plows, cable-hauled plows, and rotary diggers. The average length of furrow was about 1,000 ft. and a plat of about 7½ acres was assigned to each machine. Of the cable-drawn outfits, one with a 13-horsepower oil motor and a two-wheeled windlass truck was given first place. Of the direct traction outfits, one with a 24-horsepower motor was given first place.

Manila-rope fastenings (*Engin. Rec., 70 (1914), No. 26, p. 706, figs. 7*).—Tests to destruction of nine ordinary methods of fastening manila rope with reference to tensile strength indicated that eye-splices are the most satisfactory, considering the high strength they develop and their relative cost.

RURAL ECONOMICS.

Rural social problems, C. J. Galpin (*Bul. Univ. Wis. No. 711 (1914), pp. 51, figs. 23*).—This is the report of the fourth annual country-life conference of Wisconsin and presents a digest of significant facts, methods, and enterprises discussed.

Country-life week (*Ohio State Univ. Bul., 19 (1914), No. 3, pp. 51*).—The addresses at this conference related to the shifting of the rural population, relationship between the church and rural problems, and recreational and social needs of rural communities.

The church at the center, W. H. Wilson (*New York: Missionary Education Movement of the United States and Canada, 1914, pp. 98, pls. 4, figs. 2*).—This book outlines the function of the country church and indicates, by citing typical instances, how the church has been used as a means of improving rural conditions.

The making of a country parish, H. S. Mills (*New York: Missionary Education Movement of the United States and Canada, 1914, pp. XVIII+126, pls. 4, fig. 1*).—There is given in this book the history of the development of a country parish at Benzonia, Mich. The organization as finally developed consisted of a large, central congregation with a number of branches conveniently located to the farm homes in other parts of the parish, but closely related to the central congregation in all of their activities.

Working and living conditions of women employed in agriculture, H. Seufert, Elly zu Putlitz, and Priester (*Schr. Aussch. Förd. Arbeiterinnen-Interessen, 1914, Nos. 4, pp. XII+355; 5, pp. 169; 6, pp. 213*).—These reports describe the conditions existing in Wurttemberg, Baden, Alsace-Lorraine, Rhine "Pfalz," Mecklenburg, and Brandenburg among the native and foreign hired women agricultural workers, and of the wives and daughters of the small farmers. They note the influences of trade conditions and of the factory and household industries, and the possibilities of bettering the condition of these classes.

Report on home industries in the highlands and islands (*Rpt. Bd. Agr. Scot., Home Indus. Highlands and Islands, 1914, pp. IX+207, pl. 1, figs. 12*).—This report shows the development of home industries beginning with the fifteenth and sixteenth centuries, describes the function of home work in connection with tweed manufacture, Shetland hosiery, lace making, wickerwork, basket making, and kelp gathering, and points out the function of the board of agriculture in improving these industries and the effects of the truck system. The report, in commenting on the effect of rural home industries upon the economic life of the people, says: "Where the crofts are small or poor, and where there is a large cottar population, home industries are necessary for the support of the people, while any considerable extension of such occupations will have a material effect in raising the standard of comfort. The nature of the work in the vicinity of the home constitutes adaptation of the people to a refinement which, from the point of view of agricultural production, is an unkindly one."

Abandoned and unoccupied farms for sale in Pennsylvania, N. B. Critchfield and L. H. Wible (*Penn. Dept. Agr. Bul. 252 (1914), pp. 48, pls. 3*).—This bulletin contains a list of farms for sale, together with a description showing the location in regard to schools and markets and the character of the land and buildings.

International annual of agricultural legislation (*Inst. Internat. Agr. [Rome], Ann. Internat. Leg. Agr., 3 (1913), pp. VI+1113*).—This report contains abstracts and quotations of laws with references, concerning methods of gathering agricultural and commercial statistics; the regulation of commerce in agricultural produce, fertilizers, and live stock; appropriations for agricultural purposes; taxation and exemption of agricultural property; regulations concerning the production of plants and animals and industries connected therewith; control of plant and animal diseases; cooperative organization, insurance, and agricultural credit; relationships of the agricultural landowner, tenant, and laborers; rural sanitation; and police duties in rural districts.

Rural credits in Ireland, W. Frost (*U. S. Senate, 63. Cong., 2. Sess., Doc. 607 (1914), pp. 12*).—This contains a review of the report already noted (E. S. R., 32, p. 286).

Long-time farm loans, B. B. Hare (*U. S. Senate, 63. Cong., 2. Sess., Doc. 421 (1914), pp. 12*).—The author has outlined the system of extending credit to farmers as found in New Zealand. This country issues and sells bonds, the proceeds from which are loaned to settlers for periods varying according to the character of the security offered. He points out how the system might be adopted in South Carolina, and that it is in effective operation in eight American States.

Cotton warehouses: Storage facilities now available in the South, R. L. Nixon (*U. S. Dept. Agr. Bul. 216 (1915), pp. 26*).—The author concludes that in storage capacity the present warehouses are ample, but that these warehouses are poorly distributed. The best warehouses are not available to farmers. The dealers or middlemen not only control the best storage houses but have better financial connection. He calls attention to the fact that a large standard storage house pays ample dividends while many of the owners of small warehouses actually lose money on their investment. He considers it desirable that the farmers cooperate in building their own warehouses, and advises that all warehouses should conform fully to the standards recognized by the underwriters' associations, as this will save cost in construction, in handling, and in insurance. A proper system of warehouses would simplify the financial system and eventually free the southern cotton farmer from the present disastrous credit system. He also believes that cotton mills should encourage storing by paying a premium for cotton in good condition. The estimated number of warehouses in the cotton belt at the beginning of the 1913–14 season was 3,145, with a storage capacity of 9,344,520 bales, flat; 12,486,920 bales as offered, or 15,738,825 bales compressed.

A system of accounting for cooperative fruit associations, G. A. Nahstoll and W. H. Kerr (*U. S. Dept. Agr. Bul. 225 (1915), pp. 25*).—There is outlined in this bulletin a system of accounting devised to meet the requirements of the smaller organizations handling deciduous fruits and produce on a commission basis. Inasmuch as the organization acts in the capacity of an agent for the growers, the author claims the accounting system should be so arranged that the history of each lot of fruit or produce delivered can be easily and quickly traced from the time it is turned over to the organization for shipment until the returns are paid to the producer. The system provides for the filing together of all papers pertaining to the same shipment in a separate folder or envelope where they will be readily accessible for reference. They are kept in this folder or envelope until the receipt of the remittance from the sales is received. The accounting system calls for nine forms, as follows: The receipt, the manifest, the bulletin, the invoice, the car envelope, the journal, the record of cash, the account sales, and the ledger. The bulletin indicates how the books are to be set up and closed and the function of each form in the accounting system.

A system of accounts for farmers' cooperative elevators, J. R. Humphrey and W. H. Kerr (*U. S. Dept. Agr. Bul. 236 (1915), pp. 30*).—This bulletin outlines a system of accounting for cooperative elevators in which the complete system will require fifteen forms, as follows: (1) Cash, journal, purchase and sales record; (2) record of grain receipts; (3) record of grain purchases; (4) record of grain shipments and sales; (5) record of hedges; (6) record of sales to arrive; (7) patronage ledger; (8) grain and merchandise report; (9) manager's report; (10) grain check; (11) scale ticket; (12) storage ticket; (13) sales ticket; (14) cash receipt; and (15) cost analysis. The author gives the forms, together with a brief statement of the function of each form and how it is to be used.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 672 (1915), pp. 28*).—This number shows the estimated condition of winter wheat and rye on April 1, 1915, the approximate commercial apple crop of 1914, condition of apples in cold storage April 1, 1915, and progress of the apple movement, condition of Florida and California crops, trend of prices of farm products, and losses and condition of live stock.

The 1914–15 beet-sugar crop in the United States amounted to 722,054 short tons, and was produced from 483,400 acres, yielding 5,288,500 tons of beets. The Louisiana cane-sugar production amounted to 242,700 short tons.

According to C. M. Daugherty, the available information indicates that the United States, British India, and Canada have increased their winter wheat acreage about 8,500,000 acres. How much of this increase is offset by a decrease in acreage of the contending countries of Europe is not known, but it is concluded that these various influences are likely to leave the world's wheat acreage little, if any, larger than that of last year. His article concludes with a statement showing the average quantity of wheat, rye, barley, and oats sown per acre in the principal grain-producing countries.

F. Andrews states that a recent inquiry of the Bureau of Crop Estimates shows that the average distance from market is 6.5 miles for farms of the United States. The number of possible round trips per day averages for all farms 2.1, and for the more remote farms 1.6 trips. The average size of a wagonload of cotton in the United States is 3 bales, or 1,500 lbs., while the average wagonload of wheat is 53.5 bu., or 3,200 lbs. He estimates that it would require about 6,358,000 days for one wagon to haul from the farms the marketed portion of an average corn crop, 6,857,000 for wheat, and 2,532,000 for cotton.

T. F. Powell believes that the lack of proper assembling methods is one of the chief difficulties encountered in the successful solution of the marketing problem. In localities where suitable common or cold-storage facilities are available, the growers of farm products would find the concentration and storage-in-transit privileges two of the most desirable means for bringing about the widest distribution.

Fifth census of Canada, 1911.—Agriculture (*5. Census of Canada, 4 (1911), pp. CII+428*).—This volume of the census contains statistical data showing by districts the number of farm holdings, the land classified by tenure and purpose to which devoted, area in crops, number of fruit trees, live stock on farms, and value of land, buildings, implements, crops, and live stock. Comparative data is shown for the larger geographic divisions. A copy of the census schedule is also included.

Report of the department of agriculture of Norway for 1914 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1914, I, pp. 81*).—This report gives statistical data showing the area and production of crops by minor geographic divisions for 1914, with comparative data for earlier years.

[Statistics of agriculture in Switzerland] (*Statis. Jahrb. Schweiz, 22 (1913), pp. 72–91*).—These pages contain statistical data showing by cantons the area, production, and value of the principal agricultural products, the production of butter and cheese, and the number of live stock. See also a previous note (E. S. R., 31, p. 895).

[Agricultural statistics of Russia] (*Rec. Données Statis. et Écon. Indus. Agr. Russie et Pays Étrangers, 8 (1915), pp. XIV+640*).—This annual report shows statistical data relating to the area, production, value of the principal crops, the number of live stock, foreign trade, prices, domestic movement of agricultural products, wages of agricultural laborers, and information concerning rural credit and special agricultural industries. This information is by minor subdivisions and for 1913, with comparative data for earlier years.

[Agriculture in the Commonwealth of Australia], G. H. Knibbs (*Off. Yearbook Aust., 7 (1901–1913), pp. 220–385, figs. 6*).—This portion of the yearbook contains information concerning land tenure and settlement, number of live stock, area in crops, and agricultural production. A large number of statistical tables accompany the text which give information for individual States and for a series of years. See also a previous note (E. S. R., 31, p. 492).

Some impressions of agriculture in Australia, A. D. Hall (*Jour. Farmers' Club [London], 1915, Jan., pp. 19*).—This pamphlet contains an address describing the agricultural conditions in Australia as observed by the author, with special reference to methods of carrying on the farm operations, of handling sheep, and of solving farm labor problems. The address is followed by discussions.

[Agriculture in New Zealand], M. Fraser (*Statis. Dominion New Zeal., 3 (1913), pp. 1–6, 92–104*).—These pages of the annual statistical report contain information concerning the status of land settlement, production of crops and live stock, and the manufacture of agricultural products.

AGRICULTURAL EDUCATION.

[Statistics of] agricultural and mechanical colleges (*Rpt. Comr. Education [U. S.], 1913, II, pp. 271–313*).—This chapter contains notes on changes in courses and methods of instruction, gifts, buildings and improvements, and legislative appropriations in 1913 to the land-grant colleges of this country, and a compilation from official sources of general statistics, courses of study, attendance, degrees, value of funds and equipment, revenue and disbursements, and additions to equipment of these colleges for the fiscal year ended June 30, 1913.

Duplication in separate agricultural colleges and state universities, T. H. MACBRIDE (*Trans. and Proc. Nat. Assoc. State Univs. U. S. A., 12 (1914), pp. 163–182*).—The author reviews the beginnings of the three higher state institutions of education in Iowa, viz, the University of Iowa, the State Teachers College, and the State College of Agriculture and Mechanic Arts, and discusses the alleged duplication of work in these institutions. He inquires whether it does not appear that the whole question suggested by the topic, that of duplication in any group of state institutions, "depends entirely upon circumstances; not upon past history alone, but upon present convenience; upon the purpose of the people and the community to be served; upon what you are going to do, as well as upon the resources, wealth, and ambition of the commonwealth itself."

Rural education, G. POTTS (*So. African Jour. Sci., 11 (1914), No. 3, pp. 57–76*).—In this address before the South African Association for the Advancement of Science the author considers the problem of rural education in elementary and secondary schools and certain aspects of higher education which bear on the problem. He calls attention to the teaching of rural subjects, such as school gardening, nature study, agriculture, and the natural sciences, and the extent to which they are being taught in South Africa, and concludes that the main reforms needed to insure a satisfactory system of rural education in South Africa are (1) "more representation for agriculture and the natural sciences on the university council, (2) that the study of the natural sciences in the university colleges should cease to be discouraged, (3) more departmental instructors in nature study and science in the education departments, (4) more teaching of nature study, school gardening, botany, and zoology, and all on the most approved lines, at the training colleges, (5) a matriculation at least as liberal as the present senior certificate, especially in regard to the natural sciences, (6) more botany and zoology in the secondary schools, and (7) more nature study, both systematic and correlated, and school gardening, in the primary schools."

Report of an agricultural tour in Europe, America, and Japan during 1912–13, L. C. COLEMAN (*Dept. Agr. Mysore, Gen. Ser. Bul. 4 (1914), pp. 53*).—This bulletin contains an account of general observations in connection with institutions and organizations for the development of agriculture in Europe, America, and Japan, visited by the author with the chief object of studying methods of agricultural education. The results of this study have been previously noted (E. S. R., 31, p. 296).

Department of rural and agricultural education (*Addresses and Proc. Nat. Ed. Assoc., 52 (1914), pp. 877–907*).—The papers presented before this department of the National Education Association at its convention in St. Paul, Minn., July 4–11, 1914, included the following:

Rural demonstration schools and study-center work for rural teachers, H. H. Seerley (pp. 878–881).—Accounts are given of the demonstration schools that have been established in ten rural independent school districts to serve as centers for training teachers graduated from the special rural teacher course at the State Teachers College, Cedar Falls, Iowa; and of the teacher study centers organized for the improvement of rural teachers in service.

A beginning in rural high-school work and township supervision, Helene E. Glissman (pp. 882–886).—The development of the community spirit in the past five years by the Garfield Township (Iowa) High School is described.

The use of raw materials in teaching agriculture, W. S. Welles (pp. 886–890).—The author urges a discussion on teaching of agriculture through raw materials and in the field for boys, using the text-book only as a source of help when needed. Several suggestions are offered in the way of specific direction for such work.

The course in agriculture for training teachers in normal training high schools, J. L. McBrien (pp. 890–895).—In this symposium by educators interested in this subject the following suggestions stand out prominently: (1) The elimination of some subjects from the old traditional high-school course in order to give sufficient time in which to teach manual training, domestic science, and agriculture to the prospective rural teachers in normal training high schools; (2) in order to give agricultural education and rural economics proper dignity in the high-school course, colleges and universities must give due entrance credit therefor when properly taught in the high school; (3) the most available agencies for training teachers for the rural schools are the public high schools that are qualified to give normal training; (4) the proper agencies for training the directors of normal training work in high schools, including the work in agricultural education, are the state normal schools; and (5) the greatest problem in agricultural education is the training of a sufficient number of teachers qualified to give such instruction in rural schools.

The course in agriculture for training teachers in normal training high schools, A. V. Storm (pp. 895–898).—Having reached the conclusion that because of the inability of the normal schools to furnish an adequate supply of teachers for the rural schools, such teachers must be largely prepared by the local high schools, the author discusses the difference in organization of the high-school normal course in various States and the methods of agricultural instruction for rural teachers.

The federated boys' and girls' club work, O. H. Benson (pp. 898–905).—Leadership in country life, club work and its objects, essentials, requirements, and results, evidences of good club work, school extension, school credit for club work, point of view and team work, local organization, club policies, school and home gardens, the need of club leaders, the importance of follow-up work, and the club and the consumer, are considered.

What recognition should be given vacation and other out-of-school work, J. W. Crabtree (pp. 905–907).—The author gives brief statements of the results of school credit for vacation and other out-of-school work and of the reasons justifying such credit. He also describes some of the work for which credit has been given at the State Normal School, River Falls, Wis., including a course of self-boarding, requiring 3 hours each semester in the home economics department, and from 3 to 5 hours' credit on farm practice to boys who spend the vacation at work on the farm, in the dairy, creamery, canning factory, etc.

The use of land in teaching agriculture in secondary schools, E. Merritt (*U. S. Dept. Agr. Bul. 213* (*1915*), *pp. 12*).—This bulletin is based on questionnaires sent out on the use of land in the teaching of agriculture in the secondary schools, including the advantages and disadvantages and management of the school farm. The data have been previously noted from another source (E. S. R., 31, p. 799).

Suggestions and requirements for teaching of agriculture, manual training, cooking, and sewing in state graded schools, C. P. Cary (*Madison, Wis.: State Dept. Pub. Instr., pp. 48, figs. 10*).—This bulletin contains outlines of work in agriculture, manual training, cooking, and sewing, together with lists of the equipment, reference books, etc., necessary to meet the requirements of the legislative act of 1913 providing $100 additional state aid for instruction in these subjects in state graded schools in Wisconsin.

Agricultural course for rural high schools (In *A Manual Containing Courses of Study For the High Schools of West Virginia. Charleston, W. Va.:*

Dept. Free Schools, 1912, pp. 60–70).—This is a suggested outline of a 4-year course in agriculture, followed by a more detailed outline of the subject matter for each semester.

Corn and its uses (*Chicago: American Manufacturers' Association of Products from Corn, pp. 12*).—These five lessons on the use of corn and its products have been prepared for the use of colleges and domestic science, normal, and high schools.

Agricultural competition for boys and girls in New York State, E. M. TUTTLE (*Cornell Countryman, 12 (1914), No. 2, pp. 109–115, figs. 4*).—The author discusses the preparation for boys' and girls' agricultural competitions, kinds of contests, follow-up work, and the exhibit and school fair as valuable in the development of country life teaching. "Effort is being made in New York to have the opportunity for better country living opened to all school children as a part of the daily work of the school rather than through isolated clubs." A year ago over 50 of the 207 district superintendents conducted agricultural competitions of some kind, and this year at least half have taken leadership in the movement.

How to organize a club and keep up interest, T. J. NEWBILL (*State Col. Wash. Dept. Ext. Bul. 8 (1914), pp. 15*).—This bulletin discusses the objects to be sought, and offers suggestions for the organization of a club, keeping up interest, prizes, and club meetings. A list of helpful publications is included.

MISCELLANEOUS.

Twenty-sixth Annual Report of Georgia Station, 1913 (*Georgia Sta. Rpt. 1913, pp. 309–319*).—This contains the organization list, reports by the president of the board of directors and the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1913.

Twenty-seventh Annual Report of Georgia Station, 1914 (*Georgia Sta. Rpt. 1914, pp. 259–272*).—Data corresponding to the above are presented for the fiscal year ended June 30, 1914.

Twenty-fifth Annual Report of North Dakota Station, 1914 (*North Dakota Station Rpt. 1914, pts. 1, pp. 21; 2, pp. 41*).—Part 1 of this report contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1914. The portion of the report on the pure seed law is abstracted on page 138 in this issue.

Part 2 comprises the report of the food commissioner on food, drugs, and sanitation, and is abstracted on page 164.

Java and the Philippines, E. B. COPELAND (*Philippine Agr. and Forester, 4 (1915), No. 1, pp. 1–28*).—An account of the organization of governmental aid to agriculture in Java, based largely on the author's personal observations, and discussed with special reference to conditions in the Philippines.

NOTES.

Maryland College and Station.—William Stanley has been elected a stockholder member of the board of trustees, vice George Calvert resigned. Reuben Brigham, in charge of publications and publicity for the past two years, has been appointed assistant state leader in charge of boys' club work. Kenneth Cole has succeeded W. E. Hanger as assistant in agronomy in the station.

Minnesota University and Station.—Most of the state appropriations have been considerably reduced for the ensuing biennium, the total for the university being about $1,100,000 less than for the present biennium. The reductions are largely in the appropriations for new buildings and extension work. There is also some reduction in station maintenance which will require the elimination of projects on tobacco, weed eradication, and agricultural engineering. The maintenance appropriations for the substations, however, were increased; at Crookston from $39,900 to $45,400, at Morris from $25,000 to $34,500, at Grand Rapids from $7,000 to $10,000, at Duluth from $6,100 to $7,600, at Waseca from $3,900 to $4,400, and at the fruit breeding farm at Zumbra, from $2,000 to $4,000.

An addition to the home economics building was authorized at a cost of $45,300, as well as $30,000 for repairs in the heating plant and $8,750 for other improvements, including the remodeling of the old home economics building for soils work. A farm engineering building and a dormitory at Morris, to cost $45,000 and $15,000 respectively, are provided and $2,500 for the purchase of additional land. Farm cottages are authorized at Crookston, Morris, and Zumbra. There is $15,000 for county agent work and $30,000 for the hog cholera campaign, of which $10,000 is for alterations in the plant. The total for agricultural work is about $1,341,050, with $213,814 additional from federal funds.

Recent appointments include Robert C. Ashby, formerly of the Washington College and Station, as assistant professor of animal husbandry, Jean MacKinnon as assistant professor of nutrition, and Lucile Wheeler as assistant professor of foods and cookery.

Missouri University and Station.—The department of soils has been authorized to locate three additional soil experiment fields, the first on the Lindley loam (the rough timber land) of north central Missouri, the second on the Clarksville silt loam in the south central Missouri Ozarks, and the third on the Waverly silt loam on the lowlands of southeast Missouri.

A summer forestry camp is being maintained on a part of the 50,000 acres of forest land belonging to the university.

Until further notice the hog-cholera serum is to be sold to citizens of the State for immediate use at 1.2 cts. per cubic centimeter, or 1.4 cts. in case the field demonstrator is sent to apply the serum. Dr. J. B. Gingery has been appointed superintendent of the hog-cholera serum laboratory and will have charge of the manufacture and distribution of the serum.

Other appointments include E. H. Rucker and Percy Werner, both 1915 graduates of the university, as assistants, the former in poultry husbandry, vice C. A. Webster, resigned, and the latter in dairy husbandry. F. L. Duley, who received the master's degree this year, has been appointed research assistant in soils.

Montana College and Station.—Recent appointments effective June 15 include D. C. Wood, a 1915 graduate of the University of Missouri, as assistant professor of farm management and R. S. Jones as assistant in chemistry.

Nebraska University.—R. C. Jensen, instructor in dairy husbandry, resigned July 1 to take up commercial dairy work in South Dakota.

Cornell University and Station.—The legislature has granted increases to the college of agriculture aggregating $119,557, of which $66,557 is for maintenance, $35,000 to complete the heating plant, $8,000 for the summer school, and $10,000 for improvements and miscellaneous purposes. This increase will permit of one additional professor, three assistant professors, three instructors, and sixteen assistants on the general staff and one assistant on the extension staff.

The new soils building has been named Caldwell Hall in honor of the late Prof. G. C. Caldwell, professor of agricultural chemistry and chemist for many years. A series of additions to the greenhouses is under construction as well as a tool shed and new pig and sheep barns to cost about $15,000. Plans are being drawn for the new plant industry building and preliminary plans for a hall of zoology and a rural community service building.

A plan has been ratified for the exchange for one or two terms of instructors with others of equal grade and in similar departments at the University of Wisconsin. One of the objects sought is the furnishing to these men of an opportunity to obtain a wider viewpoint through association with men and methods of another institution.

Instruction is to be offered in bee keeping. Dr. A. A. Allen, an instructor in the arts college, has been appointed assistant professor of ornithology in the college of agriculture, mainly for new courses in economic ornithology.

A. R. Mann has been granted a year's leave of absence for graduate work in the University of Chicago in rural sociology and related lines. He will be succeeded as registrar and secretary by Cornelius Betten, professor of biology and registrar at Lake Forest College. Leave of absence for a half year was granted to Profs. J. E. Rice and W. A. Stocking.

North Dakota College and Station.—E. F. Ladd has been given the degree of LL.D. by the University of Maine.

Pennsylvania College and Station.—Recent appointments include the following 1915 graduates of the college as assistants: Paul S. Baker in agronomy, beginning June 1, and E. R. Hitchner in bacteriology and E. A. Siegler and R. S. Spray in botany, all beginning September 1. W. G. Edwards, who received the degree of master of science in botany this year, has been appointed instructor in botany and forestry beginning July 1, L. O. Overholts, instructor in botany beginning August 1, and A. Leland Beam, teaching fellow in agriculture, beginning September 1.

Tennessee University and Station.—The forty-second annual meeting of the East Tennessee Farmers' Convention was held in the assembly hall on the station farm May 18 to 20 with an attendance of about 2,500. The convention was divided into five sections, namely, live stock, dairy, horticulture, homemakers (women), and boys' corn clubs.

Recent appointments include Oscar M. Watson as instructor in horticulture and horticulturist, and the following members of the extension staff: Hugh Davis Tate, assistant director of agricultural extension; DeWitt T. Hardin, district agent for East Tennessee; James M. Dean, district agent for Middle

Tennessee; Hubert Nichols, district agent for West Tennessee; John C. McAmis, specialist in agronomy; Robert M. Murphy, specialist in animal husbandry; Campbell A. Hutton, specialist in dairy husbandry; Miss Virginia P. Moore, girls' canning club agent; and Leo John Brosmer, specialist in poultry husbandry.

Utah College and Station.—The institution recently celebrated its twenty-fifth anniversary with special exercises and a historical pageant. President Sanborn, the first president and director of the institution, was among those present and participated in the exercises.

An appropriation of $55,000 for a new chemistry building, made by the legislature two years ago but suspended by the governor, has now been released and the building is under way. An appropriation of $6,000 for a sewage system and $30,000 for an addition to the power plant were approved by the governor, but other appropriations were vetoed, including an increase to the station.

The entrance requirements for all college courses have been raised from 14 to 16 units commencing with the present academic year.

Charles W. Porter, who received the Ph. D. degree from the University of California in May, has returned as head of the college work in chemistry. H. W. Stucki has retired on account of ill health and has been succeeded as assistant agronomist by Howard Maughan and he in turn by N. I. Butt of the class of 1915. John Stewart retired at the end of the college year to engage in commercial work.

Lewis A. Merrill, for many years agronomist, but subsequently engaged in commercial work, was killed June 1 in an automobile accident in Salt Lake City. He was a graduate of the college in 1895 and had also studied at the Iowa State College and the Ohio State University. He had been in charge of farmers' institutes and agricultural extension work in Utah, giving special attention to dry farming, and had been professor of animal husbandry in Brigham Young University, editor of several Utah agricultural publications, and prominently associated with the National Dry Farming Congress. He was 41 years of age.

Vermont University and Station.—Walter H. Crockett, for many years editor of several Vermont papers, and for some time official reporter for the legislature, has been appointed editor of university publications, including those of the college of agriculture, the station, and the extension service. G. C. Cunningham, since 1910 associate plant pathologist, has been appointed plant pathologist for New Brunswick and Prince Edward Island.

Washington College and Station.—Dr. J. W. Kalkus, assistant veterinarian, has been appointed veterinarian of the station, vice Dr. S. B. Nelson, who will devote his entire time to his college duties and the secretaryship of the Cascade International Live Stock Association.

Agriculture in the New York Constitutional Convention.—An agricultural conference was held in Albany May 25 to discuss the question of securing the recognition of agriculture as a broad and fundamental phase of the State's work and the inclusion in the new constitution of a clause defining the scope and work of the State Department of Agriculture. The conference was the result of a call by the State agricultural advisory board, and later broadened by an additional call from the commissioner of agriculture to cover practically all of the agricultural interests of the State. Among the various activities represented were the New York State College of Agriculture at Cornell University, the New York State Experiment Station, the secondary agricultural schools, the state departments of agriculture and education, the grange, the agricultural press, various agricultural and horticultural societies, the dairymen's and breeders' associations, and other related bodies.

The conference was addressed by President J. G. Schurman, of Cornell University; and Hon. Seth Low, of the constitutional convention, and by several others. It was pointed out that at the present time over 150 departments, boards, commissions, and similar agencies are authorized to carry on the State's business and the idea was suggested of a plan of reorganization into a few great departments. The conference adopted resolutions advocating the establishment by a provision in the constitution of a State Department of Agriculture, and appointed a committee of ten with Dean Galloway as chairman to consider the scope and functions of such a department. At an adjourned meeting of the conference, held June 21, this committee submitted a series of resolutions, requesting the establishment of the department of agriculture coordinate with the other state departments, "the chief design and duties of which shall be to administer the regulatory laws relating to agriculture and agricultural production, marketing and distribution, lands, forests, fish, and game, and to instruct the people in regard to the meaning and application of such laws." These resolutions were adopted by the conference.

Massachusetts Agricultural Development Committee.—According to a note in *New England Homestead*, an agricultural development committee is being organized with one member each appointed from the Massachusetts College, the state grange, the state boards of agriculture and education, and three members designated by them. This committee is to outline a plan for studying and mapping the agricultural resources of the State and developing agriculture and country life in a comprehensive way, and to recommend a form of organization and work for state-supported agencies necessary to this development, and for correlating the various organizations, both public and private, designed to benefit country life. It is also to index and codify all state laws on the subject.

Agricultural Work in Cyprus.—The buildings of the department of agriculture comprise a main building containing the offices, lecture rooms for the students of the agricultural school, entomological and chemical laboratories, workshops for students learning bee keeping and basket making, and outbuildings used for the experimental distillation of oils, etc.

The department maintains seven large and several smaller gardens throughout the island and a model farm at Athalassa, near Nicosia, which is giving increasing attention to the breeding of animals. It also directs agricultural experiments in different districts; gives instruction in agriculture to teachers during the summer vacations both in the classroom and by means of outdoor demonstrations; and in collaboration with the department of education has established about 50 school gardens which are under its general guidance and observation.

A series of weekly lectures on agricultural subjects is given at the Theological College, Larnaca, and the officers of the department, when traveling in their districts, advise farmers in regard to field and garden operations.

The experimental garden at Nicosia is being reorganized to serve as an experimental garden, a model orchard for practical instruction both to the students of the agricultural school and the public, a nursery garden for raising fruit seedlings for propagation, and a public promenade.

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[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

International catalogue of scientific literature. D—Chemistry (*Internat. Cat. Sci. Lit., 10 (1913), pp. VIII+934; 11 (1914), pp. VIII+966*).—The tenth and eleventh annual issues of this catalogue (E. S. R., 27, p. 718), which contain subject and author indexes for material received between October, 1910, and October, 1911, and October, 1911, and October, 1912, respectively.

Fibrin, A. W. BOSWORTH (*New York State Sta. Tech. Bul. 41 (1915), pp. 3–6; Jour. Biol. Chem., 20 (1915), No 1, pp. 91–94*).—While working with blood certain observations seemed to indicate that fibrin might possess some chemical properties quite similar to those of casein reported by L. L. Van Slyke and A. W. Bosworth (E. S. R., 29, p. 9).

It was found that "fibrin can combine with both bases and acids to form definite compounds. Fibrin combines with four equivalents of base to form a compound which is neutral to phenolphthalein. Fibrin combines with bases to form a series of three acid salts which contain one, two, and three equivalents of base, respectively. All the combinations of fibrin with sodium, potassium, and ammonium are soluble. The calcium fibrinates containing three and four equivalents of calcium are soluble, the calcium fibrinates containing one and two equivalents of calcium being insoluble. Fibrin combined with one equivalent of acid is insoluble, and combined with more than one equivalent of acid is soluble. Pure fibrin, unlike casein, is not strong enough as an acid to decompose calcium carbonate. The molecular weight of fibrin is about 6,666. Carbon dioxid precipitates fibrin from a solution of calcium fibrinate, but not from a solution of sodium, potassium, or ammonium fibrinate."

The nature of the free amino groups in proteins, D. D. VAN SLYKE and F. J. BIRCHARD (*Jour. Biol. Chem., 16 (1914), No. 4, pp. 539–547*).—"In all the native proteins investigated the amount of free amino nitrogen is equal to one-half the lysin nitrogen, no deviation exceeding the limit of experimental error of the amino and lysin determinations being found in any case, with the possible exception of gliadin, in which the difference is 0.7 per cent. The period required for complete reaction of the proteins with nitrous acid (thirty minutes) is longer than that required by the *a*-amino groups (three to four minutes), but corresponds to that found for lysin, with a *w*-amino group free. The facts support the following conclusions:

"(1) One of the two amino groups of lysin, the *w*-group, exists free in the protein molecule. (2) This group represents, within at most a fraction of a per cent of the protein nitrogen, the entire amount of free NH_2 determinable in the native proteins by the nitrous acid method. The α-amino groups, which constitute the remaining and greater part of the free amino nitrogen found after complete hydrolysis, are, in the intact protein molecule, practically all condensed into peptid linkings. (3) With the primary albumoses the relations are different. The free NH_2 in hetero- and protoalbumose exceeds half the lysin nitrogen, by 3 and 4.2 per cent, respectively, of the total protein nitrogen, indicating that an appreciable portion of the α-amino groups is uncovered in even the primary digestion products."

Newer investigations on the protein metabolism of yeast and mold fungi, F. EHRLICH (*Ztschr. Angew. Chem., 27 (1914), No. 8, Aufsatzteil, pp. 48–52*).—A detailed and critical discussion of the subject, especially in the light of the author's findings.

The constituents of the flowers of Anthemis nobilis, F. B. POWER and H. BROWNING, JR. (*Jour. Chem. Soc. [London], 105 (1914), No. 621, pp. 1829–1845*).—The flower heads of the composite plant, *A. nobilis*, known as the Roman or English camomile, are used to a considerable extent as a medicine and are recognized by the United States, British, and other national pharmacopœias. The material used in this investigation was collected from plants grown in Belgium.

"Apart from the essential oil yielded by distillation with steam, the flowers have been found to contain the following definite compounds: (1) 3:4 dihydroxycinnamic acid; (2) apigenin, $C_{15}H_{10}O_5$; (3) a glucosid of apigenin, $C_{21}H_{20}O_{10},H_2O$ (melting point 178 to 180°), which yields a hexa-acetyl derivative, $C_{33}H_{32}O_{16},4H_2O$, melting at 144 to 146°; (4) cholin, $C_5H_{15}O_2N$; (5) *i*-inositol, $C_6H_6(OH)_6$; (6) triacontane, $C_{30}H_{62}$; (7) taraxasterol, $C_{29}H_{47}.OH$ (melting point 217 to 219°); (8) a phytolsterolin (melting point 280 to 283°), consisting chiefly of sistosterol-*d*-glucosid, $C_{33}H_{56}O_6$; (9) a mixture of fatty acids, consisting of cerotic, stearic, palmitic, oleic, and linoleic acids. The flowers contained, furthermore, a considerable quantity of sugar, which yielded *d*-phenylglucosazone (melting point 208 to 210°). The amount of fatty and resinous material, from which some of the above-mentioned substances were obtained, was equivalent to about 7.4 per cent of the weight of flowers employed.

"The so-called 'anthemic acid' of previous investigators was evidently a very indefinite product, while the 'anthesterol' of Klobb was doubtless a mixture, consisting chiefly of the compound which has been designated by the authors as taraxasterol.

"The bitter taste of camomile flowers appears to be due to dark-colored, amorphous material, and not to any well-defined constituent. It was found, for example, that the portion of the alcoholic extract which is soluble in water yielded, when extracted successively with ether and amyl alcohol, viscous products which possessed an intensely bitter taste."

Investigations on oil of black sage, C. E. BURKE and C. C. SCALIONE (*Jour. Indus. and Engin. Chem., 6 (1914), No. 10, pp. 804–806, figs. 2*).—The oil of black sage (*Ramona stachyoides*), a plant which grows abundantly in California, was studied, first with the idea of determining the yields of camphor and cineol at slightly different seasons of the year, and secondly to determine definitely the other constituents and whether or not any of the constituents were present in sufficient amounts to be commercially important.

Analyses of the oil of black sage showed pinene 6 per cent, cineol 30, dipentene, terpinene, etc., 25, thujone 8, camphor 25, and resinous material 5 per cent. The results also give a good indication as to the variation of the constituents of the oil with the season.

See also a previous note by Rabak (E. S. R., 26, p. 612).

Oils of the Coniferæ.—II, The leaf and twig, and bark oils of white fir, A. W. SCHORGER (*Jour. Indus. and Engin. Chem., 6 (1914), No. 10, pp. 809, 810*).—This continues previous work (E. S. R., 33, p. 18).

The approximate composition of the oils of white fir (*Abies concolor*) is given as follows: *l*-*a*-pinene 12 in leaf and twig oil and 9 per cent in bark oil; *l*-B-pinene 42 and 60 per cent; ester as bornyl acetate 6.5 and 2.5 per cent; free borneol 9.5 and 4.5 per cent; and "green oil" 3 and 5 per cent, respectively. The leaf and twig oil fraction boiling at 170 to 180° C. showed 15 per cent *l*-phellandrene, while the bark oil fraction at the same temperature showed dipentene 12 to 13 per cent. Furfurol was present only in traces in the leaf and twig and in the bark oils, and *l*-camphene was noted only in the leaf and twig oil. The material unaccounted for in the leaf and twig oil was 4 per cent, and in the bark oil 7 per cent.

Milk—its milk sugar, conductivity, and depression of freezing point, LILIAS C. JACKSON and A. C. H. ROTHERA (*Biochem. Jour., 8 (1914), No. 1, pp. 1–27*).—In this paper the results of measurements of the electrical conductivity, percentage of milk sugar, and depression of the freezing point are reported as a basis for drawing certain physiological deductions and interpretations rather than as a means for the identification and characterization of different milks.

"In milks secreted from different quarters of the cow's udder and from the right and left breasts in women the electrical conductivity and percentage of milk sugar show a strict reciprocity, provided that the secretion of the milk samples corresponds to the same period. In this case the milk samples are secreted against the osmotic pressure of the blood with its variation over that period. They will all have the same osmotic pressure, and if in one sample the sugar is higher than in another then the electrical conductivity will be lower. The reciprocity of milk-sugar content and electrical conductivity is well seen in the milks from a pathological gland which is slowly recovering and becoming normal. In a comparison of the milks of different species of animals the reciprocity between milk sugar and electrical conductivity is evident.

"It is shown that the milk secreted under the stimulus of removal (milking or natural suckling) differs in character from that secreted previously. The contention is that the condition of the blood has not kept absolutely constant and that the reflex milk is secreted against a slightly different blood from that against which the previously formed milk was secreted.

"Morning and evening samples of cows' milk have been compared. The evening milk generally has the higher conductivity, but exceptions exist.

"The exact effect of the proteins of cows' milk in diminishing the electrical conductivity has been estimated, the value found being a diminution of 2.76 per cent of the conductivity for every 1 per cent of protein in the milk. The dialysis experiments employed for determining this effect showed no difference between raw fresh milk and the same boiled for one hour. Also, there was no evidence that boiling has any effect on soluble calcium salts in a state of ionization.

"The effect of climatic changes upon a Holstein herd of cows has been studied. The generalization holds that hot, dry weather increases the electrical conductivity of the milk, whilst wet or cold weather diminishes it. The climatic conditions affect the cows and so indirectly their milk."

On the phosphorus content of starch, A. W. THOMAS (*Biochem. Bul., 3 (1914), Nos. 11–12, pp. 403–406*).—Positive experiments confirm the conclusions of Ford [a] and Fouard [b] that it is impossible to free starch entirely of phosphorus.

[a] Jour. Soc. Chem. Indus., 23 (1904), No. 8, pp. 414–422.

[b] Compt. Rend. Acad. Sci. [Paris], 144 (1907), No. 9, pp. 501–503.

Gravimetric estimation of nitrites, N. BUSVOLD (*Chem. Ztg.*, *38* (*1914*), *No 3*, *p. 28*).—Finding the methods of Lunge, Gerlinger, and Fischer unsatisfactory, one based on the reaction of nitrous acid with bromic acid was studied, as follows: From 1.4 to 1.5 gm. of silver bromate is dissolved in a 750-cc. Erlenmeyer flask in 100 cc. of water and 110 cc. of twice-normal acetic acid solution is added and heated at 80° C. until solution takes place. Then from a dropping funnel provided with a burette tip, 200 cc. of nitrite solution containing 1 gm. of sodium nitrite is allowed to flow dropwise, amid shaking, into the flask until a faint green-colored precipitate of silver bromid is produced. After the funnel has been rinsed out three times with water 30 cc. of sulphuric acid, 1:4, at 85° is added, heated until the fluid becomes clear and the precipitate a light yellow, filtered through a Gooch crucible, and washed with 1 liter of boiling water. The silver bromid is dried at 130° and weighed.

Parallel analyses rarely differed over +0.001, which corresponds to an error of 0.1 per cent, whereas with the Lunge permanganate method it was difficult to get a greater degree of accuracy than 0.3 per cent. Theoretically, above 0.907 gm. of silver bromid corresponds to 1 gm. of sodium nitrite, and an equivalent of 0.8936 gm. of silver bromid was found, which equals 98.5 per cent of sodium nitrite. The permanganate method gave 98.3 per cent.

Observations on the separation and determination of phosphoric acid as ammonium-magnesium phosphate, H. LESCOEUR (*Bul. Soc. Ind. Nord. France*, *42* (*1914*), *pp. 93–97; abs. in Ztschr. Angew. Chem.*, *27* (*1914*), *No. 59*, *Referatenteil*, *p. 459*).—The first part of this paper deals with the separation of phosphoric acid as ammonium magnesium phosphate. Attention is called to Varington's method in which the precipitation of calcium, iron, and aluminum phosphates with the magnesium phosphate is prevented by the addition of citric acid. The process as conducted by Joulie is described.

The second portion of the paper, which deals with the weighing of phosphoric acid as ammonium magnesium phosphate, emphasizes the fact that the phosphate precipitates often contain an excess of magnesium. The quantity of magnesium chlorid solution used in the precipitation is in direct proportion to the magnesium content of the precipitate. If, however, the precipitate is dissolved in hydrochloric acid and reprecipitated with ammonia, the pure substance is obtained.

The chemical analyses of soils, A. MITSCHERLICH (*Internat. Mitt. Bodenk.*, *4* (*1914*), *No. 4–5*, *pp. 327–335*).—A discussion of existing chemical methods of soil analyses.

The continuous extraction methods are given the preference, because they employ the same strength of acid throughout the entire procedure and have no interference from salts which have previously gone into solution. The author's carbonic-acid-extraction method is discussed in this connection. Before an international method is accepted it is held that we must be sure that it rests on a plant physiological basis, and the results obtained by it must bear some relation to crop yield. The author's quantitative formulation of the law of minimum is proposed as a basis for such a method. It is said that most of the methods in use for determining the permeability of soils by water do not give duplicate results.

Contribution to the complete chemical analysis of soils, A. A. J. VON 'SIGMOND (*Internat. Mitt. Bodenk.*, *4* (*1914*), *No. 4–5*, *pp. 336–362*).—It is stated that extraction of soil with boiling concentrated hydrochloric acid for two hours, or with sulphuric acid, will not serve as a measure for determining weathered soil constituents (weathering complexes, weathering silicates, soil zeolites, or zeolitic soil constituents). Sandy grains of soil from 2 to 0.02 mm. in size were appreciably attacked when boiling in concentrated hydrochloric acid (specific gravity 1.115) for one hour.

Comparisons were also made of the methods usually employed for dissolving soil constituents, including the Hilgard official, boiling for one hour with hydrochloric acid (specific gravity 1.115), and the Russian, with 10 per cent hydrochloric acid (Gedroits) methods. The greatest solubility of soil constituents was obtained with Hilgard's method and the least by the Russian method. The Hilgard method not only showed the highest potassium oxid, aluminum oxid, and silicic oxid content, but also the largest amount of magnesium oxid, ferric oxid, and sulphuric acid. The official method was in some respects second to Hilgard's method. Biotite, chlorite, calcite, apatite, corundolite, magnetite, and augite when boiled with hydrochloric acid (1.115 specific gravity) for one hour were dissolved, but not microcline, orthoclase, plagioclase, muscovite, tourmaline, amphibole, epidote, hypersthene, staurolite, cyanite, rutile, zircon, ilmenite, and granatite. Treatment with a 10 per cent solution of hydrochloric acid for 10 hours in the water bath dissolved all the minerals soluble in hydrochloric acid of a specific gravity of 1.115, and had also some effect on microcline. Treatment with hydrochloric acid of a specific gravity of 1.115 for 10 hours dissolved all minerals soluble in the same strength of hydrochloric acid in the one-hour period of boiling and had some effect on microcline, plagioclase, muscovite, and amphibole. By treating with hydrochloric acid of a specific gravity of 1.115 according to Hilgard's method for 120 hours in the water bath orthoclase, plagioclase, and the substances soluble in the same strength of hydrochloric acid by boiling for one hour were dissolved, and microcline, muscovite, and amphibole were affected. By the 10-hour treatment and the 120-hour treatment granatite was increased, and by the 120-hour treatment with hydrochloric acid staurolite was increased. Crude clay removed from a soil by means of a centrifuge when subjected to hydrochloric acid (specific gravity 1.115) for 1 and 120 hours, respectively, showed that the greatest solution of the monoxids took place by the 120-hour exposure. An anomaly was noted in the case of soluble silicic acid, however, because less was found after the 120-hour exposure than after the 1-hour treatment.

The characterization of soils on the basis of the chemical analysis is discussed.

Report on the work of the International Commission for chemical soil analysis, A. A. J. VON 'SIGMOND (*Internat. Mitt. Bodenk., 4 (1914), No. 4–5, pp. 271–279*).—A compilation of the most important determinations to be made for judging soils. The references to the literature are given.

The fundamental questions in preparing soil solutions for chemical analysis, A. A. J. VON 'SIGMOND (*Internat. Mitt. Bodenk., 4 (1914), No 4–5, pp. 279–296*).—For purposes of completeness these data on methods were submitted with the above report.

Contribution to methods of soil analyses, R. ALBERT and O. BOGS (*Internat. Mitt. Bodenk., 4 (1914), No. 2–3, pp. 181–198*).—A report on attempts to simplify existing methods for humus, moisture, and specific gravity of soil.

It was found that the Knop method for humus does not show a sharp end point and the glass parts of the apparatus are often attacked and must be frequently replaced. If the sample of soil is rubbed up gently in a porcelain mortar the method will yield very satisfactory results. The amount of carbon dioxid produced multiplied by 0.471 equals the humus content of the soil. The Wahnschaffe suggestion to keep soil in contact with sulphuric acid before the regular oxidation process is deemed a disadvantage rather than an advantage.

Figures obtained by the elementary analysis method according to Dennstedt [a] were generally higher than those given by the Knop method. Only in the case

[a] Anleitung zur vereinfachten Elementaranalyse, Hamburg, 1906, 2. ed., pp. 99, figs. 20.

of lime soils were the results comparable. Evidently it is advisable to determine the calcium content of each soil before making a humus determination by this method. The interference of carbonate may be obviated by evaporating the soil with an aqueous solution of sulphurous acid. The advantages of the Dennstedt method are said to lie in the fact that the results are more accurate and one can determine at the same time the loss in weight of a soil by incineration.

Physically bound water of the soil was determined by four methods, viz, in the toluol drying oven at 105° C. (for 3, 6, 9, and 12 hours), in a vacuum desiccator over phosphorus pentoxid according to Mitscherlich, at 105° C. in the air bath to constant weight, and by the Schwalbe distillation method.[a] It is concluded that for sandy soils drying in the air bath to constant weight between 105 and 106° C. will yield satisfactory results. In loam clay and moor soils the method of Mitscherlich or the distillation method of Schwalbe will serve best. As the latter method is exact enough for ordinary purposes, in view of the simplicity and speed with which it may be conducted, it is given preference over the Mitscherlich procedure.

For determining the specific gravity the von Wrochem[b] modification of the Erdmenger and Mann method was found preferable to the pycnometer with water, and the pycnometer with oil of turpentine. In this method 20 gm. of the powdered substance in an absolutely air dry condition is placed in a 50 cc. flask containing 25 cc. of pure oil of turpentine run in from a 50 cc. burette. The mixture is then rotated several times to remove air from the soil pores and the flask is filled to the 50 cc. mark. The number of cubic centimeters of turpentine remaining in the burette divided by the weight of the soil employed equals the specific gravity of the soil.

A new test for soil acidity, E. TRUOG (*Wisconsin Sta. Bul. 249 (1915), pp. 16, pl. 1, figs. 4*).—A popular description of the test previously noted (E. S. R., 32, p. 610) with simple directions for making it. In order that the test may be carried out on the farm or field a compact form of apparatus has been devised which is illustrated. "The apparatus with accessories fits snugly into a small carrying case 5½ by 7½ by 9 in."

The availability of nitrogen in kelp, J. A. CULLEN (*Jour. Indus. and Engin. Chem., 6 (1914), No. 7, pp. 581, 582*).—In view of the widespread interest in kelp as a source of American potash some information as to the value and nature of the nitrogenous substances present in this plant is reported. The methods used were the official alkaline permanganate method (E. S. R., 23, p. 9) and some modifications of it. The neutral permanganate method noted by Street (E. S. R., 23, p. 706) could not be used on account of a bulky residue and the resistance to filtration.

The official alkaline permanganate method, in its present form, was not suited for kelp, but by using increased amounts of potassium permanganate a higher availability was obtained. If an adequate amount of potassium permanganate is used to oxidize all the organic matter present, all, or nearly all, of the nitrogen is found available.

The chemical examination of water, sewage, foods, and other substances, J. E. PURVIS and T. R. HODGSON (*Cambridge, Mass.: Harvard University Press, 1914, pp. 228*).—This is intended as a text-book for the use of students of public health, health officers, and food chemists. Chemical analysis of water, sewage,

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[a] Ztschr. Angew. Chem., 21 (1908), Nos. 9, pp. 400–402, fig. 1; 45, pp. 2311, 2312.

[b] Mitt. K. Materialprüfungsamt Gross-Lichterfelde West, 22 (1904), No. 5, pp. 217–220, figs. 3.

and sewage effluents is considered in the first chapter, but the bulk of the text deals with the chemical examination of miscellaneous food products. Selected analytical methods which have been employed by the authors in their laboratory are described, and information is given regarding the natural properties of foods, the detection of poisonous metals, and preservatives in foods. Chapters are also devoted to gas and urine analysis.

The determination of carbon by the wet method, F. H. THIES (*Chem. Ztg.*, 38 (1914), No. 11, pp. 115, 116, figs. 2).—An improvement of the author's method which allows the estimation of halogen and nitrogen at the same time with the carbon. The products of oxidation obtained with potassium dichromate sulphuric acid mixture are passed over heated lime to absorb the halogen and part of the carbon dioxid and then through a weighed soda lime tube to absorb the remaining carbon dioxid. If iodin is present silver nitrate is added to the oxidation flask to retain the iodin as silver iodid. In this case bromin and chlorin are not retained.

Triketohydrindene hydrate: A method for the quantitative estimation of the NH_2COOH group, E. HERZFELD (*Biochem. Ztschr.*, 59 (1914), No. 3-4, pp. 249-259).—The method consists of evaporating the substance under examination with triketohydrindene hydrate or ninhydrin (E. S. R., 26, p. 804) and taking up the residue with alcohol. The extinction coefficient of the solution is measured by the spectrophotometer. The method has been applied to the dialyzate obtained in the Abderhalden method for diagnosing pregnancy (E. S. R., 31, pp. 278, 279).

The determination of invert sugar in the presence of saccharose, E. SAILLARD (*Jour. Fabric. Sucr.*, 55 (1914), No. 3, p. 1; abs. in *Chem. Ztg.*, 38 (1914), No. 41, Repert., p. 195).—In the presence of sucrose, as Pessoz has long since shown, only solutions containing a small amount of free alkali or none at all should be used in making the determination. It is claimed that Bertrand's method does not yield reliable results in the presence of sucrose.

Modification of Clerget's method for the estimation of sugar in molasses, V. STANĚK (*Ztschr. Zuckerindus. Böhmen*, 38 (1914), No. 9, pp. 429-440, fig. 1; abs. in *Jour. Chem. Soc.* [London], 106 (1914), No. 621, II, pp. 586, 587).—In the process described the molasses is decolorized, clarified with bromin, and polarized in the presence of definite quantities of citric acid and potassium chlorid. The bromin has no effect upon sucrose and invert sugar.

Two citrate solutions are employed, and are prepared by mixing 380 gm. of potassium hydroxid with 250 cc. of water. "When about three-fourths of the hydroxid has dissolved, the solution is decanted and 400 gm. of citric acid mixed with 200 cc. of water added to it. The remaining hydroxid is then dissolved in water and added to the citrate solution until the latter is feebly alkaline to phenolphthalein; the solution is now cooled and diluted to 1 liter (neutral citrate solution). Five hundred cc. of this solution is then mixed with 250 cc. of hydrochloric acid (specific gravity 1.188), and diluted to 1 liter (acid citrate solution). A double-normal quantity of the molasses is dissolved in water and diluted to 200 cc. Fifty cc. of this solution is transferred to a 100-cc. flask, 20 cc. of the acid citrate solution is added, and the mixture is diluted to 100 cc. with saturated bromin water; after filtration, the solution is polarized in a 200-mm. tube. A second quantity of 50 cc. of the molasses solution is now treated with 10 cc. of hydrochloric acid (1:1), inverted, cooled to 20°, 10 cc. of neutral citrate solution is added, and the solution is diluted to 100 cc. with bromin water. The reading is taken after the lapse of 20 minutes. An inversion-constant of 132.6 is employed in calculating the quantities of sucrose and invert sugar from the readings obtained at 20°."

Maple sap products and the Canadian standards, J. F. SNELL (*Jour. Soc. Chem. Indus., 33 (1914), No. 10, pp. 507–515, figs. 2*).—This discusses the history of the maple sugar industry (briefly), methods of manufacture, adulteration of maple sirup, composition of maple sugar sand, history of standards of maple products and the standards at present adhered to, methods of analysis, existing standards, value of the conductivity test for examining maple products (E. S. R., 31, p. 610), a scheme of rapid analysis (E. S. R., 31 p. 611), maple sugar making as an agricultural industry, analytical values of pure maple sirup, Canadian census returns on maple sap products in 1910, and a comparison of maple with other farm products in the Province of Quebec for 1911.

Detection of added water in milk by a simplified molecular concentration constant, L. MATHIEU and L. FERRÉ (*Ann. Falsif., 7 (1914), No. 63, pp. 12–21; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 4, p. 214*).—"The simplified molecular concentration constant denotes the sum of the weight of crystallized lactose and of the sodium chlorid expressed as the isotonic equivalent of lactose. For instance, a milk containing 54.5 gm. of lactose and 1.4 gm. of sodium chlorid per liter would give a constant of $54.5+(1.4\times11.9)=71.2$, since 1 gm. of sodium chlorid is the isotonic equivalent of 11.9 gm. of lactose. The constant must be corrected for the volume of the fat and casein; the volume of the calcium phosphate may be neglected. This correction, taking extreme cases, varies from 1.03 to 1.1 and in the majority of milks it is 1.07; that is to say, the constant found as above must be multiplied by 1.07 to give the true value. With most milks the value of the constant lies between 74 and 79 and will fall below 73 when the milk contains from 5 to 8 per cent of added water."

Uniform acidity degree for the testing of milk, W. MORRES (*Milchw. Zentbl., 43 (1914), No. 9, pp. 229–233*).—A criticism of existing standards and methods for the acidity of milk. The A. Marshall modification of the Dornic method which consists of using 9 cc. of milk and titrating with 1 decinormal sodium hydroxid solution is recommended. By this procedure a direct result is given.

Estimation of the fat content according to Kooper and total solids determination according to Mai and Rheinberger in cheese, KLOSE (*Milchw. Zentbl., 43 (1914), No. 9, pp. 225–229*).—In a comparative study of the Kooper (E. S. R., 30, p. 207), the Wendler neu-sal (E. S. R., 30, p. 208), and the Bondzynski and Ratzlaff (E. S. R., 16, p. 440) procedures for determining fat in cheese of various kinds, the highest results were obtained by the last-named method, followed by the Kooper method. The results by the Wendler neu-sal were most unfavorable.

A study of methods for total solids included those of Mai and Rheinberger and the sea-sand method (drying the cheese in sea sand to constant weight without preliminary drying). In the Mai and Rheinberger method three-quarters of an hour of distillation did not always give the correct result. The temperature at which distillation is done is of great moment and should not exceed 200° C., as otherwise it yields low results. It is further necessary, in order to get results comparable with those given by the sea-sand method, to allow the petroleum layers to become thoroughly clear.

A new method for the determination of zinc in treated wood, M. H. BEDFORD and R. PFANSTIEL (*Jour. Indus. and Engin. Chem., 6 (1914), No. 10, p. 811, figs. 2*).—The various methods proposed for determining zinc in wood treated with zinc chlorid are based upon the manner in which the organic matter is destroyed. In the case of hardwoods, particularly red oak, it was found that certain organic compounds were not destroyed by some of the ordinary processes. A modification of the methods in use was therefore attempted, the present investigation being carried out entirely with red oak.

"The details of the procedure adopted are as follows: Three gm. of red oak sawdust, previously dried at 110° C., is treated with 1 cc. of zinc chlorid solution equivalent to 0.035 gm. of metallic zinc and dried at 110°. The sawdust is then mixed with 35 gm. of sodium peroxid and fired in the bomb. After the explosion the bomb is cooled in water, and distilled water added through the plug. The contents are dissolved by heating on a water bath. The solution is then transferred to a beaker, acidified with concentrated hydrochloric acid, and boiled for a few minutes. Two gm. of citric acid, 10 cc. concentrated nitric acid, and 5 cc. of 8 per cent ferric chlorid solution are added. The solution is then made alkaline and 2 cc. excess of concentrated ammonium hydroxid is added. After dilution to 400 cc., the solution is titrated at 80° with potassium ferrocyanid. An outside indicator of equal parts of glacial acetic acid and glycerin is used.

"The potassium ferrocyanid solution is made by dissolving 5 gm. of the salt in 1 liter of water and is standardized against the zinc chlorid solution under the same conditions as exist in the charge. A blank is also run on 3 gm. of the untreated wood and subtracted from each determination. It is necessary to keep the conditions the same throughout the titration. An excess of ammonia is necessary to keep the solution from turning blue, but a large excess prolongs the end point. The time required for a determination is about 25 minutes. The accuracy of this method is shown by a set of six consecutive determinations."

Apple sirup and concentrated cider: New products for utilizing surplus and cull apples, H. C. GORE (*U. S. Dept. Agr. Yearbook 1914, pp. 227–244, figs. 2*).—The first part of this paper gives directions for preparing apple sirup, from cull and other apples too small for retail sale, for home use on the farm and on a commercial scale. Essentially the process consists in treating the expressed apple juice with milk or carbonate of lime (the latter is preferred for sirup making in the home) for the purpose of removing malic acid, and after clarification condensing to the proper concentration. In the commercial manufacture of sirup, especially as a by-product of a steam cider mill, the juice after neutralizing is treated with finely bolted infusorial earth (17.5 lbs. to 100 gals. of neutralized juice) and filtered through a filter press. The filtered juice is then evaporated to the proper consistency.

The cost of making sirup on a commercial scale as nearly as can be determined is probably slightly greater than making sirup from cane or sorghum. The cost of sirup exclusive of investment and depreciation charges, and of fuel and labor, which vary in different localities, is about 45 cts. per gallon. The malate of lime may eventually be sold to chemical firms preparing malic acid.

Some recipes for cooking and candy making developed in the Office of Nutrition Investigations are included.

The second part of the paper deals with the concentration of sweet cider by freezing as a fall activity for ice and cold-storage plants in apple sections. In experiments on a commercial scale in concentrating apple juice by artificial freezing during the apple-bearing seasons of 1913 and 1914, in connection with a cider mill located near a commercial ice-making plant in the apple-growing regions of Oregon, it was found that 5 gal. of apple juice could be reduced to 1 gal. of sirupy cider concentrate. "It was found that while the concentrated cider would not keep indefinitely under household conditions, its larger percentage of sugars and acids kept it from fermenting as quickly as ordinary cider. When kept cool, as in a household refrigerator, concentrated cider, it was found, would not spoil for many weeks. When kept at or below 32° F. in cold storage it was found that concentrated cider could be kept from one season to the next and thus make fresh cider available [by simply diluting the sirup with water] as a beverage during the summer months."

The method calls for but slight additions to the ordinary equipment of an ice-making or cold-storage plant. A brief description of the manufacture of this concentrated cider on a commercial scale and the machinery necessary is given. The estimate of the cost per gallon for the preparation of cider concentrated by freezing—that is, for raw material, freezing, labor, filtering, power, interest, depreciation, superintendence, and other charges—is about 50 cts. per gallon.

Methods followed in the commercial canning of foods, A. W. BITTING (*U. S. Dept. Agr. Bul. 196 (1915), pp. 79, pls. 3*).—A revision of the Bureau of Chemistry Bulletin 151 noted previously (E. S. R., 27, p. 313), incorporating a summary of results of experiments carried out, especially in the experimental laboratory established at San Francisco in 1912, during the seasons of 1912 and 1913. "The general plan of the experimental work in canning involved the use of underripe, prime ripe, overripe, and spoiled fruits of all the varieties canned, to determine the appearance and effect upon the finished product. . . . The object throughout all the experiments has been to duplicate factory operations and not to attempt to make mathematical standards." Certain phases of the manufacturing processes have been enlarged upon.

Microscopical studies on cotton, A. HERZOG (*Chem. Ztg., 38 (1914), Nos. 114–115, pp. 1089–1091, figs. 3; 116–117, pp. 1097–1100, figs. 6*).—The first portion of this work deals exclusively with the dead or unripe cotton fiber. This type of fiber is thin-walled and when woven into cloth has a tendency to show up as knots. Part 2 of the work considers the beard fiber of cotton, and part 3 discusses the determination of the mercerizing capacity of cotton fibers with the microscope.

METEOROLOGY.

Popular misconceptions concerning the weather, A. H. PALMER (*Pop. Sci. Mo., 86 (1915), No. 2, pp. 128–141*).—The author points out, among other things, that, contrary to popular belief, the weather is not influenced by phases of the moon or the position of the planets; there is no connection between weather and earthquakes or magnetic disturbances; forests have much less influence on weather than has been supposed; the climate is not changing; there is no known relation between the weather of one day, season, or year and that of the following day, season, or year; while storms follow pretty well-defined tracks, they have no one starting point; there is no such thing as Indian summer as popularly understood; animals have no previous knowledge of weather changes; concussions do not cause precipitation; cold waves are not generally produced from the descent of cold air from above, but are "caused primarily by the horizontal transportation of huge masses of cold air from the cold continental interior, and are heightened by the increased radiation from the ground through clear, dry air thus brought in;" night air is not essentially different from day air; the importance of ozone in the air is popularly overestimated; the so-called equinoctial storm is a fiction; thunderstorms do not follow valleys; and lightning may strike many times in the same place.

Emphasis is laid upon the fact that too much importance is generally attached to mean and not enough to extreme conditions of the weather. Attention is called to the fact that there is rather widespread misconception as to the sources of rainfall and hail.

Story of the thermometer and its uses in agriculture, A. H. THIESSEN (*U. S. Dept. Agr. Yearbook 1914, pp. 157–166, figs. 4*).—This article discusses the history and construction of the thermometer and explains its use in candy making and cooking, in the dairy, in the incubator, and in orchards, as well as occasional uses, such as in the detection of fever in farm animals.

The variation with meteorological conditions of the amount of radium emanation in the atmosphere, in the soil gas, and in the air exhaled from the surface of the ground at Manila, J. R. Wright and O. F. Smith (*Phys. Rev., 2. ser., 5 (1915), No. 6, pp. 459–482, fig. 1*).—In continuation of observations previously reported (E. S. R., 31, p. 511), an attempt was made to determine definitely to what extent the amount of radium emanation in the air is dependent on weather conditions. The methods used were substantially the same as those employed in the previous observations.

As a result of observations extending over about 13 months, the variation of the radium-emanation content of the atmosphere was found to follow quite closely the variations in rainfall and wind movement. "The ratio of the maximum to the minimum for the year was found to be appproximately as 10:1. The mean of the monthly means gives for the radium equivalent of the emanation per cubic meter of air a value of 71×10^{-12} gm. The month of January shows the highest monthly mean for the radium-emanation content, the minimum value for the rainfall, and a low value for the total wind movement. The month of July gives the lowest monthly mean for the emanation content, the maximum value for the rainfall, and the highest total wind movement. Every other month of the year shows a very similar relation. No direct connection has been discovered between the emanation content and atmospheric pressure or humidity. The effect of the direction of the wind seems at best very indefinite."

The emanation content was considerably greater during the night than during the day. "Observations for the interval from 11 p. m. to 5 a. m. gave a mean value 3.31 times greater than the mean value for the interval from 11 a. m. to 5 p. m. This variation has been found to be closely related to the variation in the total wind movement during the period, a high value of the wind movement corresponding to a low value of the emanation content.

"The rate at which radium emanation is exhaled from the surface of the ground shows a decided decrease after periods of heavy rain. This decrease has been found in some cases to be almost 60 per cent of the rate of exhalation for fair weather."

The radium-emanation content of soil gas was determined at depths of 30, 70, and 120 cm., respectively. The variation in the radioactivity of the gas collected at a depth of 30 cm. was found to follow closely the variation in the emanation exhaled from the surface of the soil, a decrease in the exhalation resulting in a corresponding increase in the emanation content of the soil gas. Soil gas collected at depths of 70 and 120 cm. showed only slight variations with the weather conditions. "The average value of the emanation content for the gas collected from the 120-cm. pipe was found to be a 304.5×10^{-12} gm. per liter, or over 4,000 times the mean value for atmospheric air. The mean value for the 30-cm. pipe was only about one-seventh that for the 120-cm. pipe."

[Meteorological observations], R. O'Connor et al. (*Ann. Rpt. Dept. Agr. Trinidad and Tobago, 1913–14, pp. 34, 61–67*).—Tables show the rainfall during the year ended March 31, 1914, at River Estate, from 1862 to 1913, inclusive, at the Royal Botanic Gardens, and for the calendar year 1913 at other places in Trinidad and Tobago, as well as various meteorological observations during 1913 and preceding years at the St. Clair Experiment Station, Trinidad.

Weather conditions (*Union So. Africa Dept. Agr. Rpt. 1913–14, pp. 287–291*).—The general weather conditions in the Union of South Africa during the year ended March 31, 1914, are described and tables showing rainfall at various places in the country are given. It is stated that during the period named "the weather over the Union as a whole was characterized by practically the same features as during the preceding twelve months, viz, a shortage of rainfall, unusual warmth, hot, drying winds during spring, with unseasonable late frosts in the east and center of the Cape Province."

Relative reliability of long-time rainfall observations, F. H. MILLARD (*Engin. News, 73 (1915), No. 25, p. 1212, figs. 2*).—Studies of a 63-year rainfall record at Milwaukee, Wis., and of a 100-year record at New Bedford, Mass., to observe the maximum and minimum average rainfall per year obtained by combining consecutive years into groups of varying lengths, brought out the fact that "the variations above the average are considerably larger than the variations below the average, and that if one is to observe for a short period only, the variation above the average is likely to be appreciably larger than the variation below the average. . . . In one case the maximum single year exceeded the average by over 60 per cent, while the minimum year was less than the average by 40 per cent. In the other case the figures show a variation of 40 per cent above the average for the maximum and 26 per cent below the average for the minimum. Taking 10-year periods, the maximum is only 16 per cent greater than the average, while the minimum is 13 per cent less in one case, the maximum being 17 per cent greater and the minimum 7 per cent less in the other case."

Average rainfall in the light of the New Bedford record, N. M. STINEMAN (*Engin. News, 73 (1915), No. 25, p. 1213, fig. 1*).—Studies of a 100-year rainfall record at New Bedford, Mass., to determine the value of records of much shorter duration are reported.

It was found that a 5-year record based on the New Bedford record is too short to give dependable results. The 10-year curve is more regular than the 5-year curve, but the 20-year averages vary from 4.2 per cent below the 100-year average to 6 per cent above. "Hence, during the entire century it would not have been possible to select any 20 successive years in which the average rainfall would have deviated by more than 6 per cent from the 100-year average."

Rainfall and production, L. McCOOK (*Agr. Gaz. N. S. Wales, 26 (1915), No. 5, pp. 389, 390, pls. 2*).—Two charts, showing graphically the variations in annual rainfall and yields of wheat and number of sheep in Queensland from 1873 to 1914, are given and briefly discussed.

The charts show the depressing effect on wheat yield of the droughts of 1888 and 1902, especially the latter, which followed six years of low average rainfall. The drought of 1888 had little effect on sheep production, but that of 1902 was disastrous. There was slow but steady expansion of wheat production and a more rapid increase in sheep production up to 1891. Thereafter wheat production rapidly increased while sheep production declined.

SOILS—FERTILIZERS.

Soil experiments on the level prairies of northeast Missouri, M. F. MILLER, C. B. HUTCHISON, and R. R. HUDELSON (*Missouri Sta. Bul. 126 (1915), pp. 317–354, figs. 6*).—These experiments were begun in one case in 1905 and in two cases in 1907. The soil on which the experiments were made is known as the Putnam silt loam, which includes practically all of the level prairie lands of northeast Missouri. "The surface soil consists of a gray to dark gray silt loam, from 8 to 10 in. deep, underlain by an ashy gray silt faintly mottled with yellow. . . . Beneath this is a clay subsoil, beginning abruptly at an average depth of about 18 in., which is made up of two layers. The upper layer is a stiff, almost impervious, chocolate brown to grayish brown clay faintly mottled with red and from 6 to 10 in. in thickness. The lower layer is a silty clay, gray in color, mottled with yellow and brown. . . .

"The chemical analyses of the soil from this area show it to have a comparatively large supply of potassium and a fair supply of phosphorus. It is somewhat low in nitrogen and in vegetable or organic material. . . . These analyses also show that the soil is acid. . . . Another characteristic of the soil in question is the presence of a heavy clay layer in the subsoil which . . . interferes with drainage and air supply."

The experiments were made on three fields in four series of five, nine, and eight ⅛-acre plats. The fertilizer treatments included the use of green manures, bone meal, rock phosphate, muriate of potash, ground limestone, and barnyard manure. The experiments indicate that when quick profits are necessary readily available forms of phosphorus would best be added to the soil.

"The important considerations in handling soils of this type are the adoption of a good crop rotation; the application of 2 or 3 tons of ground limestone, thoroughly worked into the soil, and followed by additional applications of 1 ton every six years; the use of all the manure possible to secure at a cost not exceeding $1.50 per ton, including hauling and spreading it on the field—this to be applied chiefly before the corn crop; and, finally, the application of 150 to 200 lbs. of steamed bone meal or acid phosphate to be drilled in with the wheat where this crop is used in the rotation."

Soil experiments on the dark prairies of central and northeast Missouri, M. F. Miller, C. B. Hutchison, and R. R. Hudelson (*Missouri Sta. Bul. 127 (1915), pp. 355–384, figs. 7*).—The soil on which these experiments were conducted is the Grundy silt loam, which occupies the undulating to gently rolling prairie of northeast and north-central Missouri. It "consists of a very dark brown to nearly black silt loam, 9 to 12 in. deep, gradually becoming lighter in color with increasing depth. The subsoil consists of a dark drab, plastic clay loam changing at 30 in. to a yellow gray silty clay mottled with brown."

The experiments were conducted on three fields, in three, four, and one series of five, eight, and five plats, respectively. The fertilizer treatment on the first field included the use of green manures, ground limestone, bone meal, and muriate of potash, and on the second field rock phosphate and barnyard manure were used in addition. The rotation on the second field was one of corn, oats, wheat, and clover, substituting cowpeas for the clover in case of clover failure. The experiments on the third field were planned chiefly as a test of the effect of catch and cover crops on soil fertility, and included also a test of bone meal and rock phosphate in combination with pasturing.

The results of the experiments indicate that this soil is deficient in both nitrogen and organic matter and that the supplies of phosphorus and potassium, while considerably above those of an average soil, are largely in unavailable forms. The soil is also acid.

Some profit was derived from all the treatments except cowpeas drilled in the corn at the last cultivation for a green-manure crop. "The use of manure and lime have both brought consistent and valuable net returns, while good average net returns have also been secured from the use of phosphorus, and fair returns from the use of potassium."

Specific recommendations for the management of this soil to increase its productiveness are given.

Soil experiments on the rolling glacial land of north Missouri, M. F. Miller, C. B. Hutchison, and R. R. Hudelson (*Missouri Sta. Bul. 128 (1915), pp. 385–401, figs. 4*).—The soil on which these experiments, begun in 1907, were conducted consists of weathered glacial till and is classified as typical Shelby loam. "The surface soil is a very dark brown loam to fine sandy loam, changing at about 10 in. to a light brown or grayish brown heavy loam faintly mottled with reddish brown. The subsoil below 18 in. is a light brown or yellowish brown stiff sandy clay, usually mottled brown and gray in the lower portion. The surface soil and the lower subsoil contain more sand than the middle portion of the soil section."

The experiments were made on four series of seven plats. The fertilizer treatment included the use of green manures, barnyard manure, bone meal or rock phosphate, potassium chlorid, and ground limestone. The rotation practiced consisted of corn, oats, wheat, and clover, with cowpeas substituted when clover failed.

The results of the experiments and of chemical analysis indicate that this soil is somewhat acid, is low in its supply of nitrogen, organic matter, and phosphorus, and is apparently well supplied with potassium. Additions of bone meal and potash brought good returns and lime brought fair returns, while the use of complete fertilizers and lime nearly doubled the cost of treatment.

Specific recommendations for the management of this soil to increase its productiveness are given.

Soil experiments on the red limestone upland of southwest Missouri, M. F. Miller, C. B. Hutchison, and R. R. Hudelson (*Missouri Sta. Bul. 129* (*1915*), *pp. 403–421, figs. 5*).—This is the second report on soil experiments which have been previously described (E. S. R., 23, p. 21). It is stated that the most marked return secured from the soil treatments given in these experiments has been with phosphates, the second with potash, and the third with lime.

A careful system of rotation including an abundance of legumes with free use of phosphates and some potash is suggested as the best treatment for this type of soil. "Rock phosphate may be used as a part of the phosphate application where much organic matter is added to the soil. From 800 to 1,000 lbs. per acre may be used once in 6 to 8 years. This should be supplemented with readily available phosphates and some potash, applied before wheat."

Soil experiments on the gray prairie of southwest Missouri, M. F. Miller, C. B. Hutchison, and R. R. Hudelson (*Missouri Sta. Bul. 130* (*1915*), *pp. 423–442, figs. 4*).—This is a second report on experiments begun in 1906 (E. S. R., 23, p. 20).

The soil on which the experiments were conducted is the Cherokee silt loam, which is said to be derived chiefly from a fine argillaceous shale. "It is from 8 to 10 in. in depth, of a gray color, and somewhat ashy in appearance. From 10 to 18 in. in depth it is a lighter gray in color with a yellowish tinge. At about 20 in. it abruptly becomes heavy and sticky and is somewhat mottled with reddish brown. From 20 to 30 in. in depth this mottled plastic layer is very heavy. Below 40 in. the texture is somewhat coarser. . . . The chemical analysis of this soil shows it to be deficient in all the main elements of fertility, particularly in nitrogen. The shortage of phosphorus and potassium is distinct but not quite so marked." The soil in general is acid. The subsoil contains less nitrogen and potassium and more phosphorus than the surface soil and is only slightly more acid.

The experiments were made on three series of seven $\frac{1}{8}$-acre plats. The fertilizer treatment included the use of green manures, bone meal, muriate of potash, and ground limstone. The rotation consisted of corn, cowpeas, wheat, and clover, with oats substituted for wheat and cowpeas for clover in several cases.

The eight years' experiments show that "the most profitable system of soil management tried is one using green manure catch crops to supply organic matter and nitrogen, bone meal to supply phosphorus, and chlorid (muriate) of potash to supply available potassium. Lime has not proved profitable as an average of the entire period, though it was profitable during the first two or three years." The results of seven years' tile draining experiments show that "the increased yields, . . . with tile laid at intervals of 6 rods, have paid the cost and a fair rate of interest on the investment." The results of blasting experiments on this soil showed that an average annual increase in crops valued at $1.60 per acre was obtained, while the cost of the blasting was $12 to $15 per acre.

Specific recommendations for the management of this soil to increase its productiveness are given.

[Soil experiment fields] (*Missouri Sta. Bul. 131 (1915), pp. 492, 493, fig. 1*).—For several years the station has maintained experimental fields in different parts of the State. Twelve of these are known as soil fields, being devoted primarily to the study of soil problems. The results obtained on these fields have been reported in detail from time to time in bulletins of the station (see above). The more important of these results are briefly summarized as follows:

"(1) Phosphorus is the element which can be applied with the largest net return on Missouri soils. (2) The best form of phosphate to apply under average conditions is one of the available phosphates, such as bone meal or acid phosphate. Rock phosphate brings slower returns and is adapted largely to the man who has time to wait for results and capital to invest. (3) Lime brings a small but rather consistent return on practically all the fields under experiment. These fields, however, are those more likely to need lime than a great many soils in Missouri. (4) Barnyard manure is worth about $1.65 per ton as measured by crop increase and as an average of all experiments conducted."

Sketch of the geology and soils of the Cahuilla Basin, E. E. Free (*Carnegie Inst. Washington Pub. 193 (1914), pp. 21–33, pls. 3*).—The author deals with the descriptive and historical geology of the basin and discusses the origin and character of the soils.

The two soil types represented in the basin are the desert soils of the slopes and the river alluvium soils of the Colorado Delta. The former are mainly sandy and gravelly, are mineralogically very heterogenous, and are amply supplied with useful soil-forming minerals. The alluvial soils are similarly diverse and fertile, but differ in that their mineral particles are somewhat weathered and are more uniform in size. Practically all of them are silts or very fine sands, their chief fault, aside from the frequent presence of alkali in the silts, being too great heaviness and difficulty of working. The sandy soils are seldom alkaline.

It is stated that the submergence of the soils by the waters of the Salton Sea seems to have had little effect upon their alkali content. It is also stated that no direct influence of the soils upon the local distribution of vegetation was discernible.

The colloidal properties of the acid soils of Japan, T. Tadokoro (*Jour. Col. Agr. Tohoku Imp. Univ., 6 (1914), No. 5, pp. 117–129, figs. 2*).—In continuation of previous work along the same line (E. S. R., 32, p. 318), the author reports experiments in which he compared the colloidal properties of neutral sand, clay, and humus soils with those of acid soils as determined in the previous experiments.

In the experiments with the neutral soils it was found that the increase of the volume by swelling on treatment with reagents, the adsorptive power for coloring matter, and the absorption coefficient for ammonia were greatest in the humus soil and least in the sandy soil. The differences between sandy and clay soils as regards adsorption of coloring matter were very great. The increase in adsorption of coloring matter with variations in its concentration were least in the sandy soil. The hygroscopicity was greatest in clay and least in the sandy soil.

The degree of swelling of mineral acid soils was generally greater than that of neutral soil rich in humus. This difference was greatest on treatment with sodium carbonate and caustic soda solutions. On the other hand, the volume of swelling of some of the acid soils was less than that of neutral soils poor in humus.

The variations in the volume of swelling on treatment with reagents, according to the type of reagent, were much greater with mineral acid soils than with neutral soils. This is taken to indicate that the mineral acid soils contain considerable quantities of colloidal substances showing movable, unstable forms.

The hygroscopicities of the different mineral acid soils were not markedly different from those of neutral soils, but the relation of the volume of swelling to hygroscopicity for mineral acid soils was generally greater than for neutral soils, excepting in the case of acid soil rich in humus.

The adsorptive power of mineral acid soil for coloring matter was generally greater than that of neutral soil. The relations of adsorptive power to hygroscopicity for mineral acid soils were generally greater than for neutral soils excepting in the case of acid soil rich in humus. The ammonia absorbing power of acid soil was generally greater than that of neutral soil, but there was little difference between the smallest values of the former and the greatest values of the latter. The increase of the coefficient of ammonia absorption was not greater for acid soil rich in humus and for neutral soil than for mineral acid soil.

How great is the surface of a gram of surface soil? P. EHRENBERG (*Fühling's Landw. Ztg., 63 (1914), No. 23, pp. 725–735*).—The author briefly reviews the work of others on the subject, and points out that while the results obtained by most investigators as to the surface of a gram of soil correspond closely those obtained by Mitscherlich on the basis of hygroscopicity are quite different.

From computations based on the assumption that the thickness of the surface film of hygroscopic water in soils is equal to the diameter of a molecule of water, it is concluded that the results obtained by Mitscherlich are, on this basis, double what they should be. Other data are reviewed which would indicate that the thickness of the surface film of hygroscopic water more nearly approaches the sum of the diameters of ten molecules, and it is stated that if computed on this basis the results obtained by Mitscherlich would correspond approximately to those obtained by other investigators.

It is further stated that according to his studies there are always many unknown factors present affecting the determination of the absolute surface of a soil, and that the results obtained can, therefore, give only an approximate indication of the actual facts.

Investigations on the influence of plant roots on the structure of the soil, M. BERKMANN (*Untersuchungen über den Einfluss der Pflanzenwurzeln auf die Struktur des Bodens. Diss. K. Tech. Hochsch. München, 1913, pp. 55, figs. 6*).—This article has been noted from another source (E. S. R., 30, p. 120).

The gases of swamp rice soils.—II, Their utilization for the aeration of the roots of the crop, W. H. HARRISON and P. A. SUBRAMANIA AIYER (*Mem. Dept. Agr. India, Chem. Ser., 4 (1914), No. 1, pp. 17, pl. 1, figs. 2*).—In continuation of previous work (E. S. R., 30, p. 515) a series of experiments made to determine the action of the soil surface film on the soil gases and the nature of the agents to which the changes produced could be ascribed are reported.

It was shown in the previous report that the gases formed in swamp rice soil apparently have an important connection with the aeration of the roots of the crop. It was found in the later experiments that "the organized film in contact with the surface of swamp rice soils utilizes the soil gases in such a manner as to bring about an increased oxygen output from the film leading to a correspondingly increased root aeration. The film contains bacteria which possess (1) the power to oxidize methane and hydrogen, and (2) to assimilate directly methane and carbon dioxid. These changes either directly or indirectly result in the production of CO_2 which is in turn assimilated by the green algæ with the evolution of oxygen. . . .

"The practice of green manuring, by increasing the output of the soil gases, brings about an increased activity on the part of the film resulting in an increased oxygen production and root aeration. An important indirect function, then, of green manuring is to bring about a greater root aeration and so induce greater root development and cropping power.

"The oxygen concentration of the water entering the soil appears to be one of the main factors which regulates the growth of the crop."

Effect on soil moisture of changes in the surface tension of the soil solution brought about by the addition of soluble salts, P. E. Karraker (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 2, pp. 187–192, figs. 2*).—Experiments are described in this paper, the results of which indicate that changes in the surface tension of the soil solution arising from the application of fertilizer salts are of no importance in affecting the moisture condition of the soil.

The effect of different methods of preparing a seed bed for winter wheat upon yield, soil moisture, and nitrates, L. E. Call (*Jour. Amer. Soc. Agron., 6 (1914), No. 6, pp. 249–259, figs. 2*).—Investigations, extending over five seasons, on the influence of different methods of preparing the seed bed for winter wheat upon conservation of moisture, liberation of plant food as indicated by available nitrogen, and the growth of the crop as determined by the production of grain and straw are reported. The soil used is a dark brown silt loam about 10 in. deep, the subsoil to a depth of at least 6 ft. being a reddish-brown silty clay loam.

The results obtained demonstrate the value of working ground plowed early, and also show the importance of early plowing even though it is impossible to work the ground as quickly as it should be worked after the plowing is done. "Ground worked early, regardless of the method of working, has usually produced a comparatively high yield, while ground worked late, regardless of the method, has usually resulted in a low yield. . . .

"There is very little, if any, correlation between the amount of moisture in the soil at seeding and the yield of wheat secured. . . . Those plats which produced high yields used nearly if not quite all of the available moisture in the soil, while the low-yielding plats left in the soil from 1.5 to 5 per cent of available moisture. Apparently, the low yield was not the result of a deficient supply of moisture."

The yield of wheat bore a close relation to the nitrates in the soil at seeding. Fertilization with sodium nitrate did not increase the yield of wheat on the field plowed in July, but on corn ground, where a seed bed was prepared for wheat by double disking the ground after the corn crop was harvested, fertilization with the same quantity of sodium nitrate increased the yield nearly 100 per cent. "It appears, therefore, that on late-plowed ground or on ground otherwise worked late, nitrogen was not liberated in sufficient quantities to supply the crop with the amount necessary for the maximum growth, and under such conditions a lack of nitrogen has been responsible for the low yields of wheat secured. On the other hand, where the ground was prepared early in the season, sufficient nitrogen was liberated to supply the needs of the plant and additional nitrogen in the form of nitrate of soda did not increase the yield."

The action of liquid manure as a nitrogenous fertilizer, A. STUTZER (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 6, pp. 68–70*).—Briefly summarizing the results of experiments by various investigators, the author reaches the conclusion that liquid manure is a satisfactory nitrogenous fertilizer on heavy and medium soils which have the necessary absorptive capacity for ammonia and potassium carbonate. It, however, is not well suited to light nonacid sandy soils which have little absorbent power for ammonia. In such soils the liquid manure produces a persistent alkaline reaction, which is likely to cause burning of the plants. The best results with liquid manure are obtained on mildly acid humus soils.

Poultry manures, their treatment and use, W. P. BROOKS (*Massachusetts Sta. Circ. 54 (1915), pp. 4*).—A revision of Circular 36 (E. S. R., 32, p. 322).

Imports and exports of fertilizer materials (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Ser. 1914–15, No. 6, pp. 455, 456, 458, 478; Com. Rpts., No. 42 (1915), p. 694*).—The following table gives a summary for the calendar years 1913 and 1914 of imports and exports by the United States of the principal fertilizing materials, as reported by the U. S. Department of Commerce:

Imports and exports (in long tons), of fertilizing materials by the United States, 1913 and 1914.

Materials.	1913		1914	
	Amount.	Value.	Amount.	Value.
IMPORTS.	Tons.		Tons.	
Bone dust and bone ash	34,619	$836,682	36,022	$890,672
Guano	19,105	538,183	25,562	762,688
Kainit	465,850	2,207,018	329,611	1,550,879
Manure salts	223,292	2,150,190	168,426	1,842,649
Muriate of potash	213,762	7,120,055	168,509	5,740,893
Sulphate of potash	39,538	1,633,114	36,264	1,568,704
Nitrate of soda	625,862	21,630,811	543,715	15,228,671
Sulphate of ammonia	58,281	3,957,307	74,121	4,475,603
All other substances	....	4,995,690	....	5,055,355
Total imports	1,680,309	45,069,050	1,382,230	37,116,114
EXPORTS.				
Phosphate rock, untreated:				
High-grade hard rock	473,533	4,735,330	281,806	2,818,060
Land pebble	891,263	5,255,416	681,241	3,948,079
All other phosphates	1,712	5,834	1,067	5,513
Total phosphates	1,366,508	9,996,580	964,114	6,771,652
All other fertilizers	72,747	1,666,755	63,554	1,311,227
Total exports	1,439,255	11,663,335	1,027,668	8,082,879

During the fiscal year ended June 30, the imports of calcium cyanamid were approximately 15,000 tons in 1913 and 30,000 in 1914; of basic slag 15,000 tons in 1913 and 10,000 in 1914; of crude phosphates 24,000 tons in each year; and of apatite 3,000 and 100 tons, respectively. The potash salts imported contained 228,757 tons of actual potash (K_2O) in 1913 and 176,354 in 1914.

"The decrease in imports of potash salts extends to other groups used in the chemical and other manufacturing industries. Carbonate of potash fell from 21,500,000 lbs. in 1913 to 16,000,000 lbs. last year [1914]; nitrate of potash, from 10,000,000 to 2,250,000 lbs.; caustic potash, from 8,500,000 to 7,250,000 lbs.; and other salts, except the cyanid, from 6,000,000 to 5,000,000 lbs. Cyanid of potash slightly increased, from 1,000,000 to about 1,250,000 lbs."

Fertilizer markets (*Oil, Paint and Drug Reporter, 87 (1915), No. 11, pt. 2, pp. 46, 47*).—This is a concise review of the fertilizer trade of the United States during 1914, giving data for production, consumption, and prices for nitrate of soda, sulphate of ammonia, fish scrap, phosphate rock, and potash salts.

The chemistry of base goods fertilizer, E. C. LATHROP (*Jour. Indus. and Engin. Chem., 7 (1915), No. 3, pp. 228–233*).—This article is based upon investigations which have already been noted from another source (E. S. R., 32, p. 217).

The preparation of fertilizer from municipal waste, J. W. TURRENTINE (*U. S. Dept. Agr. Yearbook 1914, pp. 295–310, pl. 1*).—This article discusses the composition and availability of sewage, street sweepings, dead animals, and garbage, as well as the processes and possibilities of converting these waste products into useful fertilizers.

It is estimated that the 199 cities of the United States having a population of more than 30,000 each, produce 3,600,000 tons of wet sewage sludge, or 720,000 tons of dry sludge, yearly, capable of producing 7,200 tons of ammonium sulphate worth $480,000. The same cities produce over 5,000,000 tons of street sweepings, containing 0.44 per cent of nitrogen, 0.1 per cent of phosphoric acid, and 0.21 per cent of potash. The dead animals from these cities are capable of producing 25,000 tons of tankage worth $500,000 and containing about 8 per cent of nitrogen and 10 per cent of bone phosphate. The present annual production of garbage tankage is roughly estimated at 150,000 tons, valued at $975,000. This is obtained from 1,200,000 tons of raw garbage rendered in about 25 plants. The garbage collected in 1909 in the cities having a population of 30,000 or over amounted to 2,700,000 tons, capable of yielding 400,000 tons of dry tankage worth $2,500,000.

Electro-manufacture of nitrates, M. ADAMS (*Jour. Electricity, 34 (1915), No. 10, pp. 190–192, fig. 1*).—Some of the leading processes used for this purpose are briefly described, and the possibilty of their profitable utilization in Nevada for the production of nitric acid to be combined with the abundant natural supplies of sodium carbonate for the manufacture of sodium nitrate is discussed.

Ammonification of cyanamid, F. LÖHNIS (*Ztschr. Gärungsphysiol., 5 (1914), No. 1, pp. 16–25; abs. in Chem. Abs., 9 (1915), No. 8, p. 1085*).—Investigations are briefly reported which show that there are at least 14 fungi capable of transforming cyanamid nitrogen into ammonia. About one-half of these appear to be species of Penicillium and about one-half of the nitrogen present is transformed in cultures. In soils the cyanamid nitrogen is almost completely transformed, first into ammonia and later into nitrate, and this change is more rapid in sterilized than in unsterilized soil. It is suggested that the first step in this change, viz, the formation of urea, is due to the action of the colloid constituents of the soil, and that the further steps, ammonification and nitrification, are due to the action of different kinds of organisms.

Field experiments on the action of different nitrogenous fertilizers, GERLACH ET AL. (*Ber. Landw. Reichsamte Innern, No. 34 (1914), pp. 229*).—The results of comparative tests of sodium nitrate, ammonium sulphate, lime nitrogen, calcium nitrate, calcium nitrite, and liquid manure on rye, oats, barley, wheat, potatoes, and beets by the experiment stations of Bernburg, Bremen, Breslau, Bromberg, Halle, and Jena are reported in detail.

Sodium nitrate produced about the same result whether applied in one dose or in two. Taking the average action of the sodium nitrate on rye, barley, oats, potatoes, sugar beets, and fodder beets as 100, the average of the action of ammonium sulphate on these crops and on wheat in addition was 84, of lime nitrogen on the same crops as in the case of ammonium sulphate 76, of calcium nitrate on the same crops 99, of calcium nitrite on oats, potatoes, and sugar beets 90, and of liquid manure on barley, oats, potatoes, and fodder beets 64.

As the average of all of the results, it was found that 61 per cent of the nitrogen applied in the form of sodium nitrate was recovered in the crop. Taking the recovery of nitrogen from sodium nitrate as 100, the recovery in the case of ammonium sulphate was 78, of lime nitrogen 65, of calcium nitrate 91, of calcium nitrite 54, and of liquid manure 57. The percentage of nitrogen in the crop was very slightly influenced by nitrogenous fertilizers. This was especially true in the case of the roots and tubers, but also true of leaves and vines. The influence of the nitrogenous fertilizers on the quality of the product was scarcely noticeable.

The action of different nitrogenous fertilizers, GERLACH (*Fühling's Landw. Ztg., 64 (1915), No. 1, pp. 1–7*).—The results here reported are noted for the most part in the above.

The action of common salt in combination with ammonium sulphate, SCHNEIDEWIND (*Landw. Wchnschr. Sachsen, 17 (1915), No. 1, pp. 3, 4*).—Field experiments with beets and wheat in which ammonium sulphate was used in combination with kainit and with 40 per cent potash salt mixed with twice its weight of common salt are briefly reported. The results indicated that the combination of ammonium sulphate with kainit is fully as effective and more economical.

The Perlis phosphate mines (*Indische Mercuur, 38 (1915), No. 8, pp. 133–135*).—This article discusses the origin, extent, composition, and fertilizing value of the phosphates occurring in Perlis, the northernmost State of Siam. Analyses reported show that the phosphate contains about 21 per cent of phosphoric acid, about 10 per cent of which is soluble in 2 per cent citric acid, 2.7 of ferric oxid, 4.7 of alumina, 27 of lime, 0.43 of potash, and 0.32 of nitrogen, largely nitrates.

Double superphosphate, E. BERNARD (*Kisérlet. Közlem., 17 (1914), No. 5, pp. 709–724*).—This article discusses briefly double superphosphates in general, but deals especially with the properties of a double superphosphate prepared by the author's method. This superphosphate is moderately hygroscopic, due to the presence of free phosphoric acid (about 11 per cent). The water-soluble phosphoric acid amounts to from 40 to 43 per cent, and the sum of the water-soluble and citric acid soluble phosphoric acid to from 44 to 46 per cent.

Ground limestone for sour soils, F. H. HALL (*New York State Sta. Bul. 400, popular ed. (1915), pp. 8, fig. 1*).—This is a popular edition of Bulletin 400, previously noted (E. S. R., 33, p. 26).

The fertilizer law and rules and regulations for its enforcement, B. H. HITE (*West Virginia Sta. Circ. 16 (1915), pp. 11, fig. 1*).—The text of the West Virginia fertilizer law enacted in 1901 and the rules and regulations promulgated under its provisions are given.

AGRICULTURAL BOTANY.

Department of botanical research, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book, 13 (1914), pp. 63–104, figs. 5*).—This is a progress report of the investigations carried on by members of the staff, collaborators, and research associates, the greater part of the work being conducted at the desert laboratory near Tucson, Ariz. The investigations include further studies of physical, chemical, and biological phenomena in connection with the Salton Sea; an analysis of the effect of climatic complexes and various external factors upon plants; studies on photolysis, respiration, hydratation, and growth; and various special investigations of Cactaceæ and other desert plants.

Notes on the production of tropical plants, E. DE WILDEMAN (*Notes sur des Productions Végétales Tropicales. Antwerp: E. Stockmans & Co., 1914, pp. 175*).—Compiled and original notes are given on a number of economic tropical plants, agricultural practices, plant diseases, etc., the substance of the several articles having already been presented in various publications.

Obligate symbiosis in Calluna vulgaris, M. C. RAYNER (*Ann. Bot.* [*London*], *29* (*1915*), *No. 113, pp. 97–133, pl. 1, figs. 4*).—This investigation was conducted to determine the precise ecological conditions associated with small, well defined communities of *C. vulgaris* in a restricted area of England.

In common with other members of the family Ericaceæ, *C. vulgaris* was found to possess a characteristic root mycorrhiza. The infection by the mycorrhizal fungus, it is said, takes place shortly after germination, the source of infection being the testa of the seed. The infection does not cease with the formation of the mycorrhiza associated with the roots, but affects all parts of the young seedling and most of the mature plant as well. The embryo and endosperm of the resting seed seem to be free from infection. It was found possible to sterilize the seed and germinate seedlings free from fungal and bacterial infection, but where the appropriate fungus was not present, seedlings did not develop roots and their growth was checked, although they remained alive for several months. The mycorrhizal fungus has been isolated and grown in pure cultures, and sterile seedlings inoculated, thus completing the synthesis of the fungus and the plant. It has not been found possible to replace the stimulus to development which follows seedling infection by supplying various organic nitrogenous substances to the plant.

A bibliography is given.

Andropogon halepensis and A. sorghum, C. V. PIPER (*Proc. Biol. Soc. Wash.*, *28* (*1915*), *pp. 25–43*).—The results are given of a study of many forms of these grasses under cultivation, besides herbarium material in this country, at Kew, and Berlin. These two species of grass are generally treated as distinct species, although there have been published statements indicating that the latter species is derived from the former under cultivation.

As a result of his investigations the author considers a more satisfactory treatment of the plants to be to recognize them as two distinct species, *A. halepensis*, perennial plants possessing rootstocks, 5 subspecies or varieties of which are recognized, and *A. sorghum*, annual plants which become perennial in frostless regions and are without rootstocks. Of the latter species the author enumerates 11 varieties.

Additional evidence of mutation in Œnothera, H. H. BARTLETT (*Bot. Gaz.*, *59* (*1915*), *No. 2, pp. 81–123, figs. 17*).—Studies are reported on mutants of *Œ. pratincola*, a small, recently described self-pollinating species from Kentucky, which were brought to maturity and have yielded a second generation.

The author states that this form is in a condition comparable with that of *Œ. lamarckiana*, the most striking of the mutations (called *Œ. pratincola nummularia*) occurring in strains from 7 wild mother plants out of 8 selected at random. Two of these strains give mutations in both the F_1 and F_2 generations from the parent plant and a third strain showed mutations only in the F_2 generation. The mutant appears with a fairly uniform frequency of 1 to every 300 to 400 of the seeds planted, a ratio not agreeing with the Mendelian hypothesis. The new form is better adapted than is the parent form to withstand influences unfavorable to germination.

The author thinks that selective germination and differential mortality among dormant seeds may be important factors in natural selection. He also holds that mutation is a process distinct from Mendelian segregation, and that the phenomena exhibited by *Œ. lamarckiana*, *Œ. biennis*, and *Œ. pratincola* can not be attributed to heterozygosis.

Cultural bud mutations in subterranean portions of Solanum caldasii, E. HECKEL (*Compt. Rend. Acad. Sci.* [*Paris*], *160* (*1915*), *No. 1*, *pp. 24–28*).—In continuance of previous articles (E. S. R., 30, pp. 433, 529, 730), the author reports that he has obtained, from the same stock of *S. caldasii*, tubers some of which resembled the wild ancestors while others resembled in several respects cultivated varieties. This is considered a case of mutation.

The effect of salt on the growth of Salicornia, A. C. HALKET (*Ann. Bot.* [*London*], *29* (*1915*), *No. 113*, *pp. 143–154*, *pl. 1*, *figs. 4*).—A series of experiments was conducted with Salicornia and Suæda seedlings which were cultivated in the presence of various amounts of sodium chlorid, some being grown in soil treated with solutions containing various percentages of sea salt, while others were grown in nutritive solutions to which definite quantities of sodium chlorid were added.

The author found that *Salicornia oliveri* and *S. ramosissima* grow better in the presence of sodium chlorid than in its absence, the greatest growth taking place when between 2 and 3 per cent of this salt was present. With higher percentages of salt there was a decrease in the growth of the plants. The effect of sodium chlorid on the growth of *Suæda maritima* was not so marked, the plants growing as well in its absence as when a small quantity (1 per cent) was present. Both *Salicornia ramosissima* and *Suæda maritima* were found able to resist the presence of a large amount of sodium chlorid, the plants remaining alive and green with the salinity of water in the soil at times as high as 17 per cent, although they were not able to make any growth.

The growth of *Glyceria maritima* was found to decrease with an increase of salinity in the soil.

The total amino nitrogen in the seedlings of the Alaska pea, T. G. THOMPSON (*Jour. Amer. Chem. Soc.*, *37* (*1915*), *No. 1*, *pp. 230–235*).—An account is given of a study of the formation and distribution of amino acids and the acid amids in seedlings of the Alaska pea at various stages of growth (especially in the very young seedlings).

The author states that there is a steady increase in the percentage of amino nitrogen and a notable increase thereof on the first and the fifth day. This is explained as probably due to the rapid transformation of the seed and the requirement for a greater quantity of this sort of plant food to build up the highly elaborated nitrogenous material in leaves, stems, and roots. In case of seven-day seedlings it was found that the plumules contained a much greater amount of amino nitrogen, supposedly serving as a food supply for the newly forming leaves and stems.

Analysis of leaves and of stem near the top and near the roots of the plant showed that the total nitrogen remains fairly constant in the leaves, but that there is a noticeable decrease in the amino nitrogen. With increase in age the leaves and stems near the top and bottom show a decrease in both total and amino nitrogen when expressed in terms of dry material. The amino nitrogen in the stems near the lower part of the plant shows a slightly smaller percentage than is noted in the sample taken near the leaves. Results from the older plants were somewhat impaired by difficulty in freeing them from foreign materials, but apparently they contain a smaller percentage of amino nitrogen than do the stems.

A note on the significance of sugar in the tubers of Solanum tuberosum, O. Butler (*New Hampshire Sta. Sci. Contrib. 7 (1913), pp. 110–118, pl. 1, figs. 2*).—A reprint of an article previously noted (E. S. R., 29, p. 219).

On the relation between the concentration of the nutrient solution and the rate of growth of plants in water culture, W. Stiles (*Ann. Bot. [London], 29 (1915), No. 113, pp. 91–96*).—The results of a study with rye and barley in water cultures indicate that the variation over a fairly wide range of the concentration of the nutrient solution of rye and barley growing in water culture produces relatively little effect on the amount of dry matter produced. Below a certain concentration it is said there was a definite falling off in the rate of growth. The concentration of the soil solution, as estimated by Cameron (E. S. R., 26, p. 122), is said to be high enough to produce healthy plants. Frequent changing of the nutrient solution of water cultures, it is claimed, produces decidedly better growth of the plants. It is considered necessary to calculate the probable error of the results obtained in experiments with water cultures in order to determine the significance of differences between results from different sets of cultures.

An experimental study of the rest period in plants.—The summer rest of bulbs and herbaceous perennials, W. L. Howard (*Missouri Sta. Research Bul. 15 (1915), pp. 25, pls. 4*).—This is a second report (E. S. R., 23, p. 526) and relates to the summer rest of bulbs and herbaceous perennials.

From results of experiments with ether and other agents as described, it is concluded that most or all bulbous plants have a pronounced summer rest period, which is difficult to shorten or to break during its earlier stages with the means which prove effective in case of woody plants, but it is believed that this may be practicable by employment of temperatures not over 60° F. after treatment. Desiccation followed by injection with ether and Knop's solution, and combinations of these, seem to be the most effective treatments tested for shortening the rest period.

Experiments with a large number of species of herbaceous perennial plants showed that for most of these freezing was perhaps the best treatment for forcing early growth, but its effects were not cumulative. In case of plants already in leaf its effects were sometimes harmful, as were also those of etherizing, which proved very stimulating in some cases.

It is believed that several species of herbaceous perennials have a rest period, but that they may be aroused by proper treatments, frost, desiccation, and ether appearing to be the most effective agents.

An experimental study of the rest period in plants.—Pot-grown woody plants, W. L. Howard (*Missouri Sta. Research Bul. 16 (1915), pp. 27, figs. 12*).—This is the third report of this series, giving results of more recent work than that above noted. The author states that rest period studies with woody plants can be as safely carried out with twigs 12 to 15 in. long as with trees or shrubs growing in pots. It is held that the rest period and its interruption relates to the bud itself rather than to roots, cambium, or any tissue of trunk or branches. The roots of potted plants are not affected directly by the ether treatment.

It is considered probable that dormancy of plants depends upon suspension of enzym activity, awakening upon its resumption. It is thought that practically all woody forms rest for a longer or shorter period of time, and that all can be aroused by proper treatment, some more difficultly than others. Quickly responsive species are considered to be in a state of enforced and unnatural rest, due to unfavorable growing conditions. When dormant woody plants are treated, growth first begins in the buds, regardless of root connection. Latent buds on old wood force with great irregularity. Ether is perhaps the most reliable rest breaking agent yet employed. Species vary greatly as regards dosage required.

The relative transpiration of white pine seedlings, G. P. BURNS (*Plant World, 18* (*1915*), *No. 1, pp. 1–6*).—This is a detailed account of a paper previously noted (E. S. R., 30, p. 726), in which the author concludes that the differences in size and chemical composition of three groups of white pine seedlings under no shade, half shade, and full shade, are to be sought along the line of photosynthesis and assimilation rather than along the line of absorption and transpiration.

The visible effects of the Schumann rays on protoplasm, W. T. BOVIE (*Bot. Gaz., 59* (*1915*), *No. 2, pp. 149–153*).—A brief account is given of the violent visible effects of the Schumann rays (1,250 to 2,000 Angstrom units or 0.125 to 0.200 microns in wave length) on protoplasm.

Vesicle formation and the bursting of spores are considered to point strongly to changes in osmotic relations or in imbibition. These, it is thought, may be connected with the fact pointed out previously (E. S. R., 29, p. 130) that the longer ultraviolet light waves have the power to break down proteins. These rays are thought to possess a similar power in greater degree.

The later researches on anthocyan, P. Q. KEEGAN (*Chem. News, 111* (*1915*), *No. 2882, pp. 87, 88*).—The author reviews some recent publications in which different opinions are expressed regarding the origin of anthocyanin, and gives a summary of his own conclusions regarding this matter, in which he states that plants producing phloroglucol tannins yield original reds only. Those plants producing caffetannin are said to yield original blues only. Plants which produce gallotannin seem inclined to display vivid violets or warm purplish blues, but never cold true blues.

It is claimed that there is only one anthocyanin pigment in plants producing caffetannin. The red appearing on stems or petals is here due to acid only. Yellow flowers owe their color to carotin or its diffused oxidized product, xanthophyll, and in rare instances to a flavone. White flower color often incloses a very dilute solution of anthocyanin. He claims that Grafe's opinion that a special chromogen of anthocyanin can not exist is incorrect so far as the specific hereditary tendency of the protoplasm to form certain kinds of tannin is concerned.

Micro-organisms in silage, EMMA B. MUNDY (*Missouri Sta. Bul. 131* (*1915*), *pp. 470, 471*).—A study was made of *Monascus purpureus* or red mold, which is common in silage. It is stated that growth is vigorous on a neutral or slightly acid medium and feeble on an alkaline one, organic acids such as lactic and acetic being more favorable than inorganic acids such as hydrochloric. Oxygen is absolutely essential, but liquid and agar media do not seem particularly favorable. It grows well on a number of complex organic compounds, as certain sugars; also abundantly on such starchy materials as rice.

A variety of factors influence the production of the characteristic carmine red pigment, which is not necessarily correlated with abundant growth. The pigment, the solubility of which is discussed, is not due to simple oxidation, but is thought to be an end product of metabolism.

An improved nonabsorbing porous cup atmometer, J. W. SHIVE (*Plant World, 18* (*1915*), *No. 1, pp. 7–10, fig. 1*).—A description is given of a form of porous cup atmometer in which the instrument is modified in such a way as to be self-contained and at the same time to reduce the liability of breakage and the difficulty of adjustment.

FIELD CROPS.

Dry-farming investigations in western North Dakota, J. C. Thysell, H. C. McKinstry, R. S. Towle, and A. J. Ogaard (*North Dakota Sta. Bul. 110* (*1915*), *pp. 155–207, figs. 11*).—This bulletin presents a study of the annual and seasonal precipitation; evaporation; length of frost-free period; the soil moisture storage and reduction as affected by various crops; and rates of seeding and methods of tillage derived from data obtained at the stations at Dickinson, Hettinger, Edgeley, and Williston, N. Dak., in cooperation with the U. S. Department of Agriculture in determining the best methods of soil cultivation and crop rotation for the conservation of moisture and maintenance of humus.

It is noted that on account of the lack of an underground water table ordinary methods of cultivation which would develop a mulch are of no avail as a means of storage of soil moisture. Cultivation to prevent the growth of weeds proved more effective. In studying the reduction of soil moisture by plant growth it is shown that wheat roots penetrated to the sixth foot and corn roots to the fifth, as evidenced by the reduction of the moisture supply.

The following conclusions have been reached: "Climatic conditions are the chief determining factors in crop production in western North Dakota. The amount of rainfall during the growing season is a better criterion of crop production than is the annual rainfall. Available records show the average frost-free period to be 129 days at Edgeley, 119 days at Williston, and 110 days at Dickinson. Even with alternate cropping, water is seldom stored to a greater depth than that from which annual crops can recover it.

"While stored water may be of value in supplementing rainfall, it is unable in itself to mature a crop in western North Dakota. Shallow soils are not as responsive to tillage as are deeper soils. Prevention of the growth of weeds is a much more important function of cultivation than is the maintenance of a mulch. Summer tillage has a certain value as insurance against crop failure. It has not, however, increased average yields over those obtained by other methods enough to warrant giving it more than a secondary and temporary place in the agriculture of this section.

"The application of barnyard manure has shown marked value. Sod crops should not enter into short rotations. Neither fall nor spring plowing has a marked advantage of one over the other in the average of a series of years. Disking land upon which a crop of corn has been raised, and kept free from weeds, is as good a preparation for the succeeding grain crop as plowing."

Dry farming in Egypt, Alchevski (*Bul. Dir. Gén. Agr. Com. et Colon. Tunis, 18* (*1914*), *No. 80, pp. 583–587*).—This article describes irrigation experiments conducted with wheat and barley in wooden tanks of 1 square meter surface and 1 cubic meter capacity. The amounts of water used ranged from 100 to 700 liters per tank.

In the case of the barley a constant yield was not reached. The yields of grain increased regularly with the increase in irrigation water and ranged from 23 to 247 gm. per tank. In the case of the wheat the constant weight was reached with the application of 600 liters of water per tank. The wheat yields ranged from 92 to 304 gm. of grain per tank. The maximum amount of water used reached 1 cubic meter per square meter of soil surface.

[Report on the progress of farm crops investigations] (*Missouri Sta. Bul. 131* (*1915*), *pp. 475–477, 484–486, fig. 1*).—In experiments with cowpeas and soy beans by J. C. Hackleman it is noted that rows spaced from 30 to 36 in. apart gave the best seed production and that 60 lbs. of seed per acre gave the largest hay yield. Canada peas and oats gave the best mixture for spring forage crops, and rape or Canada peas for a single crop. Sorghum showed best for a summer forage, and rye or rye and vetch for a fall crop. Crimson clover was not so satisfactory as vetch. In alfalfa experiments Northern seed is noted as being superior to commercial seed, especially that from subtropical and warm humid climates.

From results of 25 years of crop rotation experiments, in charge of M. F. Miller and C. A. Le Clair, it is stated that "a rotation alone even including legumes is not sufficient to maintain soil fertility providing all crops are removed. Rotation maintains productiveness very much better than continuous cropping of any kind. A rotation of corn, oats, wheat, clover, timothy, manured at the rate of seven tons annually maintains the productiveness of the soil and is also financially profitable. It was found profitable to apply manure to continuously cropped land. Continuous fertilizing with commercial fertilizers on continuous wheat at a rate sufficient to supply plant food for a 40-bu. crop annually maintains the productiveness as high as does the seven tons of manure annually. Continuous timothy with manure has been one of the most profitable treatments."

As results of studying the effect of various crop rotations on the physical character of the soil, by M. F. Miller and C. A. LeClair, it is noted that "the system of cropping does not influence the mechanical composition of the upper 4 ft. of soil. A system of rotation may influence the water retaining power of the surface soil by influencing the amount of organic matter present. The system of cropping apparently has no appreciable effect on the movements of air or water in the subsoil."

Experiments in the associated growth of corn and cowpeas have shown that "when cowpeas are grown with corn either between the rows or in the row, the nitrates of the soil are not greatly reduced below the amounts present when corn or cowpeas are grown alone. Cowpeas grown with corn does not seriously exhaust the soil moisture, although more water is used than in the case of corn alone. The average height of the corn plant is shortened about a foot when cowpeas are grown in the corn. The number of leaves on the corn plants grown with cowpeas is greater at the time of harvest than on the plants where corn is grown alone, but the yield of corn is slightly decreased when cowpeas are grown with corn."

It appears from data gathered in a study of the development of the maize plant, by J. C. Hackleman and A. R. Evans, "that the most important period in the growth of the corn plant, from the standpoint of soil moisture, is the period from the time the corn is usually 'laid by' until the ear is practically formed. There is a direct relation between the amount of moisture present in the soil and the amount of growth. Clay loam soil gives a larger root development than sandy loam. The growth of the vegetative part above the ground is not necessarily in proportion to the root growth."

"In a system of continuous wheat growing followed by cowpeas the same year [this experiment being conducted by C. A. LeClair], the effect of removing cowpeas from the land results in a gradual decrease in the wheat yield, according to data collected during a period of twelve years. Better results are secured when the cowpeas are disked in rather than when plowed under."

Growing field root, vegetable, and flower seeds in Canada, M. O. MALTE and W. T. MACOUN (*Canada Expt. Farms Bul. 22, 2. ser. (1915), pp. 15*).—This gives general suggestions as to methods of producing seeds of mangels, sugar beets, turnips, carrots, swede beets, parsnips, cabbage, cauliflower, onions, celery, and flowers.

Farm crops, C. A. ZAVITZ (*Ontario Dept. Agr. Bul. 228 (1915), pp. 80, figs. 17*).—This gives the results of tests, chiefly variety tests, of farm crops, including cereals, legumes, root crops, and forage crops, and states the yields for varying periods of years for different classes of crops.

Work in the nurseries and distribution of plants, F. Birkinshaw (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1913–14, pp. 2–10*).—This briefly notes progress in manurial experiments with cotton, arrowroot, and cassava, breeding and selection experiments with cotton, and cultural trials of peanuts, sugar cane, and sweet potatoes.

[Field experiments], A. G. Birt (*Ann. Rpt. Agr. Expts. Assam, 1914, pp. 7–27*).—This reports work continued from previous years at the Jorhat Experiment Station, covering variety tests of sugar cane and manurial tests with applications of air-slaked lime, ground limestone, wood ashes, and flour phosphate, and green manuring with cowpeas to rice and barley. The use of lime is noted as being essential for successful crops on the soils tested, and ground limestone showed a quick action that made it of value.

[Field experiments], B. C. Basu (*Ann. Rpt. Agr. Expts. Assam, 1914, pp. 32–49*).—This reports work for the year at the Upper Shillong Station.

In potato experiments cut seed showed an increased yield of from 3 to 4 per cent over whole seed tubers. In a test of seed rate it was found that 12 maunds (984 lbs.) per acre gave more satisfactory results than either 14 or 16 maunds. The yields ranged from 236 to 253 maunds per acre.

Rotation experiments, manurial experiments on peaty soils, and trials of new fodder and other plants are briefly noted as new work.

Growing forage crops for hogs, R. R. Snapp (*West Virginia Sta. Circ. 19 (1915), pp. 4*).—This offers suggestions for the production and use of forage suited to West Virginia conditions and gives a table showing time of seeding and use of forage crops covering a 12-month period.

Native pasture grasses of the United States, D. Griffiths, G. L. Bidwell, and C. E. Goodrich (*U. S. Dept. Agr. Bul. 201 (1915), pp. 52, pls. 9*).—This bulletin briefly comments upon the conditions which seem to make investigation of range forage plants a necessity, and discusses and describes 135 native grasses of the continental United States.

Chemical analyses, both original and compiled, as available, show the percentage of moisture, ash, ether extract, crude fiber, nitrogen-free extract, protein, and pentosans for each species, and it is noted that a sample of each has been preserved as a herbarium specimen.

Pasture problems: The response of individual species under manures, R. G. Stapledon (*Jour. Agr. Sci. [England], 6 (1914), No. 4, pp. 499–511*).—This article examines in detail the behavior of a few typical species of grasses under the action of manures and gives results of a study of the action of these species in relation to the types of grass land on which definite experiments have been carried out.

"The effect of manurial treatments has been gauged on meadows by comparing the weight of the produce from the several plats, on pastures by comparing the live weight increase of stock, or by comparing the milk yield of cattle fed upon the plats. Analyses have been made at several stations to show the action of manures on the botanical composition of the herbage on plats variously treated."

The types of soils that were considered were calcareous soils over Great Oolite, residual clay over Oolite, good second-class pastures on Ordovician shales, and heath. Tabulated data are given regarding *Agrostis stolonifera*, *A. vulgaris*, *Festuca ovina*, *Dactylis glomerata*, *Lolium perenne*, *Bromus erectus*, and *Trifolium repens*.

In concluding it is noted that the factors which are always operative and which will tend to exaggerate or diminish the action of the manures are the botanical composition of the herbage of the plats (before the manures are added) in relation to the type of grass land to which they belong, and the prevailing meteorological conditions. Factors which are indirectly dependent on the nature of the manures added are the rôle the manure exercises in merely disturbing the prevailing equilibrium, and the effect the treatment may have on the physical, chemical, and biological properties of the soil. Factors which are dependent on the chemical composition of the manures added are the individual appetites of the several species for the particular plant foods in the form they are added, and the physiologically depressing effect particular manures may produce on individual species.

A bibliography of 11 titles is included.

Experiment tanks for the determination of the water requirements of the principal meadow and pasture grasses, C. von Seelhorst (*Jour. Landw., 62 (1914), No. 4, pp. 337–344, fig. 1*).—This article describes concrete sunken tanks and methods employed for the determination of water requirements of grasses.

Grasses and clovers on the Murrumbidgee irrigation area.—A spring trial, R. W. McDiarmid (*Agr. Gaz. N. S. Wales, 26 (1915), No. 2, pp. 127–129*).—This article gives results of the first season's growth of spring sowings of the following grasses and clovers: Strawberry clover (*Trifolium fragiferum*), Chilian clover (*T. pratense perenne*), Egyptian clover (*T. alexandrinum*), white Dutch clover (*T. repens*), Rhodes grass (*Chloris gayana*), *Phalaris bulbosa*, Texas blue grass (*Poa arachnifera*), prairie grass (*Bromus unioloides*), perennial rye (*Lolium perenne*), tall fescue (*Festuca arundinacea*), Hungarian brome grass (*B. inermis*), cocksfoot (*Dactylis glomerata*), Sudan grass (*Andropogon sorghum*), and panic grasses (*Panicum flavidum* and *P. bulbosum*). Among these it is noted that Rhodes grass, Sudan grass, panic grass, Hungarian brome grass, and tall fescue were most successful. The clovers were unsuccessful.

Results of experiments on the manuring of grass carried out at Moorlands Farm, Kineton, Warwickshire, E. Parke (*London, 1913, pp. 3*).—This article gives results of the twelfth season of experiments on the manuring of grass, carried out at Moorlands Farm, Kineton, with the cooperation of Dr. Bernard Dyer.

It is stated that in general "the unmanured land is still conspicuous for the poor, wiry nature of the grass and the abundance of plants which, in a pasture, may be regarded as weeds. On all the manured plats, on the other hand, there is an abundant growth of rich grass. Where phosphates, or phosphates and potash salts, have been continuously applied without nitrogen, the growth of plants of the clover kind is most conspicuous; while on the plats on which nitrate of soda has been continuously used without phosphates or potash (a mode of manuring which on general principles is not to be recommended), the grasses, as distinguished from clovers, are most prominent. The best herbage, however, in which clovers and grasses appear to flourish with equal vigor and luxuriance, is still found on the plats on which both phosphates and nitrate are used every year."

Universal hay tonnage table, Mollie D. Chesnut (*Torrington, Wyo.: Author, 1915, pp. 32*).—Tables are given showing the number of tons of hay in a stack, according to the required measurement of round stacks, and based upon United States Government rules.

Western hay tonnage table, Mollie D. Chesnut (*Author: 1914, pp. 12*).—A table showing the tonnage when width, overthrow, and length of stack are given for alfalfa and wild hay, with rules for computation.

Grain inspection in Canada, R. Magill (*Ottawa: Govt., 1914, pp. 64, figs. 34*).—This describes and illustrates the methods of sampling, weighing, and testing grain in western Canada.

The peas and beans of Burma, E. Thompstone and A. M. Sawyer (*Dept. Agr. Burma Bul. 12 (1914), pp. 107*).—This bulletin gives the results of an extended survey of the peas and beans of Burma covering almost four years, during which period several hundred samples of beans were examined. Aside from the botanical names and descriptions, the locality and local names of the plants are given. The genera studied include Cajanus, Canavalia, Cicer, Crotalaria, Cyamopsis, Dolichos, Glycine, Lathyrus, Lens, Mucuna, Pachyrhizus, Phaseolus, Pisum, Psophocarpus, Sesbania. Vicia, and Vigna.

Soy beans and cowpeas, T. A. Kiesselbach (*Nebraska Sta. Bul. 150 (1915), pp. 31, figs. 7*).—This bulletin discusses the value of soy beans and cowpeas for Nebraska farmers, and gives general directions for their production as hay, grain, and silage crops and results of tests covering periods of varying lengths. The average yields of eight varieties of soy beans from 1909 to 1914 ranged from 13.39 to 15.87 bu. per acre for the different varieties. The average yields for all varieties for the different years ranged from 6.11 to 22.84 bu. per acre. A summary shows the comparative yields of corn, wheat, oats, and Haberlandt soy beans at the station to have been 42, 36.5, 49.5, and 16 bu. as a 6-year average.

Inoculating soy beans at the station, either by the culture or soil method, failed to increase the yield materially. The average yield of the four earliest varieties tested was 1 bu. more per acre when the rows were 28 in. apart than when 35 in., but these results were reversed for the four latest maturing varieties.

Soy beans in cooperative farmers' tests showed unsatisfactory results in general.

Soil physics and soil moisture in relation to first year's growth of alfalfa, L. R. McNeely and G. W. Kable (*New Mexico Sta. Bul. 93 (1915), pp. 42, figs. 18*).—This gives the results as regards the growth of alfalfa in 1914 of various soil moisture and cultural conditions. Four classes of soils were used, viz, (1) 6 ft. or more of sandy loam, (2) 4 to 5 ft. of sandy loam over gravel, (3) 2 to 4 ft. of sandy loam over gravel, and (4) 2 ft. of sandy loam over gravel. Methods of surface treatment consisted in drilling alfalfa, planting in rows 30 in. apart, and fallowing. Irrigation treatments consisted in applying water in 2, 3, 4, and 5 in. depths at each application in such a way as to maintain about a 7 per cent moisture content.

The yields on the different classes of soil differed only slightly, ranging from 4,401 to 4,882 lbs. per acre under similar treatment. It was found that the deepest soils required the least water, 972, 1,051, 1,279, and 1,450 lbs. of water being required to make a pound of hay on the respective soil classes. It is stated that nearly the same amount of water was necessary to keep the soil moist where there was no crop as was used on the plats that were covered with plants, and that where the alfalfa grew in rows 30 in. apart more water was required than in either of the other cases.

The plats that were covered to a depth of 5 in. at each irrigation required an average of nearly 30 in. of water during the season; those covered to a depth of 2 in. required only 19 in., although the latter were irrigated a greater number of times than the former. The number of pounds of water required per pound of hay produced for different depths of irrigations were for 2 in., 1,026 lbs.; 3 in., 1,168 lbs.; 4 in., 1,180 lbs.; and 5 in., 1,377 lbs.

The number of pounds of water required to produce a pound of hay for different total depths of water during the season were found to be for 16.75 in., 1,023 lbs.; 23.08 in., 1,105 lbs.; 26.53 in., 1,235 lbs.; and 34.46 in., 1,613 lbs. For the different depths of irrigation, 2, 3, 4, and 5 in., the yields per acre and the yields per acre-inch of water were, respectively, 4,363 lbs., 235.8 lbs.; 4,559.9, 198.2; 4,707.5, 197.4; and 4.943.4, 177.7. The yields resulting from variation in total depths varied similarly to those from different depths at each irrigation.

The examination of the root systems showed that the plants had deeper roots on the shallow soil than on the deepest soil. The plants on the deepest soil plat receiving 5 in. of water had better developed root systems than those receiving 2 in. On the shallow soil there was little difference for the different depths of irrigation.

Effect of frequent cutting on the water requirement of alfalfa and its bearing on pasturage, L. J. BRIGGS and H. L. SHANTZ (*U. S. Dept. Agr. Bul. 228 (1915), pp. 6, figs. 2*).—This paper describes a pot experiment conducted as in those previously noted (E. S. R., 29, p. 825), and gives the results obtained with Grimm alfalfa. Three cuttings were made of the plants of the A series of pots during the season, and the plants of the B series were also cut back weekly during the middle period, somewhat as in pasturage.

The results showed that "the water requirement of the two series during the first period (i. e., up to the time of the first cutting) was practically the same. The mean ratio of the six pots of series A (check) was 600±17 and of series B 615±6. The difference is less than the probable error.

"During the second period the water requirement of the check series was 853±13, while the series which was cut weekly during this period gave a water requirement of 975±23, an increase of 14±4 per cent. It thus appears that alfalfa is slightly less efficient in the use of water when subjected to weekly cuttings.

"During the third period, when both sets were again treated alike, the water requirement of the check series (A) was 421±10 and that of series B 479±16. The B series thus shows during the third period also a slight increase (14±4 per cent) in water requirement compared with series A."

It is noted that when the water requirement is based on the total dry matter produced during the season, series B was practically as efficient as the check series. The explanation seems to have been found in the relative yields during the second period, during which time series B produced only 18 per cent of its total dry matter, while the check series produced 38 per cent.

"The check series produced practically the same amount of dry matter during the second period as during the first. Series B produced only 30 per cent as much during the second period, the small plants being unable to elaborate plant material as rapidly as the larger plants of series A. Series B was also maintained during the midsummer period with an actual expenditure of only one-third the water required by the check series. This forced economy in the use of water through frequent cutting seems not to be without effect on subsequent production. Series B produced only 48 per cent as much dry matter during the third period as the check series, while during the first period, notwithstanding the shorter period of growth, series B produced 60 per cent as much dry matter as the check series."

The bearing of these results on the management of alfalfa lands is discussed to show a means of limiting the growth of the crop, so that its demand for water will not exceed the available moisture supply, by a system of pasturage in midsummer.

Barley in the Great Plains area: Relation of cultural methods to production, E. C. CHILCOTT, J. S. COLE, and W. W. BURR (*U. S. Dept. Agr. Bul. 222 (1915), pp. 32, figs. 2*).—The study of the yields obtained under various methods of seed-bed preparation as here presented is made in such a way as to show the effect of the crop immediately preceding and the tillage involved in preparing the seed bed for barley. The area included in these investigations covers parts of ten States and about 400,000 sq. miles of territory, and ranges in altitude from 1,400 to 6,000 ft. Climatic conditions and the general plan of the investigations are described. Tables show the average cost per acre of the farm operations, the cost per acre of producing barley in the shock by the different methods, and the results at individual stations. The total cost of production of barley in the shock by the different methods of preparation is given at $4.65 for disked corn land, $5.45 for listed, $5.99 for spring plowed, $6.46 for fall plowed, $7.07 for subsoiled, $11.40 for summer tilled, and $14.51 for green manured land.

The conclusions state that "differences in the climatic conditions of different seasons have caused much wider variations in yields than have resulted from differences in cultivation. Yields at Belle Fourche, Garden City, Dalhart, and Amarillo have been markedly lower than those obtained at the other field stations. The only profit shown at any of these stations is 35 cts. an acre on disked corn ground at Belle Fourche.

"The highest average yields at eleven of the fourteen stations have been by summer tillage. On the average, it increased the yields nearly one-half over those produced on land cropped in the preceding year. On account of its cost it has not been the most profitable method of production.

"At ten of the fourteen stations under study disked corn ground produced higher yields than from either the fall plowing or the spring plowing of barley stubble. It has been the most profitable method under trial at all the stations except Hettinger.

"The relative advantage of either fall or spring plowing is largely dependent upon the season. In the general average of the thirteen stations at which each method has been tried there is practically no difference. At only three stations has there been an average difference of over 2 bu. per acre between the two methods. At the four more southern stations fall plowing has been better than spring plowing.

"At the seven stations where subsoiling for barley has been tried it has produced an average of only 0.4 bu. more than fall plowing. At only two stations has there been a marked difference in the results of the two methods. At one of these, subsoiling has been responsible for an increase and at the other for a decrease in yield.

"At eight stations listing instead of plowing has been tried. While the resulting yields have not been materially different from those on fall-plowed land, the lower cost of listing has made it the more profitable method."

Field beans, a profitable West Virginia crop, I. S. Cook (*West Virginia Sta. Circ. 18* (*1915*), *pp. 11, figs. 5*).—Methods of production and harvesting of field beans and the treatment of bean pests are given.

Hardier spineless cactus, D. Griffiths (*Jour. Heredity, 6* (*1915*), *No. 4, pp. 182–191, figs. 5*).—This article notes selections already made in three varieties, *Opuntia cacanapa*, *O. subarmata*, and *O. ellisiana*, which are described and illustrated, and which have been crossed with the more tender varieties of spineless cactus. The results are forms which are entirely devoid of spines and are as rapid of growth as the spiny natives of the Texas region.

Corn in the Great Plains area: Relation of cultural methods to production, E. C. Chilcott, J. S. Cole, and W. W. Burr (*U. S. Dept. Agr. Bul. 219* (*1915*), *pp. 31, figs. 6*).—The area covered by these investigations is that noted for barley (see p. 230). The method of work adopted involved the raising of different crops in various combinations or systems of rotations and under different methods of cultivation.

In a study of the comparison of cultural methods it is shown that the average cost per acre of the farm operations involved in growing corn in the Great Plains area is as follows: Plowing, $1.71; disking, 75 cts.; harrowing, 17 cts.; subsoiling, \$1.43; drilling, 40 cts.; cultivating, 38 cts.; listing, 60 cts.; cutting and binding, 62½ cts.; shocking, 50 cts.; twine, 22½ cts.; and binder wear and repair, 15 cts. The comparative cost per acre of producing corn by different methods is shown as listed, \$5.98; spring plowed, \$7.11; fall plowed, \$7.49; subsoiled, \$8.18; and summer tilled, \$12.36. Data for each station are given and the results discussed.

"No one method of seed-bed preparation is essential to the production of corn in the Great Plains. Differences in seed-bed preparation, other than summer tillage, have not produced wide differences in grain yields, except at Huntley, Mont. Summer tillage has slightly increased the grain yield at all except three stations and has materially increased the fodder yields at the three southern stations. The increase in yields, however, has not been sufficient to make it the most profitable method at any station except Scottsbluff.

"At some of the stations, especially at North Platte and Akron, crop sequence is more important than seed-bed preparation in the production of corn. At eight of the 13 stations corn as a grain crop has not been produced at a profit by any method. When a value of \$4 per ton is assigned to the stover or fodder, corn has been profitably grown by some method at all but one of the stations. The response to differences in culture and crop sequence is greater in the southern and central portion of the Great Plains than it is in the northern portion."

A new and prolific variety of cotton, G. W. Carver (*Alabama Tuskegee Sta. Bul. 26 (1915), pp. 7, fig. 1*).—This notes a variety of cotton produced by the station having a long, fine staple, very prolific, remarkably wilt resistant, adapted to upland conditions, and bred from Sea Island, Russell Big Boll, Jacksons Wilt Resistant, and Simpkins Prolific. Cultural methods are suggested.

[Flax growing], H. L. Bolley (*North Dakota Sta. Circ. 6 (1915), pp. 4*).—This suggests improved methods, including early sowing, the preparation of corn ground for seeding to flax, the use of wilt-resistant varieties, and the official inspection of the seed field by the station.

Fiber flax, F. C. Miles (*U. S. Dept. Agr. Farmers' Bul. 669 (1915), pp. 19, figs. 10*).—This discusses the production of flax for fiber, covering methods of cultivation and preparation of the fiber.

Oats in the Great Plains area: Relation of cultural methods to production, E. C. Chilcott, J. S. Cole, and W. W. Burr (*U. S. Dept. Agr. Bul. 218 (1915), pp. 42, figs. 2*).—This bulletin contains a study of the yields of oats from different methods of cultivation and seed-bed preparation similar to that for barley (see p. 230). Descriptions of the climatic conditions and of the general plan of the investigations are followed by the results obtained at each of the several stations.

The average cost per acre of the farm operations involved is given as the same as that for oats (see p. 231), except that cutting and binding cost 40 cts., shocking 13 cts., and twine 25 cts. The cost per acre of producing oats in the shock in the Great Plains area, as the averages of data from eight stations, show for disked corn land \$4.50, listed \$5.30, spring plowed \$5.84, fall plowed \$6.31, subsoiled \$6.92, summer tilled \$11.25, and green manuring \$14.36.

Tables show itemized data for yields and costs at each station for the different methods for several years, and these are briefly discussed.

These investigations have shown that "the relatively poor adaptation of oats to the southern section of the Great Plains can not be overcome by cultivation. Seasonal conditions cause much wider variations in yields than can be caused by differences in cultivation. . . .

"At all stations where it has been tried, listing for oats has been either more profitable or has resulted in less loss than fall plowing. Green manuring has been productive of higher yields than either fall or spring plowing, or disking corn ground, at nine of the thirteen stations from which results by it are reported. The cost of production by this method was so high that it showed a profit at only two stations. Oats following summer tillage produced the highest average yields at all stations except Hettinger, where the yield was exceeded only by that on disked corn ground. While the expense of the method has prevented its being the most profitable, the degree of insurance which it affords against failure of the feed crop might justify its practice in oat production in at least some sections of the Great Plains. Disking corn ground yielded the highest profits of any method tested at all stations except Garden City and Dalhart. At these two stations the crop was produced at a loss, but this loss was less than by any other method."

Potato breeding and selection, W. STUART (*U. S. Dept. Agr. Bul. 195* (*1915*), *pp. 35, pls. 16, figs. 2*).—In this bulletin the author defines breeding and selection and their limitations in work with the potato, notes the technique in handling the pistil and stamens, discusses pollen-producing varieties, and gives results of experimental crosses since 1909.

It is noted as doubtful whether the secretion of a stigmatic fluid is a normal function of the potato blossom at the present time. This observation is stated as being contrary to the teachings of previous investigators. Records show the parentage, number of flowers crossed, number of seed balls developed, percentage of success, and the number of seedlings that produced tubers for over 100 crosses made in 1909. Varietal affinity is noted as a factor in making successful crosses. The method of growing and testing some 28,000 seedlings is described.

In regard to inheritance in the F_1 generation it is stated that "in a population of 1,425 seedlings from a cross between Irish Cobbler and Irish Seedling, the first parent having a creamy white skin and purplish tinged sprouts and the latter with flesh-tinted skin and purplish sprouts, color was absent in 70.2 per cent of the tubers. Of those showing color, 36 were mottled with white, 229 were flesh, 104 were red, 55 were purple, and one was violet-black. In another instance, out of a population of 870 seedlings of Irish Cobbler crossed with Keeper, color was absent in 69.7 per cent of the tubers. The pollen parent, Keeper, being a red-skinned variety, it would seem that if white were recessive a larger proportion of the F_1 generation should have shown color."

The work of Goodrich and other early breeders in the improvement of the potato by selection are briefly discussed and the tuber-unit and hill-selection methods described.

It is stated that the almost total failure of our present-day commercial varieties to produce seed balls is due to male sterility rather than to imperfect pistils or ovaries, and that the tuber-unit and hill-selection methods are chiefly valuable in pointing out the weak, unproductive, and diseased seed tubers.

Report of the officer in charge of the Prickly Pear Experimental Station, Dulacca, J. WHITE (*Ann. Rpt. Dept. Pub. Lands Queensland, 1913, pp. 66–78, pls. 3*).—This gives in detail the methods employed in searching for ways and means for the destruction of the prickly pear in Queensland. The effects of different poisons applied by injections and by spraying, treating with poisonous gases and vapors, and the use of parasitic insects are described.

The prickly pear problem in Australia, C. F. JURITZ (*Reprint from Weekly Cape Times and Farmers' Rec., 1915, Feb. 5, pp. 14, figs. 6*).—This article gives compiled results from various sources of methods for the eradication or utilization of prickly pear in Australia. The methods consist in the introduction of the cochineal insect, poisoning the plants with various chemicals, and establishing a commercial use for the plant, such as a source of potash fertilizer, oil, industrial alcohol, and fodder for stock.

Some observations on Upper Burma paddy (grown under irrigation), E. THOMPSTONE (*Agr. Jour. India, 10 (1915), No. 1, pp. 26–53, figs. 11*).—This article notes the improvement of rice by selection and crossing as to the number of grains per plant, variation in weight of grain, and tillering.

It is shown that as the tillers increase there is an increase in the weight of grain, but this increase is not in direct proportion to the number of tillers produced by the plant. As the number of tillers increase the average yield per tiller decreases.

In cross-fertilization is was found that "whiteness and redness of glumes act as a pair of simple Mendelian characters, the former being dominant. Whiteness and redness of grain also act as a pair of simple Mendelian characters, redness being dominant."

It is noted that "as the heads of paddy emerge from the sheath the flowers mature from above downward, before or when very little spreading of the panicle has taken place. The stamens emerge daily generally from the segment of the head which has just come out of the sheath, and the head ripens the whole of its flowers in three or four stages on successive mornings. The glumes open, the stamens hang out, and the feathery stigmas protrude once only and for a short time in the early morning, usually between 7 and 10 a. m. Dewy mornings appear to be most favorable, and 'flowering' will then be at its maximum height about 8 to 9 a. m. As the dew gradually disappears the flowers will be found to be opening rapidly but, as soon as the day begins to get very bright, dry, and warm, no more glumes open and those already opened close up again, the stamens by this time being dried and shriveled up.

"The angle formed by the two edges of the glumes when the flowers are fully open is about 25 to 30°, but the stamens have often emerged before the flower is fully open. Pollination takes place before the glumes open, or at the moment of opening, seldom afterwards. At the moment they emerge from the glumes the anthers are found to be already open at the lower end, and with the aid of a microscope pollen grains can generally be found on the stigmas."

The transplanting of [rice], N. S. MCGOWAN (*Ann. Rpt. Agr. Stas. Bihar and Orissa, 1913–14, pp. 20–23*).—This article gives the results in transplanting 1, 2, 4, and 6 seedlings to a hill under varying conditions.

The data show that 4 seedlings per hill gave the largest yields in general, whether planted in a wet or dry seed bed. Using 8 maunds (about 650 lbs.) of seed per acre gave better results in the seed bed than 1, 4, or 16 maunds. Transplanting 18 in. apart seemed preferable to 6, 9, or 12 in. With heavy applications of barnyard manure (160 tons per acre) the single plant hill equaled or exceeded the others (2, 4, and 6) in yield.

Notes on the hydrocyanic acid content of sorghum, J. J. WILLAMAN and R. M. WEST (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 2, pp. 179–185, figs. 2*).—The following conclusions were drawn from tests at the Minnesota Experiment Station with two varieties, feterita and Orange sorgo, grown on different soils and under varying fertilizer treatments:

"When sorghum is grown on poor, infertile soil, added nitrogen may slightly increase the amount of hydrocyanic acid in the plant. With a fertile soil and abundant nitrogen this effect may not be produced. During the first three or four weeks of the plant's life the prussic acid is concentrated in the stalks. Then it rapidly decreases and disappears there, but apparently persists in the leaves in decreasing percentages until maturity.

"Climate and variety may be more important factors than soil nitrogen in determining the amount of the acid in the plant. Complete hydrolysis of the glucosid is obtained by digesting the macerated tissue for two hours at 40 to 45° C."

Soy beans, an important West Virginia crop, I. S. COOK and W. B. KEMP (*West Virginia Sta. Circ. 20* (*1915*), *pp. 19, figs. 4*).—Methods of utilizing soy beans as a seed crop, hay, silage, pasture, and soil improvement crop are briefly noted. Two, 3, and 4 year rotations that include soy beans are suggested. Thirty-three varieties are described and yields from some of them for 1912, 1913, and 1914 are given that show a range up to 25.3 bu. of seed per acre. Of the varieties tested, Wilson, Roosevelt, and Peking are noted as the most promising sorts for West Virginia. Cultural and harvesting directions are given.

Saccharose formation in the sugar beet, H. COLIN (*Compt. Rend. Acad. Sci.* [*Paris*], *159* (*1914*), *No. 20, pp. 687–689*).—This gives the results of a study to determine whether the saccharose is developed in the leaf and passes to the roots as such or whether it passes to the roots as invert sugar and is there transformed to saccharose. From the use of two varieties of beet studied in light and in darkness the author concludes that both of these phenomena take place, with much variation in different varieties of beets.

Sweet potato [experiments], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta.* [*etc.*], *Antigua, 1913–14, pp. 5–8*).—In variety tests of sweet potatoes covering the period from 1901 to 1914, inclusive, the average yields ranged from 31 to 51 lbs. per plat of $\frac{1}{160}$ acre for 16 varieties.

In plant selection experiments based on large yield per plant it is noted that very satisfactory results are being obtained. The first year plants yielded from 3 to 6 lbs. each, which increased to from 4 to 17½ lbs. the second year.

The early agricultural history of timothy, C. V. PIPER and KATHERINE S. BORT (*Jour. Amer. Soc. Agron.*, 7 (*1915*), *No. 1, pp. 1–14*).—This article notes the early agricultural history of timothy or herd's grass as first discovered in New Hampshire in 1700 or in Maryland in 1720. A bibliography of works published prior to 1847, in which this grass is mentioned, is cited.

A text-book on tobacco, C. WERNER (*New York: Tobacco Leaf Publishing Co., 1914, pp. 323, figs. 34*).—An enlarged edition of this work (E. S. R., 22, p. 637).

Relation between the dry matter and winter resistance of different varieties of winter wheat, E. SINZ (*Jour. Landw.*, *62* (*1914*), *No. 4, pp. 301–335*).—This gives the results of experiments carried on at Göttingen in 1911 and 1912 in the experiment field, in pots, and in sunken masonry tanks with 10 varieties of wheat.

It is shown that there is a direct relation between dry matter and frost resistance; that is, a high, dry matter content correlates with high frost resistance, and vice versa. Those varieties that show ability to prevent rapid transpiration by the firm texture of the tissues and by the action of the stomata were found to be among those that were most highly frost resistant.

Hard wheats winning their way, M. A. CARLETON (*U. S. Dept. Agr. Yearbook 1914, pp. 391–420, pls. 7, figs. 4*).—This article traces the evolution of the hard wheats in this country from their introduction from Russia through the stages of increased production on the Great Plains, and the milling and commercial developments as to their products.

HORTICULTURE.

[Progress report on horticultural investigations] (*Missouri Sta. Bul. 131* (*1915*), *pp. 479–483, fig. 1*).—This comprises concise statements of progress made along various lines of horticultural work during the year ended June 30, 1914.

In a study of bud selection for increasing yields by J. C. Whitten it has been found that continuous bud selection of strawberry plants during a period of 15 years has given no gain in the total productiveness of the plats originated from high-productive plants over the plats originated from the low-productive plants. Selection from bud-propagated strawberry plants does not appear to have limited the range of variation among individual plants. A similar experiment has been conducted with scions selected from an exceptionally poor-yielding Ben Davis apple tree and from the Ben Davis tree which produced the largest and best apples of its kind on the station grounds. Examination of the third year's crop showed no perceptible difference in size, color, grade, or quality of the fruit from the two lots of trees. The total product from the trees in each lot averaged slightly higher than those propagated from the high-producing parent. There appeared to be as much variation between individual trees in either plat as between the two.

An investigation is being made by C. C. Wiggans of the tendency of certain varieties of fruit trees to bear only in alternate years, as compared with varieties which tend to bear more regularly. Observations made in the spring in the case of a Gano apple tree showed that there were no blossoms produced on spurs which had borne fruit the previous year. Likewise but very few blossoms were produced on the Rome and Jonathan trees on bearing spurs of the previous year.

The test at the station of fall *v.* spring planting of trees, by J. C. Whitten, has shown that fall-planted trees have reached their bearing habit approximately one year in advance of the spring-planted trees. In every case the fall-planted trees have grown much better during the year than those planted in the spring. This was particularly true of cherries. In apples the fall-planted trees showed a greater growth of from 33⅓ per cent to 150 per cent in excess of spring-planted trees. Fall-planted trees produced a thicker trunk and the growth of the lateral buds was more vigorous.

Observation of the self-fertility and self-sterility of fruits by C. C. Wiggans during the last year indicates that all the varieties of peaches commercially grown in Missouri are self-fertile, and that mixed plantings for the sake of cross pollination are unnecessary. Only a few of the commercial apples gave indications of being able to fertilize themselves.

In the orchard nutrition studies by J. C. Whitten and C. C. Wiggans the peach is the only fruit which has so far shown any advantage from the application of fertilizers (E. S. R., 31, p. 335). On all plats fertilized with nitrogen, whether alone or in combination, the number of peaches set was larger than on the other fertilized plats or on the check plats, and the average increase in the number of peaches produced was 50 per cent. The average weight of the peaches fertilized with nitrogen, however, was only 60 per cent of the average weight of the peaches grown on plats receiving fertilizer other than nitrogen. The nitrogen-fertilized trees carried a very heavy foilage, and it is believed that extreme drought conditions caused an excessive evaporation from these trees.

Observations thus far made by C. C. Wiggans relative to the possibility of forecasting bloom by examination of fruit buds during the winter indicate that a fairly accurate prediction can be drawn from a count of the winter buds. This work is to be continued.

Division of horticulture.—Summary of results, 1914, W. T. Macoun et al. (*Canada Expt. Farms Bul. 82* (*1915*), *pp. 88*).—This comprises a summary of results secured in 1914 in the breeding and cultural experiments with fruits, vegetables, forest and ornamental trees, and herbaceous plants conducted at the

Central Farm, Ottawa, and at the various branch experimental farms and stations in Canada. The details of the work are to appear as usual in the annual report at a later date.

Among the commercial varieties of apples tested at the Central Farm Red June, Stayman Winesap, and Rome Beauty give considerable promise, both with reference to hardiness and quality, although it is believed that Rome Beauty should be tested further before recommending it for commercial planting in a climate as cold as that at Ottawa. The Delicious kills back and is not considered hardy enough for commercial purposes in that region.

Additional data are given on the closely planted Wealthy apple orchard (E. S. R., 32, p. 437). The estimated net profit per acre in 1914 was $115.40, the average net profit per acre from date of planting, 1896, being $90.49. Of the original 144 trees there are now 88 left.

In previous observations made for a number of years relative to the yields of individual trees of the same varieties of apples there was found to be a great difference in the yields from different trees (E. S. R., 27, p. 343). An experiment in scion selection was started in 1905 in which scions taken from the least productive tree, the most productive tree, and the tree which bore a good crop every year in a row of 18 Wealthy apple trees were root grafted and planted out in 1909 on a uniform piece of soil. The yields for the three bearing years 1912 to 1914 indicate that the bearing habit of the parent tree has been perpetuated in each case, although observations are to be made for several years before definite conclusions are drawn.

Of the autumn bearing strawberries being tested, the Progressive has thus far given the best results. In 1914 this variety yielded a fair crop of fruit in the regular season and also in the autumn, the fruit continuing to ripen until injured by frost. The results for the first season of a test of European grapes grown under glass are given. Data are also given on a series of experiments with orchard heaters conducted at the farm in the fall. The data secured indicate that these heaters may prove very useful in strawberry and truck crop plantations, where the value of the crop is relatively high. The usual notes are given on the more promising varieties of vegetables and ornamentals tested both at the Central Farm and at the branch stations. Fertilizer tests with potatoes are reported from the Fredericton, New Brunswick, substation, and cultural tests from the Rosthern, Saskatchewan, substation.

A series of tests was started in 1913 at the Kentville station, W. S. Blair in charge, to determine the advisability of fertilizing fruit trees when they are planted. The results to date indicate that there is little advantage in using fertilizers at planting time and that good cultivation is of greater importance. From two years' work carried on by this station in a number of cooperative orchards, it appears that four thorough applications of lime-sulphur arsenate of 1.008 sp. gr. will control scab as effectively as Bordeaux mixture without danger of russeting the fruit, which is usually more or less serious when Bordeaux is applied after the blossoms fall. The application of a dormant spray in addition to the regular sprays appears to be of little value in controlling scab. A test was made of the claim that sugar added to Bordeaux will prevent russeting. The addition of 2, 4, and 6 lbs. of sugar, respectively, to 4 : 4 : 40 Bordeaux arsenate mixture proved to be of no value as a preventive of russeting. A series of tests undertaken to determine the actual gain from arsenate of lead in lime-sulphur for the control of scab indicated that the arsenate of lead had very little fungicidal value. Commercial concentrate lime-sulphur appeared as effective in controlling scab as the home-boiled concentrate.

The university farm garden, A. L. Dacy (*West Virginia Sta. Circ. 17* (*1915*), *pp. 16, figs. 4*).—The author here presents detailed records of demonstration experiments in vegetable gardening conducted in the university farm garden during 1913 and 1914. The data given for each vegetable show the dates of planting, area planted, date of first sale, approximate yield, approximate average price, total sales, and estimated gross returns per acre. The results are further discussed from the standpoints of yields, distribution of income, relative values of the different crops, and the relative values of the different systems of cropping. This circular also contains a planting table for vegetables, together with a table showing the details of succession and companion cropping plans as used in 1914.

Cabbage, cauliflower, turnip, rape, and other crucifers, W. P. BROOKS (*Massachusetts Sta. Circ. 49 (1915), pp. 4*).—This is a revision of Circular 38 of the same series (E. S. R., 32, p. 337).

How to grow muskmelons, J. W. LLOYD (*Illinois Sta. Circ. 139, 2. ed., rev. (1915), pp. 18, figs. 8*).—The present edition of this circular (E. S. R., 23, p. 42) has been somewhat revised to conform to more recent information on the subject.

Arboriculture in Spain, J. M. PRIEGO (*Bol. Agr. Téc. y Econ., 6 (1914), Nos. 66, pp. 530–533; 67, pp. 626–633; 68, pp. 712–723; 69, pp. 827–833; 70, pp. 927–933; 71, pp. 1011–1017; 72, pp. 1115–1120*).—An analysis of fruit growing in Spain by groups and regions, with a discussion of the part to be played by the producer, the merchant, and the State with reference to the best future development of the industry.

Annual report on the Fruit Experiment Station, Shillong, for the year ending June 30, 1914, C. H. HOLDER (*Ann. Rpt. Agr. Expts. Assam, 1914, pp. 55–73, pl. 1*).—This comprises a brief descriptive account of the fruit station, which was started in 1912, together with a statement of the number and varieties of trees, bushes, and plants in the fruit plantations.

[Final reports of the Royal Commission on the Fruit Industry] (*Melbourne, Australia: Govt., 1914, pp. 23+19*).—This embraces the salient features of the majority and minority reports of a parliamentary investigation relative to the production, distribution, marketing, and exportation of Australian fruit, including the operations of producers, shippers, carriers, dealers, and others connected with the fruit industry. Recommendations looking to the betterment of the industry are also included.

New or noteworthy fruits, III, U. P. HEDRICK (*New York State Sta. Bul. 403 (1915), pp. 211–220, pls. 4*).—In continuation of a previous bulletin (E. S. R., 31, p. 337) the author describes the best recent fruit introductions as tested on the station grounds. Attention is called to the fact that these varieties are still on probation at the station and growers are advised to go slow in making commercial plantings of such fruits.

The varieties here described include the Niagara peach, Muscat Hamburg grape, Lambert cherry, Late Muscatelle plum, Industry gooseberry, Black Pearl black raspberry, Marldon red raspberry, and Amanda strawberry.

Experimental results in young orchards in Pennsylvania, J. P. STEWART (*Pennsylvania Sta. Bul. 134 (1915), pp. 20, figs. 4*).—The station started an extensive series of orchard experiments in various parts of Pennsylvania in 1907–8. The results of some of these experiments, especially those on the fertilization of mature orchards, have been reported on from time to time (E. S. R., 29, p. 437). This bulletin gives the results of various experiments which have been conducted in young orchards during the first seven years.

A comparative test was made of apple trees propagated on whole roots, on top pieces, and on bottom piece roots. As measured by the average size and height of trees after a period of 11 years in the orchard, it is concluded that there is practically no difference in efficiency between the various methods of propagation now generally used in nurseries. The author calls attention, however, to the desirability of eliminating the seedling root entirely with the view of doing away with the numerous ill effects of poor unions and the development of definite and standard root systems, with which the injuries from root aphis and kindred difficulties might be reduced or entirely eliminated. Further work is planned along this line.

A test was made relative to the influence of scion selection in improving yields. The scions from supposedly superior individual trees were top grafted chiefly on Northern Spy stock and ordinary nursery trees of the same varieties were planted alongside for comparison. The relative yields from the two classes of trees as shown for eight varieties for the seventh year of growth are not sufficiently decisive, either to approve or condemn the practice of scion selection. The results as a whole thus far do not warrant anyone in paying materially higher prices for so-called pedigreed trees.

Another experiment is being conducted to determine the best stocks for use in top grafting. The Jonathan, Tompkins King, and Grimes apples were all top grafted on Northern Spy, Tolman, Wolf River, Paragon, and Champion stocks and compared with nursery-grown trees of these three varieties grafted on seedling roots. In all cases, except one, those of varieties top grafted on Wolf River, the top-grafted trees on known stocks have made a better average growth during the period, 1908 to 1914, than those grafted on seedling roots in the nursery. Among the various stocks the trees developed on the Paragon are now distinctly in the lead, with those on Tolman coming second. The superiority of these two stocks for Grimes and Tompkins King is very marked so far as growth is concerned. In smoothness of unions the Tolman and Champion are probably best, with Paragon next, except with grafts of the Jonathan, with which variety the Paragon stock has tended to outgrow the scions. Northern Spy stock has averaged third in growth and is about equal to Paragon in unions. Although making an excellent trunk and root system, it is considered less desirable than either Tolman or Paragon for stock purposes owing to its unusual tardiness in starting growth in the spring. Attention is called to some interesting relations between certain stocks and scions observed by S. Fraser, of Geneseo, N. Y. This nurseryman finds that the Twenty-Ounce top grafted on Baldwin makes from 50 to 100 per cent better trees in five to eight years than when worked on Northern Spy. The Wealthy does very poorly on Rhode Island Greening, whereas Rhode Island Greening does very well on Wealthy. Hubbardston scions top grafted on Ben Davis, Northern Spy, and Tolman resulted in such peculiar changes in twig color that they could not be used with safety for further scion wood until they had proved their identity by coming into bearing.

Four experiments in dynamiting orchard soils were started in 1912. Two of these were on orchards just being planted and two on 25-year-old Baldwin trees which had become more or less sod bound. Briefly stated the results for a period of three years have failed to show any appreciable benefits, either in the young or the old orchards.

In one experiment started in 1908 the orchard was divided into 45-tree plats, each involving three varieties of trees. The following treatments have been followed annually: Tillage, tillage and intercrop, tillage and cover crop, cover crop and manure, cover crop and fertilizer, mulch, mulch and manure, and mulch and fertilizer. Data secured on moisture, growth, and yield at the close of a 7-year period show practically no difference between the clean tillage plat and the plat tilled early in the season and sown to an annual cover crop of a mixture of red and crimson clover. The use of a tilled annual intercrop early in the season followed by a late cover crop of rye resulted in nearly 12.5 per cent more tree growth than for trees under either tillage or tillage with a cover crop. In general all of the mulching methods gave better results than the tillage methods. The author concludes relative to this test that the best soil management in a young orchard is the one which conserves the moisture best. This gives the largest growth and earliest fruiting under most conditions. The moisture is conserved most efficiently by a good mulch of strawy manure or other plant materials, which should be accompanied by proper protection against mice. Where sufficient mulching materials are not available proper tillage and cover crops should give satisfactory results. On good tillable soil and with the trees well mulched the use of tilled intercrops is the most practical method of orchard development. The financial returns from intercrops of potatoes in these experiments have usually run from $40 to $50 an acre even on the very poor soil involved.

Among the annual cover crops buckwheat, hairy vetch, and millet rank high. It is suggested that the buckwheat may be harvested by high cutting or heading probably without materially reducing its favorable influences on the adjacent trees. The use of alfalfa in the orchard not only furnished an abundant supply of mulching material around the young trees, but under favorable conditions it may also afford a considerable surplus for hay. The mulch should be heavy enough to prevent the alfalfa from growing in competition with the principal tree roots. This system of management gave better results than any kind of annual tillage during the first seven years. In the older bearing orchards, where the mulch-producing area is small, three courses are suggested—mulching materials may be brought in, a tillage system, preferably by disking, may be adopted, or it may be possible to replace both by a proper system of fertilization.

The fertilizer experiments as a whole have shown that the fertility needs are often most important in the older orchards (E. S. R., 29, p. 437). In lieu of specific information relative to the needs of such orchards annual applications of either stable manure at the rate of 6 or 8 tons per acre or a commercial fertilizer carrying about 6 per cent nitrogen, 8 per cent phosphoric acid, and 4 per cent potash at the rate of about 500 lbs. per acre are recommended. On young trees applications of plant food alone have given as a rule but little benefit except in the presence of an abundance of moisture. In a few cases some actual injury has apparently resulted to young trees from rather heavy applications of commercial materials especially rich in the more soluble forms of potash. Hence a good mulch of manure is believed the best general application for young trees. Where this is not available moderate surface applications of the above noted general fertilizer are recommended.

Making old orchards profitable, L. GREENE (*Iowa Sta. Circ. 20 (1915), pp. 3–32, figs. 14*).—This circular summarizes the principal results secured in an apple orchard survey of Mills County, Iowa (E. S. R., 32, p. 540).

Stock influence upon the vintage quality and other characters of apples, B. T. P. BARKER (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1913, pp. 97–102*).—The results of analyses made under the direction of the National Fruit and Cider Institute for a number of years lead to the conclusion that the influence of the intermediate stock on the vintage quality is very slight, if it exists at all. Analytic data on fruit juice from various trees in 1913 with average data for the period 1908–1913 are given.

The cacao tree in the State of Bahia, L. ZEHNTNER (*Le Cacaoyer dans l'Etat de Bahia. Berlin: R. Friedländer & Sohn, 1914, pp. XII+156, pls. 49*).—An account of cacao culture in Bahia, based upon travel studies made by the author during 1909 and 1911. The region of cacao culture is briefly described and consideration is given to the establishment of plantations, management, production, financial returns, varieties, harvesting and preparation, statistics, diseases and insect pests, transportation, and the relation of the State to the cacao industry.

Citrus fertilization experiments in Porto Rico, C. F. Kinman (*Porto Rico Sta. Bul. 18* (*1915*), *pp. 33*, *pls. 2*, *figs. 2*).—This bulletin reports cooperative fertilizer experiments in citrus groves which were started in 1905 by H. C. Henricksen, continued by M. J. Iorns, and completed by the author. In order to determine the comparative effects of nitrogen, phosphoric acid, and potash, both complete and incomplete mixtures of these elements secured from various sources were applied. The results secured in three different groves are here presented in tabular form and discussed.

The results of the work as a whole show a pronounced effect on both trees and quantity of fruit due to fertilization. This effect was greatest as to trunk, top, and leaf growth, and as to leaf color where a complete fertilizer was given. The difference in leaf color appeared to be most pronounced during periods of drought. In one grove the color was poorest in the plat given no phosphoric acid and in another grove the color was poorest where no nitrogen was given.

The growth in the check plats was so slow and unsatisfactory that all except one were discontinued before the conclusion of the experiments. The appearance and growth of the trees in plats given a complete fertilizer were practically the same, except that in a plat given nitrogen in the form of dried blood they were not so thrifty. The weight of fruit harvested from check plats was only 27 per cent of that harvested from complete fertilizer plats.

In one grove the gain in yield by plats given three elements over those given two was 80 per cent and in the other 44 per cent. Of the trees receiving only two elements those given no potash bore more than those given no phosphoric acid.

The trees receiving no nitrogen gave the poorest yields. The average weight of the fruit per hundred was heavier in the plats given no nitrogen than in those where phosphoric acid or potash was omitted. The differences in yield between plats receiving muriate of potash and sulphate of potash were too slight to indicate the superiority of one form over the other. No differences were noted between these plats in respect to quality, flavor, or color of the fruit. In one grove where nitrogen was applied in the form of nitrate of soda the yield was but 83.7 per cent of that where an equal amount of nitrogen was given in the form of sulphate of ammonia. In another grove, however, there was practically no difference resulting from the two treatments. On the basis of the results of these experiments dried blood appears to be a somewhat less favorable source of nitrogen for citrus fruits than either sulphate of ammonia or nitrate of soda. No marked difference in flavor of fruit was observed resulting from the application of different fertilizers. There was also no apparent difference in time of ripening of the fruit between the various fertilized plats. The fruit ripened earlier in the check plat than in the fertilized plats.

Drug plants under cultivation, W. W. Stockberger (*U. S. Dept. Agr., Farmers' Bul. 663* (*1915*), *pp. 39*, *figs. 8*).—The author calls attention to a number of drug plants suitable for cultivation in the United States and gives general suggestions relative to the culture, harvesting, distillation, yielding, marketing, and commercial prospects for drug plants. Specific information secured from various sources in this department is then given relative to the cultivation, handling, and yield of individual species, including also available data relative to the demand and prices paid.

A bibliography of department publications dealing with drug plants is appended.

Experiments in hybridizing Japanese flowers which appear to show a variation in Mendel's law, W. P. JENNY (*Sci. Amer. Sup., 79 (1915), No. 2036, pp. 18, 19; abs. in Sci. Amer., 112 (1915), No. 8, p. 182*).—The author found that the dry pollen of the white moonflower applied to the stigma is inert, and will not fertilize the ovary unless the pollen be wet with the fluid excreted upon the surface of the stigma of the moonflower. This discovery led to the series of experiments here described, in which the Japanese morning-glory was crossed with the white moonflower. As a result of these experiments, extending over several years, it is concluded that hybrids of Japanese morning-glory with the white moonflower are subject to Mendel's law in only a limited way, if at all. This is believed to be due to the influence of the fluid excreted by the stigma of the moonflower. Crosses between the Japanese and American morning-glories arising from pollination by insects follow Mendel's law.

Dwarf evergreens, G. V. NASH (*Jour. N. Y. Bot. Gard., 16 (1915), No. 183, pp. 47–61, pls. 2*).—The author briefly discusses the selection and care of evergreens, and gives short descriptions of a number of dwarf evergreens, both coniferous and broad-leaved, which may be readily procured. Lists of evergreens for special purposes or conditions are also given.

Lime and sulphur solutions, G. E. STONE (*Massachusetts Sta. Circ. 53 (1915), pp. 2*).—This is a revision of Circular 39 of the same series (E. S. R., 32, p. 338).

FORESTRY.

The National Forests and the farmer, H. S. GRAVES (*U. S. Dept. Agr. Yearbook 1914, pp. 65–88, pls. 6*).—In this paper the author calls attention to many ways in which the National Forests influence the welfare and development of agricultural communities. Among the special benefits to the farmer here discussed are the benefits through protection of water resources, through supplies of forest products, from grazing privileges, direct and indirect benefits from the establishment and maintenance of various industries utilizing the resources of the forests, and the benefits from public improvements built by the Government.

The farm woodlot problem, H. A. SMITH (*U. S. Dept. Agr. Yearbook 1914, pp. 439–456, pls. 8*).—An economic discussion of the farm woodlot problem in which consideration is given to the question of taxes, woodlots as sources of wealth, marketing difficulties, how the farmer may protect himself in marketing timber, and woodlot values, present and future.

The new Massachusetts forest taxation law, F. W. RANE (*Boston: State [1915], pp. 35, pls. 8*).—This pamphlet contains the full text, with explanation, of the Massachusetts forest taxation law passed in the spring of 1914.

Natural reforestation in the mountains of northern Idaho, H. B. HUMPHREY and J. E. WEAVER (*Plant World, 18 (1915), No. 2, pp. 31–47, figs. 9*).—The authors here present the results of a study of various types of natural reforestation as observed in the mountains of northern Idaho.

[Report of progress on] forestry (*Missouri Sta. Bul. 131 (1915), pp. 478, 479*).—A concise statement of progress made in forest investigations, carried on by E. C. Pegg during the year ended June 30, 1914.

With the view of studying the methods of prolonging the service of wood fence posts about 550 posts, representing 25 species, were set in 1913. Examination at the end of the first year showed no evidence of decay or fungus growth. Persimmon, honey locust, and a few coffee-bean posts showed damage by borers. The creosote had leached out and discolored the soil to certain extent around some of the cottonwood, willow, and sycamore posts.

A test of the effect of storage conditions on the vitality of forest tree seeds indicates that the vitality is low after they have been stored for two years, and that the proper method of storing forest tree seeds will depend upon the species to which any particular seed may belong.

The preservation of structural timber, H. F. WEISS (*New York and London: McGraw-Hill Book Company, Inc., 1915, pp. XVIII+312, pls. 47, figs. 32*).—A text-book and manual of information dealing with the wood preserving industry, the subject matter being based largely on lecture notes prepared by the author for civil engineering students at the University of Wisconsin.

The introductory chapter deals with the importance and history of wood preservation. The succeeding chapters discuss the factors which cause the deterioration of structural timber, the effect of the structure of wood upon its injection with preservatives, the preparation of timber for its preservative treatment, processes and preservatives used in protecting wood from decay, the construction and operation of wood preserving plants, prolonging the life of cross-ties from decay and abrasion, prolonging the life of poles and cross-arms from decay and insects, prolonging the life of fence posts from decay, prolonging the life of piling and boats from decay and marine borers, prolonging the life of mine timbers, paving blocks, shingles, lumber, and logs, the protection of timber from fire and minor destructive agents, the strength and electrolysis of treated timber, and the use of substitutes for treated timber. Considerable information dealing with wood preservation, wood preserving processes, and data on the wood preserving industry of the United States, etc., is appended.

The deterioration of lumber.—A preliminary study, M. B. PRATT (*California Sta. Bul. 252 (1915), pp. 301–320, figs. 8*).—In the study here reported lumber from three important timber species, viz, sugar pine (*Pinus lambertiana*), western yellow pine (*P. ponderosa*), and Douglas fir (*Pseudotsuga taxifolia*), was under observation in the yards of a representative lumber company in the northern part of the Sierra Nevada Mountains of California from the time it left the sawmill until it was shipped. Data were secured relative to the loss in grade due to air seasoning, kiln drying, and finishing, and the causes leading to the loss.

The limited amount of data secured in this work show that the upper grades of sugar pine deteriorate much more in seasoning than either western yellow pine or Douglas fir. The average loss for all lumber tallied in unfinished upper grades of sugar pine through fall seasoning was approximately $12 per thousand board feet as compared with an average loss of $2.58 per thousand board feet through summer seasoning. One test in kiln drying sugar pine at the same temperature as western yellow pine and Douglas fir indicated that the deterioration in the upper grades of sugar pine lumber would be much less if kiln dried than when air dried in the spring or fall. Until the matter of kiln drying of sugar pine has been worked out more satisfactorily, however, it seems preferable to air dry the summer-cut stock.

Blue stain and brown stain, the greatest sources of depreciation in sugar pine lumber, are largely the result of poor drying conditions due to imperfect circulation of air, poorly drained soil, failure of a pile to shed rain water, or damp, rainy weather. The author concludes that since a large loss is liable to occur in air-seasoned sugar pine owing to the sensitiveness of the wood to blue stain and brown stain the value should be fixed in accordance with the ultimate grade and value of the species rather than its grade and value at the saw.

Since air-dried western yellow pine lumber checks so badly, it pays to kiln dry all of the upper grades. Approximately 80 per cent of western yellow pine tallied in this study retained the original grade as made at the mill after the lumber had been kiln dried and surfaced. The average loss through deterioration during kiln drying of the upper grades was approximately $1.55 per thousand board feet. With lumber surfaced on two sides there was a further loss ranging from 51 cts. per thousand board feet in lumber taken directly from the kiln to $2.27 per thousand board feet in that stored in the sheds.

Experience has shown that kiln drying is the only practical method of keeping up the grades of Douglas fir. Approximately 91 per cent of the upper grades of Douglas fir 1 in. in thickness retained the original grade when shipped after being kiln dried. The average loss through deterioration due to kiln drying was 53 cts. per thousand board feet for 1 in. lumber and $2.90 per thousand board feet for 2 in. lumber, which checks very badly.

DISEASES OF PLANTS.

Physiological relations of powdery mildews to their hosts, G. M. Reed (*Missouri Sta. Bul. 131 (1915), pp. 469, 470*).—It is stated that absence of light during the growth of barley and wheat results in a marked decrease of infection by powdery mildew; also a retardation in the development and a lengthening of the incubation period of the fungus. A marked correlation is noted between the violence of infection and the development of chlorophyll in etiolated plants.

A connection between mildew attack and photosynthesis is indicated by the fact that wheat and barley grown in the presence of light, but in the absence of carbon dioxid, remain free from mildew. Mineral starvation of the plant confers upon it partial immunity as regards the fungus, but it does so indirectly by lessening the vigor of the host and so depriving the parasite of its proper nutriment. Such substances as manganese sulphate, potassium sulphate, and lithium bromid added to the soil may slightly decrease susceptibility in the host. Dwarfing host plants by a high content of mineral in the soil water has no effect as regards susceptibility to mildew. There seems to be a positive correlation between normal development on the part of the host and successful attack on the part of the fungus.

Studies in the genus Phytophthora, J. Rosenbaum (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 394, 395*).—A study is reported of a number of species of Phytophthora, 10 of which have been collected and grown in cultures.

The results indicate that the kind of spores produced and the time of their appearance on a given medium is in some cases characteristic of the different species. Morphological studies also reveal characters of taxonomic importance. A great variation was found to exist in spore forms. From inoculation experiments the author concludes that the parasitism of species of Phytophthora is of a rather low order.

The Verticillium wilt problem, C. W. Carpenter (*Abs. in Phytopathology, 4 (1914), No. 6, p. 393*).—Verticillium wilts are said to have been reported on potato, okra, eggplant, snapdragon, and dahlia.

Of the first three plants the parasite is said to be *V. albo-atrum*, while for dahlia wilt the cause is given as *V. dahliæ*. In addition to attacking the hosts mentioned above, *V. albo-atrum* is believed to be the cause of a spontaneous wilting of two cotton plants at Arlington, Va. It likewise occurs in the vascular system of the weeds Abutilon and Xanthium, and is also the cause of the wilt of snapdragon. Attention is called to some views regarding the classification of the genus and its species, and the desirability of a monographic study is pointed out.

Classification of local rusts, J. P. Bennett (*Missouri Sta. Bul. 131* (*1915*), *p. 469*).—It is stated that there have now been collected and identified 67 species of rust occurring on 127 hosts obtained from 443 collections. It is thought probable that there are still at least as many more species occurring in Boone County that have not yet been collected.

The relation between Puccinia graminis and host plants immune to its attack, E. C. Stakman (*Abs. in Phytopathology, 4* (*1914*), *No. 6, p. 400*).—In continuation of previous studies (E. S. R., 31, p. 146), the author states that in many cases, both with cereals resistant to a biologic form of *P. graminis* and wheats resistant in varying degrees to attacks of *P. graminis tritici*, varying degrees of infection occurred. In some cases fairly large areas of the host tissue were killed outright, in others the discolored portions indicating the death of the host tissue were extremely small. In extreme cases no spots whatever are visible to the naked eye. A histological study of the infection in such cases indicates that small areas of the leaf, comprising sometimes only four or five cells are killed and the fungus is then unable to develop further. In the case of normal infection the killing of the cells by the hyphæ does not seem to occur. Whether or not hypersensitiveness of the host plant toward *P. graminis*, which is unable to infect it, is a universal phenomenon is not yet determined.

Grain smut infections and control, G. M. Reed (*Missouri Sta. Bul. 131* (*1915*), *p. 469*).—In testing pure strains of wheat a wide range as regards susceptibility to bunt (*Tilletia fœtens*) was observed. A high degree of efficiency was indicated as regards the method of inoculation employed, which consisted simply in dusting the seed with the dry spores of the fungus. Treadwell proved to be less susceptible than Red Cross or Early Ripe. It has not yet been conclusively shown that late planting results in a high percentage of smut, but it has been proved that a high degree of soil contamination with smut spores causes smut in the subsequent crop.

The necessity for annual seed treatment of seed oats for loose smut (*Ustilago lævis*) is indicated. A wide variation in susceptibility was noted, some supposedly resistant varieties proving to be otherwise. The common method of treating seed oats with formalin (1 lb. to 40 gal. water) is said to be absolutely effective in preventing the smut.

A bacterial leaf-spot disease of celery, I. C. Jagger (*Abs. in Phytopathology, 4* (*1914*), *No. 6, p. 395*).—The author reports having had under observation in central and western New York for the past five years an apparently undescribed leaf spot of celery. It is said to occur very commonly in that region, but so far only a few cases of noticeable injury to the crop have been observed. Spots of a rusty brown color, irregular in outline, are formed on the leaves, from which bacteria have been repeatedly isolated and characteristic spots reproduced by inoculation. The bacterial spots closely resemble those due to Septoria, being distinguished by means of the pycnidia in the spots formed by the fungus.

Downy mildew of cucumbers, G. E. Stone (*Massachusetts Sta. Circ. 51* (*1915*), *pp. 2, fig. 1*).—This is a revision of Circular 40 (E. S. R., 32, p. 342).

The control of onion smut, G. E. Stone (*Massachusetts Sta. Circ. 52* (*1915*), *pp. 4, figs. 4*).—This is a revision of Circular 41 (E. S. R., 32, p. 342).

Leaf spot and some fruit rots of peanut, F. A. Wolf (*Abs. in Phytopathology, 4* (*1914*), *No. 6, p. 397*).—The substance of this note has been previously given (E. S. R., 32, p. 546).

Effect of temperature on germination and growth of the common potato scab organism, M. Shapovalov (*U. S. Dept. Agr., Jour. Agr. Research, 4* (*1915*), *No. 2, pp. 129–134, pl. 1, fig. 1*).—This is a brief account of studies on the potato scab organism formerly known as *Oospora scabies*, but recently claimed by Lutman and Cunningham (E. S. R., 32, p. 546) to be identical with *Actino-*

myces chromogenus. Several strongly pathogenic strains were studied at the Maine Experiment Station after being isolated from diseased specimens from Maine, Vermont, and Wisconsin.

It is stated that while temperatures of 35 to 40° C. are most favorable for germination of the gonidia, they are unfavorable for long continued growth, although at 35° a stimulating effect was produced at first. The maximum temperature for growth is about 40.5°, the optimum 25 to 30°, and the minimum about 5°.

Involution forms appeared abundantly when 0.25 per cent of potassium monophosphate was included in a synthetic culture medium, but none resulted from temperature conditions.

The use of sulphur for the control of potato scab, H. C. LINT (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 396, 397*).—Investigations have been carried on to obtain data regarding the effectiveness of sulphur for the control of potato scab, and also to determine the influence of the various factors involved.

The results thus far obtained indicate that spring applications are more satisfactory than fall applications. The benefits derived from the use of sulphur were greater when applied to land on which no cover crop had been grown the preceding season than on land where such a crop had been used. Seed treatment with formaldehyde and the application of sulphur to the soil gave better results than the sum of these two treatments used separately. Broadcasting of the sulphur on the soil after planting is considered the best method of application. When used in connection with fertilizers, sulphur was found more effective with ammonium sulphate than with sodium nitrate, with acid phosphate than with steamed bone, and with muriate than with sulphate of potash.

Seedling diseases of sugar beets and their relation to root rot and crown rot, H. A. EDSON (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 2, pp. 135–168, pls. 11*).—A study is reported of damping off in beets, also of another seedling trouble designated as root sickness, together with associated rots of the growing or of the mature root. Some factors influencing the health of the plants, as alkali injury, are also discussed.

Four fungi casually related to damping off are *Phoma betæ*, *Rhizoctonia* sp., thought to be identical with *Corticium vagum solani*, *Pythium debaryanum*, and an undescribed member of the Saprolegneaceæ. While plants attacked by the first two may recover temporarily or permanently, those suffering from the other two usually succumb. Phoma and Rhizoctonia produce a characteristic decay in mature beets, the former infecting primarily the seedling and remaining after recovery in a dormant condition on the host, developing occasionally a characteristic black rot on growing beets in the field, and being noted frequently on beets in storage. It may destroy the root or appear on the seed stalk and the mature seed.

Control measures are to be sought in proper cultural methods and seed treatment looking to the production of uninfected seed.

P. debaryanum is capable of attacking the feeding roots of the beet throughout its vegetative period, and may attack the mature beets.

Rhizopus nigricans is found to attack the tissue of dead or dormant sugar beets, producing a characteristic decay.

A bibliography of cited literature is appended.

Phoma betæ on the leaves of the sugar beet, VENUS W. POOL and M. B. MCKAY (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 2, pp. 169–178, pl. 1*).—The authors found that *P. betæ* produces a characteristic infection on leaves that have a stomatal count of 60 to 100 per square millimeter on the upper leaf surface, a low physiological condition permitting infection of all except the heart leaves. The spots bearing pycnidia usually appear during July and August on old or yellowing leaves near the ground, the pycnospores being disseminated by such agencies as beet balls, wind, irrigation water, insects, and manure.

P. betæ in leaf tissue is killed in ½ hour by dry heat of 80 to 90° C., in 3 months by storage in boxes of soil exposed to outdoor conditions, in 5 to 8 months by burial in the ground, but apparently in 2 months by ensiling. A period of one year seems sufficient to eliminate *P. betæ* from an infected field, with the possible exception of the mycelium in a sugar beet root or mother beet stalk. No evidence of a perfect stage of the organism was found.

Blossom-end rot of tomatoes, C. Brooks (*New Hampshire Sta. Sci. Contrib. 8 (1914), pp. 345–374, pls. 3, figs. 5*).—A reprint of an article previously noted (E. S. R., 32, p. 343).

Resistance to Cladosporium fulvum in tomato varieties, J. B. S. Norton (*Abs. in Phytopathology, 4 (1914), No. 6, p. 398*).—The author reports a study of 256 plants of 14 varieties of tomato grown in the greenhouse in the early spring of 1914, nearly all of which were badly affected with Cladosporium, except Stone and Sterling Castle, which were practically immune.

Loss from mosaic disease of tomato, J. B. S. Norton (*Abs. in Phytopathology, 4 (1914), No. 6, p. 398*).—The author reports the extensive occurrence of a mosaic disease of tomato in Maryland. Greenhouse experiments showed that the plants first attacked by the disease bore scarcely less weight of fruit than those which remained healthy longest, but healthy plants set 33 per cent more fruit than infected ones.

Orchard experiments in 1914, M. T. Cook and G. W. Martin (*Abs. in Phytopathology, 4 (1914), No. 6, p. 394*).—A brief account is given of experiments carried on by the New Jersey Experiment Stations, in which finely divided sulphur was applied to peach orchards.

The results indicate that scab was successfully controlled, although some of the trees were partly defoliated. On apple trees finely divided sulphur did not give as good results as lime sulphur.

Hosts of brown rot Sclerotinia, J. S. Norton (*Abs. in Phytopathology, 4 (1914), No. 6, p. 398*).—Inoculation experiments with conidia of the common brown rot fungus of orchard fruits have shown that conidia developed on the cherry, wild-goose plum, blackberry, Japanese plum, Damson plum, green corn, pear, peach, apple, wild black cherry, strawberry, crab apple, Cratægus, *Pyrus betulifolia*, dried prune, peach, apricot, and raisin. About 50 species of plants, including Rosa, Amelanchier, *Rubus occidentalis*, *P. arbutifolia*, and *Cydonia japonica*, showed no outward sign of infection.

Apple fruit spot and quince blotch, C. Brooks and Caroline A. Black (*New Hampshire Sta. Sci. Contrib. 5 (1912), pp. 63–72, pls. 2*).—A reprint of an article previously noted (E. S. R., 27, p. 652).

Apple leaf spot, C. Brooks and Margaret DeMeritt (*New Hampshire Sta. Sci. Contrib. 6 (1912), pp. 181–190, pl. 1*).—A reprint of an article previously noted (E. S. R., 28, p. 548).

Apple rust or cedar rust in West Virginia, N. J. Giddings and A. Berg (*West Virginia Sta. Circ. 15 (1915), pp. 16, figs. 7*).—Discussing briefly the life history of the apple and cedar rust fungus, the author describes attempts at control by preventive treatment.

Control by use of sprays, while possible, seems impracticable for the commercial orchardist. Destruction of cedar trees seems effective if complete, and practicable, costing less than 48 cts. per acre over 1.113 acres experimented upon. It is believed that the cedar-free area should cover a radius of at least a mile around an orchard.

Apple varieties show a very wide range of susceptibility, and even different trees of the same kind show variation. Lists are given of varieties found to be immune, resistant, or more or less susceptible.

Treatment of apple canker diseases, J. C. WHITTEN (*Missouri Sta. Bul. 131 (1915), p. 483*).—The indications are that whitewashing the trunk of apple trees protects them from the entrance of canker by preventing the undue rise of temperature and resulting scald on the sunny side of the tree.

Canker can be eradicated if treatment is commenced before it has gone so deep as to weaken the wood of the tree.

A nursery disease of the peach, M. T. COOK and C. A. SCHWARZE (*Abs. in Phytopathology, 4 (1914), No. 6, p. 394*).—The authors' attention was called to a peculiar disease of Elberta peaches in the nursery in 1914.

The disease is said to attack the young shoots a few inches back of the tips, producing cankers on one side and causing a characteristic curving as a result of the growth on the uninjured side. The cankers originate as small brown spots and gradually enlarge until they are 2 or 3 cm. in length. The diseased area becomes brown and depressed, and finally splits down the center. Gum exudes from the split. The causal organism is considered a species of Sphæropsis and successful inoculation experiments have been carried on with it. So far as the authors' observations go, the trouble is of rather limited distribution.

A wilt disease of Japanese and hybrid plums, B. B. HIGGINS (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 398, 399*).—For a number of years a destructive disease, locally known as plum wilt, has been reported to the Georgia Experiment Station, and investigations have been conducted regarding its cause.

According to the author the disease is caused by a fungus which enters through wounds, the hyphæ passing rather slowly toward the center of the tree, as well as up and down through the water ducts, causing the formation of gum which plugs the water ducts and cuts off the water supply. The leaves wilt suddenly and then dry up. Apparently about a year is consumed from the infection to the death of the tree. The fungus has been isolated, grown in cultures, and its parasitism demonstrated by means of inoculation, but the identity of the organism has not been determined.

Studies on Plasmopara viticola, C. T. GREGORY (*Abs. in Phytopathology, 4 (1914), No. 6, p. 399*).—In a study of the downy mildew of the grape the author found that infection could take place only through stomata, never through injuries. Experiments have demonstrated that conidia sown on the upper surface of the leaf could cause infection provided a continuous film of water extends over the margin to the lower surface. The discoloration of the lesions is considered due to decomposition of the chlorophyll and chloroplastids. The swelling of the stem of the host is said to result from the hypertrophy of the cells and the intussusception of mycelium between the cells.

The conidiophores are usually said to be produced through stomata, though they may burst through the loose tissue above the veins or directly through the epidermis of the flower pedicel. The inability of the fungus to fruit on older berries is considered due to the absence of stomata.

Citrus canker, A. B. MASSEY (*Abs. in Phytopathology, 4 (1914), No. 6, p. 397*).—This is a brief note on the occurrence of citrus canker in south Alabama and elsewhere, a previous account of which has been given (E. S. R., 32, p. 53).

A new rust of economic importance on the cultivated snapdragon, G. L. PELTIER and C. C. REES (*Abs. in Phytopathology, 4 (1914), No. 6, p. 400*).—According to the authors the snapdragon is becoming of some importance as a greenhouse crop. Recently the culture has been interfered with by a new rust.

This was first observed in the vicinity of Chicago in 1913, and in 1914 was reported in a number of localities in Ohio and Indiana.

The rust appears on the plants in the field about the last of July, the uredo stage persisting until fall, when the teleuto pustules may be found on the stems and branches. The uredo stage may be also found in the greenhouse throughout the winter on cuttings and seedlings, and later on mature plants. Toward spring the rust seems to die out in the house, reappearing in the summer. The fungus was first described as *Puccinia antirrhini* in 1895, but there seems to be no reference to the rust since that time.

A Nectria parasitic on Norway maple, M. T. Cook (*Abs. in Phyotpathology, 4 (1914), No. 6, p. 396*).—The author reports having observed for the past two years a disease of Norway maple, symptoms of which bear striking resemblance to those of the chestnut bark disease due to *Endothia parasitica.*

The leaves of the infected maple trees wilt and the branches die. Observations showed that the trouble was due to a canker which girdled the branches. The infection usually occurs through a wound. The causal organism is considered probably *N. cinnabarina* or *N. coccinea.* On an isolated group of Norway maples the disease has proved very destructive. It was also found in a nursery, but here the fungus was apparently saprophytic.

Thrombotic disease of maple, W. H. Rankin (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 395, 396*).—The first indication of this disease, found near Claverack, N. Y., is a withering and drying of the leaves without change of color except a slight blanching. After one limb of a tree becomes affected, other limbs either directly above or below are killed, the disease progressing until within a month or two the tree is dead.

An examination of a diseased limb showed no fruiting bodies of a fungus, and the bark on recently killed limbs was found apparently healthy. Upon cutting into the sapwood of the current season's growth, it was found to be streaked with dark-green lines. The mycelium of a fungus was abundant, and the dark-green streaking is said to be due to the abundant production of sclerotia, which were packed in the vessels. The causal fungus was found to be a species of Acrostalagmus.

Inoculation experiments and other investigations are said to be in progress.

A mutation in Phyllosticta, C. H. Crabill (*Abs. in Phyotpathology, 4 (1914), No. 6, p. 396*).—The author reports observing in studies of several species of fungi isolated from frog eye leaf spot of apple one which answers closely to the descriptions of Phyllosticta, except that it produces chlamydospores. This is believed to be a mutant from the usual form of the fungus.

The perfect stage of Phyllosticta paviæ, V. B. Stewart (*Abs. in Phytopathology, 4 (1914), No. 6, p. 399*).—The author reports observing the mature perithecia in May, 1914, on the underside of diseased horse chestnut leaves that had been exposed to the winter. Cultures made from the perithecia and transferred to horse chestnut seedlings produced the characteristic lesions of the leaf blotch within 10 days, indicating that the perithecia are the perfect stage of the fungus *P. paviæ.*

Comparing this stage of the fungus with one previously described by Peck, the author finds that they are identical, so that the name for the sexual stage of the fungus should be *Læstadia æsculi.*

The longevity of pycnospores and ascospores of Endothia parasitica under artificial conditions, F. D. Heald and R. A. Studhalter (*Phytopathology, 5 (1915), No. 1, pp. 35–44, pl. 1; abs. in Phytopathology, 4 (1914), No. 6, p. 401*).—The author states that pycnospores in suspension in water show a slow but gradual reduction in the number remaining viable. At temperatures from

42 to 75° F., one-third were viable at the end of 49 days. At freezing temperature or below the loss of vitality was less pronounced. When separated and allowed to dry, pycnospores were found less resistant than if dried in the form of sporehorns. When dried on glass, from 66 to 78 per cent were killed by the process, and none remained viable for more than 2 weeks.

When separated and allowed to dry from suspension in water, ascospores were found much less resistant to desiccation than when dried in perithecia or as spore-prints on object slides. When so separated, from 86 to 94 per cent of the ascospores were killed in the process of drying, and none remained viable more than 35 days.

The vitality of separated spores when dried on living leaves or bark was found to be much greater than when dried on a glass surface.

An unreported fungus on the oak, C. A. SCHWARZE (*Abs. in Phytopathology, 4 (1914), No. 6, p. 396*).—The author reports a leaf spot on the black oak, chestnut oak, and red oak in different parts of New Jersey, in which the spots are from 3 to 8 mm. in diameter and light reddish-brown in color with a narrow dark brown border. Examination showed the presence of a fungus which is very similar to, if not identical with, *Actinopelte japonica*.

Notes on soil disinfection, C. HARTLEY (*Abs. in Phytopathology, 4 (1914), No. 6, p. 398*).—Information additional to that previously noted (E. S. R., 31, p. 647) is given regarding experiments conducted with soil disinfection for pine seed beds.

Heating has proved a failure on account of the fact that the soil is left in a condition suitable for the reestablishment of parasites. Sulphuric acid, copper sulphate, and zinc chlorid were more effective than formaldehyde, and were fairly satisfactory even when applied the preceding autumn. The use of acids was found cheaper than formaldehyde, and has given rather satisfactory results except on soils containing carbonates, where acids have failed and toxic salts have proved the best. The precipitation of copper salts was found to be delayed by adding ammonia. A large number of other substances have been tested, but only sugar, acetylene, and arsenicals seem to be worthy of further consideration.

The acid treatment, followed two days later by an application of lime, is recommended as a possible substitute for heating for crops that do not tolerate acid alone.

Nematodes and their relationships, N. A. COBB (*U. S. Dept. Agr. Yearbook 1914, pp. 457–490, figs. 20*).—This is a somewhat popularized discussion of nematodes in general and also as curious, harmful, or helpful organisms. It is intended to indicate to the general reader the vast number of nematodes that exist, the enormous variety of their forms, and the intricate and important relationships they sustain directly or indirectly to mankind.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Field mice as farm and orchard pests, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 670 (1915), pp. 10, figs. 7*).—This deals with the habits, distribution, and methods of combating meadow and pine mice. The protection of the natural enemies of mice is also touched upon.

Our shore birds and their future, W. W. COOKE (*U. S. Dept. Agr. Yearbook 1914, pp. 275–294, pls. 3, figs. 3*).—This is a discussion of the habits of shore birds, particularly as their migration habits relate to the problem of protection. It is pointed out that few shore birds put less than a thousand miles between their nest and winter home, and most of them make a trip of several thousand miles each way. Among the species considered are Wilson snipe, woodcock, upland plover, Eskimo curlew, etc. While excessive shooting, due to inadequate state laws, has resulted in their recent decrease in numbers, it is thought that with the wise administration of a federal law they will again become common enough to afford the hunter a fair amount of legitimate sport.

Eleven important wild duck foods, W. L. McAtee (*U. S. Dept. Agr. Bul. 205 (1915), pp. 25, figs. 23*).—In this bulletin, the third of a series on the subject (E. S. R., 30, p. 545), the author shows how eleven groups of plants may be successfully used as food for wild ducks in localities where now unknown.

Those here described are musk grasses, duckweeds, frogbit (*Limnobium spongia*), thalia (*Thalia divaricata*), water elm (*Planera aquatica*), swamp privet (*Forestiera acuminata*), eel grass (*Zostera marina*), wigeon-grass (*Ruppia maritima*), water cress (*Sisymbrium nasturtium-aquaticum*), water weed, and coontail (*Ceratophyllum demersum*).

Mortality among waterfowl around Great Salt Lake, Utah, A. Wetmore (*U. S. Dept. Agr. Bul. 217 (1915), pp. 10, pls. 3*).—This is a report of progress in investigations carried on by the Biological Survey in Utah and California with a view to determining the cause and means for preventing the extremely high mortality among ducks and other waterfowl. It is shown that untold thousands of wild ducks, snipe, sandpipers, and other birds of less economic value which frequent the marshes along the eastern shore of Great Salt Lake and other localities, as Tulare and Owens lakes, California, perish annually. During the work in Utah in 1914, 27 species of birds of 11 families were found to be affected. "Among these were 9 species of ducks, 10 of shore birds, and 8 miscellaneous forms ranging from grebes and snowy herons to the pipit. Among ducks the pin-tail and green-winged teal seemed to be most susceptible, while the mallard, spoonbill, and cinnamon teal followed them closely. Avocets and stilts suffered more heavily than any other shore birds.

"The birds affected first lose the power of flight and are unable to rise in the air, though in some cases they can flutter across the water and in others can fly for a few rods before dropping back. The legs next become affected and the power of diving is lost. As the birds grow weaker they crawl out on the mud bars, if able to do so, or hide in growths of grass or rushes. In a later stage of the affection they are unable to rise. Finally the neck relaxes and the head lies prostrate. If in the water death comes by drowning, but on land birds may live for two days or more in this condition.

"A large series of post-mortem examinations revealed no pathological lesions other than that the intestine was reddened and firm and hard to the touch. When the gut was slit, washed, and examined under a low magnification, the capillaries in the intestinal villi were found to be distended, showing intense irritation. . . . A severe dysentery occasioned by the irritation of the intestine was the obvious external symptom."

Reference is made to the numerous theories that have been advanced to account for the mortality, including bacterial infection, parasitic nematodes, smelter and factory waste, etc., all of which appear to have been eliminated as the probable cause. Pathological investigations of affected birds, a brief report of which by J. R. Mohler, of the Bureau of Animal Industry of this Department, is presented, have led to the conclusion that the affection is probably an acute poisoning and not of bacterial origin. The author states that the work of the past summer has led him to conclude that the mortality results from an alkaline poison the nature of which is still to be determined. The absence of lesions in any of the organs, other than a severe irritation in the lumen of the intestine, the fact that practically all the affected birds are fat, that a large percentage of the birds recover when given fresh water, etc., all point to this conclusion. It is pointed out that as soon as irrigation ceases and there is a great increase in the amount of river water entering the constant flow steadily drains the flats and removes the stagnant water. As a result the mortality ceases almost at once. Fresh water is the only remedial measure yet discovered.

Some data on the effect of temperature and moisture on the rate of insect metabolism, T. J. HEADLEE (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 413–417*).—The author finds that the rate of metabolism in certain actively feeding insects with an abundant supply of succulent food is not affected by large differences in atmospheric moisture.

On the valuation of lime-sulphur as an insecticide, H. V. TARTAR (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 463–467*).—It is stated that the work done by the department of entomology of the Oregon Experiment Station indicates clearly that the calcium polysulphids are the principal insecticidal constituents of lime-sulphur. Experimental work carried on at the laboratory indicates that if hydrogen sulphid is liberated under normal conditions it is in very small quantity and evidently is not an important factor to consider.

Insecticide formulas, C. W. WOODWORTH (*California Sta. Circ. 128 (1915), pp. 7*).—Formulas for the preparation of various insecticides are given in the order of their importance in California.

Twenty-ninth report of the state entomologist, 1913, E. P. FELT (*Univ. State N. Y. Bul. 589 (1915), pp. 257, pls. 16, figs. 36*).—Under the heading of Injurious Insects (pp. 13–44) the author briefly reports upon control work with the codling moth during the year in continuation of that of the preceding four years (E. S. R., 30, p. 656), and gives brief accounts of the lined corn borer (*Hadena fractilinea*), which was the source of injury to corn through boring into the heart and killing the stalks in Ulster County; the European grain moth or wolf moth (*Tinea granella*), an important cereal pest discovered in a seed warehouse at Albany, where it had nearly destroyed hundreds of bushels of sweet corn; *Sesia rhododendri*, said to be generally distributed in New York Zoological Park and common in and about Prospect Park, Brooklyn, and also recorded from Cheltenham, Pa.; the azalea leaf skeletonizer (*Gracilaria azaleæ*) which injured azaleas in greenhouses at Yonkers and Rochester; the arbor vitæ leaf miner (*Argyresthia thuiella*) which was abundant at Westbury; white grubs and June beetles; the spotted hemlock borer (*Melanophila fulvoguttata*) which caused the death of hemlock in the New York Botanical Garden; the white pine weevil (*Pissodes strobi*), which is widely distributed; the hickory bark borer (*Eccoptogaster quadrispinosa*); the pitted ambrosia beetle (*Corthylus punctatissimus*), which injured rhododendrons at Irvington and Tarrytown; the cactus midge (*Itonida opuntiæ*); and the banded grape bug (*Paracalocoris scrupeus*), a pest of grapes which is increasing in numbers in western New York and damages grapes in the Niagara district.

In a brief discussion of the use of miscible oils on trees (pp. 45–47), the author states that the data at hand abundantly justify a refusal to recommend these materials as applications to dormant sugar maples and warrant the employment of caution in their use in a similar way for other trees.

Under the heading of Notes for the Year (pp. 48–67), accounts are given of the occurrence of a number of important insects, including *Aspidiotus osborni*, not previously recorded from the State, and *Pulvinaria acericola*, two rare scales, which were found during the past season, the former at Scarborough and the latter at Tarrytown. Fruit-tree pests noted are the apple tent caterpillar, plum curculio, pear thrips, false red bug (*Lygidea mendax*), pear psylla, plant lice, San José scale, and the variegated cutworm (*Agrotis saucia*).

Among those mentioned as attacking shade trees are the elm leaf beetle (*Galerucella luteola*), the English elm pouch gall (*Tetraneura ulmisacculi*), the false maple scale (*Phenacoccus acericola*), spruce bud scale (*Physokermes piceæ*), and tulip tree scale (*Toumeyella liriodendri*). Forest tree pests noted include the forest tent caterpillar, locust borer (*Cyllene robiniæ*), and spruce aphid (*Mindarus abietinus*). Among the miscellaneous insects noted are the drug-store beetle (*Sitodrepa panicea*), mason bees (*Osmia felti*), white winged Bibio (*Bibio albipennis*), and *Bolitophila cinerea*.

Lists are given of publications of the entomologist and additions to collections. In an appendix, which is part 2 of A Study on Gall Midges (E. S. R., 30, p. 656), the author deals with the subfamily Itonididinæ, which comprises by far the larger number of the family and includes practically all the gall making forms. Keys to the tribes, genera, and species and colored plates of the galls formed are included.

Additional notes on Porto Rican sugar cane insects, T. H. Jones (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 461–463*).—The data here presented are supplementary to those given in the accounts by Van Dine, previously noted (E. S. R., 29, p. 353; 30, pp. 355, 356).

The California pear thrips in Maryland, W. M. Scott (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 478, 479*).—The author reports the discovery of this pest in a small Kieffer pear orchard near Baltimore, where the leaves were curled and blackened at the tips and around the margins, and most of the blossom clusters destroyed.

The status of spraying practices for the control of plant lice in apple orchards, P. J. Parrott and H. E. Hodgkiss (*New York State Sta. Bul. 402 (1915), pp. 193–210, pls. 2, figs. 2*).—Three species of plant lice, the rosy apple aphis (*Aphis sorbi*), apple aphis, and oat aphis (*A. avenæ*), are injurious to apples in New York, the two former normally causing the greatest losses in crop production. It is pointed out that experiments by the station indicate that the most effective and satisfactory means of protecting young fruit during its formative stage is through the destruction of plant lice on the expanding buds.

"The most efficient spraying mixtures are nicotin solution, oil emulsions, or soap preparations. The physical features of the location of the orchard, such as the direction and elevation of the slopes of the land, proximity of water and character of soil, have a marked influence on the development of the buds. The time for effective spraying will therefore vary with individual orchards as well as with different varieties of apples."

Controlling plant lice in apple orchards, F. H. Hall (*New York State Sta. Bul. 402, popular ed. (1915), pp. 3–7, figs. 2*).—A popular edition of the above.

Four aphids injurious to the apple, B. S. Pickett (*Illinois Sta. Circ. 179 (1915), pp. 4*).—The species noted are the apple aphis, the rosy apple aphis (*Aphis sorbi*), the European grain aphis, and the clover aphis (*A. bakeri*).

Control of the San José scale in Missouri, L. Haseman (*Missouri Sta. Bul. 132 (1915), pp. 9, figs. 4*).—With the passage of the Nursery and Orchard Inspection Act in 1913, the station was authorized not only to inspect for insect pests and diseases but also to assist with the cleaning up where these were found. Since the San José scale was the one pest of most vital importance to horticulture in the State steps were at once taken to assist in its eradication.

Spray experiments are said to show that two applications, one in late fall and one in the spring before the buds open, are required in the case of badly infested orchards. Where but one application is made equal results are obtained from a late fall or early spring application. It is stated that so far as the control of the San José scale alone is concerned, lime-sulphur and commercial miscible oils gave practically the same results.

Notes on Coccidæ found in Peru, E. W. Rust (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 467–473*).—A discussion of the occurrence of some twenty species of Coccidæ in Peru.

Report on the gipsy moth work in New England, A. F. Burgess (*U. S. Dept. Agr. Bul. 204 (1915), pp. 32, pls. 11, figs. 3*).—This is a report of progress in the work against the gipsy moth now under way by the Bureau of Entomology of this Department, especially that with parasites. The importance of bringing forest lands into a growth which is unfavorable to the development of the gipsy moth is emphasized.

Maps which show the dispersion of natural enemies in New England, including *Apanteles lacteicolor*, *Compsilura concinnata*, and *Calosoma sycophanta;* the towns in New England in which silvicultural experiments are being conducted; the areas in New England infested with the gipsy and brown-tail moths in 1914; and the gipsy moth quarantine districts are attached.

Wilt of gipsy moth caterpillars, R. W. Glaser (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 2, pp. 101–128, pls. 4, figs. 17*).—This is a summarized account of the present status of our knowledge of the wilt disease of gipsy moth caterpillars, based upon a review of the literature and investigations carried out by the author, an employee of the Bureau of Entomology of this Department. The data presented have been summarized as follows:

"The wilt of gipsy moth caterpillars is a true infectious disease that is distributed over the entire territory infested by the gipsy moth. Epidemics of the disease occur only in localities heavily infested by the gipsy moth. Climatic conditions appear to bear an important relation to wilt in the field. The disease is more prevalent among older than among younger caterpillars, but small caterpillars also die of it in the field. No diagnosis of wilt is valid unless polyhedra are demonstrated microscopically. There is no account of the occurrence of wilt in America prior to 1900. Minute dancing granules may be observed in wet smears. Polyhedra are probably reaction bodies belonging to the highly differentiated albumins, the nucleoproteids. The pathology of wilt does not vary with the age of the caterpillars. The polyhedra originate in the nuclei of the tracheal matrix, hypodermal, fat, and blood cells. The nuclei of the tracheal matrix and blood cells seem to be the first tissue nuclei affected. Many minute violently dancing granules are found in the pathological nuclei of fresh tissue. Giemsa's stain demonstrates many little granules in the nuclei of diseased tissue sections. The alimentary canal seems to be the last organ in the body to disintegrate.

"Two types of blood corpuscles exist in normal hemolymph. Two types of pathological blood corpuscles exist in diseased caterpillars. The blood is a fairly reliable index of a caterpillar's condition. The blood test is impracticable for large experimental series. Bacteria are not etiologically related to wilt. The virus of wilt is filterable with difficulty. Such a filtrate is free from bacteria and polyhedral bodies. Caterpillars that have died from infection with filtered virus are flaccid, completely disintegrated, and full of polyhedra. Minute dancing granules were observed in the Berkefeld filtrate. These may be identical with certain granules observed in smears and tissue nuclei and may be etiologically significant. The incubation period of wilt varies, and temperature at times seems to bear an important relation to this variation. A large number of caterpillars used in the experiments died of disturbances in their normal physiological activities. The success of wilt infection experiments is absolutely dependent upon attention to seemingly insignificant details. Genetic immunity of certain individuals is probable. Active immunization with sublethal doses is possible. The polyhedral bodies may be stages of the filterable virus, but as yet no evidence to substantiate this view has been produced. Infection naturally takes place through the mouth by means of the food. Some of the imported parasites may be important factors in aiding the dispersion of the wilt disease. Although probable, there is no definite evidence as yet that wilt is transmitted from one generation to another."

A list of 18 titles relating to the subject is included.

The squash-vine borer, F. H. CHITTENDEN (*U. S. Dept. Agr., Farmers' Bul. 668 (1915), pp. 6, figs. 2*).—A revision of Circular 38 of the Division of Entomology, in which a popular account is given of the distribution, food habits, natural history, and preventive and remedial measures for this pest.

The verbena bud moth, D. E. FINK (*U. S. Dept. Agr. Bul. 226 (1915), pp. 7, pls. 3, fig. 1*).—A summarized account of the life history and habits of, and of control measures for, the verbena bud moth (*Olethreutes hebesana*). This moth appears to confine its injury solely to flowering plants, having been reared from tiger flower (*Tigridia pavonia*), snapdragon (*Antirrhinum* spp.), flag (*Iris* spp.), hedge nettle (*Stachys palustris*), mullein (*Verbascum thapsus*), verbena (*Verbena* spp.), closed gentian (*Gentiana andrewsii*), and false foxglove (*Dasystoma flava*). Injury is caused through its attacking the stems, feeding upon flower heads, webbing seed capsules together to feed upon the young and undeveloped seeds, and feeding upon dry seed pods.

The eggs are deposited singly or in groups of from three to five on sepals of flower buds or along the upper part of the flower stalk and hatch in from seven to ten days. Under laboratory conditions the life cycle occupied 43 days as follows: Eggs deposited March 2 hatched March 10, the larvæ pupated March 31, and the adults appeared April 14. During July and August in 1913 the life cycle was passed in 34 days. In the vicinity of Norfolk, Va., where the observations were made in cooperation with the Virginia Truck Station, at least five or six generations are produced each year.

The methods of control found effective against the larvæ include the application of arsenicals and the cutting back and destroying of infested flower stalks.

A bibliography of ten titles relating to the subject is included.

The serpentine leaf-miner on cotton, E. A. MCGREGOR (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 447–454, figs. 8*).—A report of studies at Batesburg, S. C., of the dipterous leaf miner *Agromyza scutellata* on cotton. The paper supplements a general account of the pest by Webster and Parks, previously noted (E. S. R., 29, p. 857) in which they refer to it as *A. pusilla*.

List of zoophagous Itonididæ, E. P. FELT (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 458, 459*).—A list is given of 29 reared species.

Arthrocnodax constricta n. sp., E. P. FELT (*Jour. Econ. Ent., 7 (1914), No. 6, p. 481*).—The itonidid here described was reared at Rio Piedras, P. R., from garden beans infested with the common red spider, upon which it is thought to be predaceous.

The losses to rural industries through mosquitoes that convey malaria, D. L. VAN DINE (*Reprint from South. Med. Jour., 8 (1915), No. 3, pp. 184–194, figs. 2*).—A discussion of the mosquito-malaria problem in the South and of investigations being carried on by the Bureau of Entomology of this Department. The investigations under way consist of survey work, climatological observations, biological and pathological work, and experimental control work.

The details of an intensive study which is being made of malarial conditions on a plantation of 3,500 acres located at Mound, La., in a region on the Mississippi where malaria is prevalent, are presented. It is shown that 48 out of 74 tenant families on the plantation were treated by the physician for malaria during the crop season of 1914, and that a total loss of 1,842 days, representing

1,066 days of adult time, resulted. Details relating to the occurrence of and loss of time from malaria are presented in tabular form.

While three species of Anopheles, namely, *Anopheles quadrimaculatus*, *A. punctipennis*, and *A. crucians*, occur in the vicinity of Mound, La., the first mentioned is by far the most abundant and is apparently the species concerned as the conveyor of malaria in that region. Observations on breeding places show that *A. quadrimaculatus* is partially domestic in its breeding habits.

The introduction of a tachinid parasite of the sugar cane weevil borer in Hawaii, O. H. Swezey (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 455–457*).—A description of the manner in which *Ceromasia sphenophori* was introduced into Hawaii from British New Guinea. A reference to its introduction into Fiji by Illingworth has previously been noted (E. S. R., 32, p. 350).

This tachinid was first discovered at Amboina, in the East Indies in 1908, by Muir, where it parasitizes a weevil infesting sago palm. An attempt to introduce it into Hawaii from that locality failed on account of the relay stages of the journey having been too long. It was later discovered in British New Guinea destroying a high percentage of the borers in sugar cane. The first attempt to introduce the pest from New Guinea into Hawaii failed on account of the illness of Mr. Muir but a second attempt later was successful, living parasites having reached Honolulu in August, 1910. The author states that at the time of writing after a period of three years the parasites are established almost entirely throughout the sugar cane districts of the Hawaiian Islands. In plantations where the borers previously caused the greatest damage to cane, little damage is now occasioned.

On the original habitat of Stomoxys calcitrans, F. Muir (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 459, 460*).—The author believes that the stable fly originated in Africa.

Susceptibility of Pollenia rudis to nicotin, P. J. Parrott (*Jour. Econ. Ent., 7 (1914), No. 6, p. 487*).—A nicotin preparation consisting of 90 per cent nicotin and 10 per cent water applied by means of a small wad of cotton to the sills at the base of window panes in laboratories at the New York State Station, where the "cluster fly" had been numerous and annoying, caused the death of a large percentage of the insects within a short period of time.

The probable best method of rearing certain scarabæid larvæ, A. A. Girault (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 445–447*).—A description of the author's method, developed at the Bureau of Sugar Experiment Stations in Queensland.

Agrilus politus infesting roses, H. B. Weiss (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 438–440*).—During the course of nursery-inspection work in northern New Jersey attention was called to the death of standard roses, the stems of which were swollen somewhat at different points. The buprestid beetles which emerged apparently represent the species *A. politus*, previously recorded as reared only from willow.

A new pest of cane in Fiji (Sphenophorus nebulosus), J. F. Illingworth (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 444, 445*).—This article deals with a small beetle borer resembling the ordinary cane borer (*Rhabdocnemis obscurus*). It is apparently *S. nebulosus*, which, though exceedingly prolific, has as yet done little damage to sound cane in Fiji.

Some coccinellid statistics, H. E. Ewing (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 440–443, fig. 1*).—This article includes a table which shows the relative abundance of different species of coccinellids in five different situations, namely, on hops, thistles, lamb's quarters, kale, and vetch, and a diagram showing the relative numbers, expressed in percentage terms, of the total population of different species found in each patch.

Notes on the rice water weevil (Lissorhoptrus simplex), J. L. Webb (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 432–438, pl. 1, figs. 2*).—These notes are supplementary to the accounts by Tucker (E. S. R., 27, p. 562) and Newell (E. S. R., 29, p. 259). Careful experiments are said to have determined that drainage is still the safest remedy for the rice water weevil.

Effect of temperature upon the oviposition of the alfalfa weevil (Phytonomus posticus), T. H. Parks (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 417–421, pl. 1, fig. 1*).—The author reports upon a series of oviposition experiments with *P. posticus* conducted at Salt Lake City in 1911 and 1912 in which the variation in mean daily temperature throughout the oviposition period of the weevils was compared with the rate of oviposition of the beetles kept in confinement.

The relation between the curves representing temperature variation and oviposition record was very noticeable, and the mean daily temperature seemingly affects the progress of oviposition until well into the summer. The oviposition record of 16 beetles in 1912 shows 1,184 to have been the largest number of eggs deposited and 726 eggs per female the average for the series. In a series of experiments with 11 females collected from hibernation on December 20, 1911, and allowed to deposit eggs in the warm laboratory room during the winter and spring as high as 1,918 eggs were deposited by one female, the average number of eggs deposited being 913.

Relation of the Arizona wild cotton weevil to cotton planting in the arid West, B. R. Coad (*U. S. Dept. Agr. Bul. 233 (1915), pp. 12, pls. 4*).—This bulletin deals with cotton growing in Arizona in its relation to the boll weevil, a variety of which (*Anthonomus grandis thurberiæ*) has been found developing on a wild cotton plant (*Thurberia thespesioides*). Accounts relating to this pest by Cook (E. S. R., 29, p. 458), Pierce (E. S. R., 30, p. 56), Pierce and Morrill (E. S. R., 31, p. 350), and Coad (E. S. R., 31, p. 458) have been previously noted

The author discusses the distribution of this weevil and Thurberia, the life history of the weevil on cotton in the South and on Thurberia, nature of damage to cotton, food preferences, the transfer to cotton, etc., and give descriptions of the weevil stages. While existing on the wild cotton plant in some of the mountains of southeastern Arizona, the weevil seems to be particularly concentrated in the ranges surrounding Tucson. The author points out that while its attack may be transferred from the wild cotton plant to cultivated cotton in the Santa Cruz and Rillito Valleys, its present habits are such that it would not injure cotton greatly, although its habits may be changed to a certain extent and more injurious ones acquired. "The present habits render it quite probable that the control of the Arizona form will be a very different problem from that of the cotton weevil and more easily solved. A careful watch should be maintained for the first appearance of the weevil on cultivated cotton in order that it may be combated successfully."

Notes on the life history of Prospaltella perniciosi, D. G. Tower (*Jour. Econ. Ent., 7 (1914), No. 6, pp. 422–432*).—The author calls attention to the fact that *P. perniciosi*, which he previously described as new (E. S. R., 29, p. 459), is a true internal parasite, the larval forms living within the body tissues of the female San José scale except during the last part of the second larval stage, when the entire contents of the host are consumed by the larva, which then pupates in the empty skin of the scale.

While the number of eggs deposited by an individual has not been determined, the author reports having obtained 1,364 developed eggs from 20 females selected as they emerged, giving an average of 68 developed eggs apiece. By rearing parasitized scales of the first stage in the laboratory at temperatures varying from 68 to 72° F., it was found that the parasites reached maturity in from 36 to 39 days, while the parasites in the second stage scales matured in from 19 to 23 days. The winter is passed as undeveloped and partially developed eggs in the bodies of the first and second stage scales, and the first larval stage also winters over in the second stage scales and also in the bodies of second stage larval parasites. It is stated that these second-stage larvæ are not arrested in their development by the second parasite within them until after they have completed their growth and passed their waste. Since older forms of the parasite, such as the second stage larva, pupa, and adults, have not been observed to winter over, it appears that dormant or winter spraying will kill the parasite as well as the scale.

The predaceous enemies of the scale, such as *Microweisia* (*Pentilia*) *misella*, are destructive to the parasite in all its stages of development except the adult stage.

On the capture of living insects by the cornfield ant (Lasius niger americanus), W. P. Flint (*Jour. Econ. Ent.*, *7* (*1914*), *No. 6*, *pp. 476–478*).—The author records observations made every night for nearly two months of the movements of the cornfield ant at Bloomington, Ill. It was frequently noticed that on warm nights when the ants were very active they would attack and kill many small insects that came near their nests.

Description of a new sawfly injurious to strawberries, S. A. Rohwer (*Jour. Econ. Ent.*, *7* (*1914*), *No. 6*, *pp. 479–481*).—A new species which is the source of injury to strawberries in Iowa is described as *Empria fragariæ*.

The economic status of the fungus diseases of insects, R. W. Glaser (*Jour. Econ. Ent.*, *7* (*1914*), *No. 6*, *pp. 473–476*).—A brief review.

Harvest mites, or "chiggers," F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 671* (*1915*), *pp. 7*, *figs. 3*).—This is a revision of Circular 77 of the Division of Entomology, previously noted (E. S. R., 18, p. 559).

FOODS—HUMAN NUTRITION.

Air, water, and food from a sanitary standpoint, A. G. Woodman and J. F. Norton (*New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd.*, *1914*, *4. ed. rev.*, *pp. V+248*, *pl. 1*, *figs. 16*).—In this, the fourth edition, the whole book has been carefully revised and the character of the treatment of certain parts has been radically changed to make it of more use in colleges and technical schools. Since the last edition, in 1909 (E. S. R., 22, p. 366), "there have been distinct advances in analytical methods, and a changed point of view has brought about a somewhat different interpretation of results. This is particularly true with regard to the relation of air to health and comfort. . . . All of the discussion on air and water has been completely rewritten, as has the section on milk, the older methods revised, and numerous additions, to correspond with the latest practice, made. As in previous editions, these discussions are intended to be essentially elementary rather than exhaustive.

Progress in food chemistry, H. Beckurts, H. Frerichs, and O. Beck (*Jahresber. Untersuch. Nahr. u. Genussmtl.*, *23* (*1913*), *pp. 192*).—This publication contains a brief summary and digest of the more important additions to the knowledge of chemistry of food and nutrition during the year 1913. The subjects covered are general chemistry of foods and nutrition, milk, butter and margarin, cheese, eggs, fats and oils, meats and meat products, cereals and cereal products, fruits and fruit products, sugar, and beverages, both alcoholic and nonalcoholic.

Preservation of meat, A. GURINI (*Clin. Vet.* [*Milan*], *Rass. Pol. Sanit. e Ig.*, *37* (*1914*), *Nos. 15–16, pp. 669–678; 17, pp. 711–724; 18, pp. 764–782; 19, pp. 799–825*).—This article includes some analyses showing the composition of fresh and preserved meats.

Pork and pork fat and their use in the household, M. HERTER and G. WILSDORF (In *Die Bedeutung des Schweines für die Fleischversorgung. Berlin: Deut. Landw. Gesell., 1914, pp. 115–166, pls. 24*).—In this article information of general interest is given regarding the cost of pork, methods of slaughtering, and its inspection and handling in the meat trade. The different cuts of pork are described and illustrated. The preserving and pickling of pork and pork products are also considered, together with the different ways in which the various parts of the animal may be utilized, and some information regarding the value of pork in the diet.

Composition of corn (maize) meal manufactured by different processes and the influence of composition on the keeping qualities, A. L. WINTON, W. C. BURNET, and J. H. BORNMANN (*U. S. Dept. Agr. Bul. 215* (*1915*), *pp. 31*).—This bulletin reports the results of an investigation in which was studied the general composition of American table corn meal milled by different processes, but more especially the keeping quality of different types which had dried to different degrees and were stored in various localities. The composition of grits and by-products was also considered to some extent.

General information is given concerning the consumption of corn meal in its various forms in different parts of the country. The stone and roller processes of grinding corn and the various products of corn milling are briefly described.

Chemical analyses were made of samples taken from 41 mills located in 32 towns in 17 States. These samples were classified by the authors as follows: "Whole-kernel, stone-ground meal; bolted, undegerminated meal; degerminated, bolted, roller-ground meal ('cream meal'); and low-grade or 'standard' meal." The analytical data regarding these samples are reported in detail, but may be summarized briefly as follows:

"Whole-kernel meal at the time of grinding is the same in composition as the corn except in regard to moisture, but soon develops a greater acidity.

"Bolted, undegerminated meal contains less fiber than the corn, but no other general rule can be formulated owing to the variable conditions of manufacture.

"Degerminated, bolted meal contains less protein, fat, fiber, and ash, but more nitrogen-free extract than the corn.

"Low-grade ('standard') meal contains sometimes more and sometimes less of each constituent than the corn."

In experiments carried out to determine the effect of moisture upon its keeping quality, ton lots of degerminated, bolted, roller-ground meal, containing different amounts of moisture, were stored at Savannah and Chicago. The detailed results of these experiments are reported and are summarized briefly by the authors as follows:

"The lot containing 16.68 per cent of moisture showed an excess of acidity in 12 weeks, a loss of fat in 16 weeks, and a musty taste in 20 weeks. The lot containing 15.04 per cent of moisture only slightly exceeded the limit for acidity (30) in 24 weeks, and did not suffer in taste or appearance, while those with 13.41 per cent or less kept well in all respects up to the end of the experiment (24 weeks).

"Carload lots . . . with 15.73 per cent of moisture, showed an excess of acidity at Savannah in 8 weeks and at Chicago in 12 weeks, but did not suffer appreciably in quality. Highly dried meal with 9.86 per cent of moisture after 24 weeks showed a maximum acidity of only 21.8."

Studies of the comparative keeping quality of whole-kernel and degerminated meal showed the superior keeping quality of the latter.

From a consideration of the results of these experiments the authors draw the general conclusion that "degerminated, bolted meal containing not over 14 per cent of moisture and 1 per cent of fat, as determined by the method of the Association of Official Agricultural Chemists, properly stored should keep for 6 months; with a moisture content of 15 per cent it should keep 3 months. Schindler's limit for moisture, namely 13.5 per cent, obtained by drying in an open dish, corresponds to about 14.5 per cent by the method of the Association of Official Agricultural Chemists.

"Whole-kernel meal, like cream, should be produced locally and consumed soon after grinding; properly dried, degerminated meal, like butter, keeps well during transportation and long storage."

The use of rice flour in bread making, N. NOVELLI (*Gior. Risicolt.*, *5* (*1915*), *No. 5, pp. 68–72*).—General information and comparative analyses are given of bread made with 25 per cent of rice flour and several other kinds of bread.

Bitter and sweet cassava—hydrocyanic acid contents, A. E. COLLENS (*Bul. Dept. Agr. Trinidad and Tobago, 14* (*1915*), *No. 2, pp. 54–56*).—Determinations were made of the hydrocyanic acid content of freshly dug roots, of those which had been removed from the ground for three days, of the liquid expressed from bitter cassava, and of the boiled roots.

The results of these experiments showed "that if sweet cassava is properly cooked either by boiling or roasting . . . no hydrocyanic acid is developed even on allowing to stand for one day. In the case of both bitter and sweet cassava if the roots are not properly boiled and are allowed to remain soaking in water for some time, there is a possibility of a small amount of hydrocyanic acid being developed."

Ash content of canned vegetables, with special reference to canned peas, AGNES F. MORGAN (*Jour. Home Econ.*, *7* (*1915*), *No. 2, pp. 72–77*).—The work of others is reviewed, and the results reported of experiments in which were studied the loss of mineral constituents of canned vegetables due to blanching.

"As compared with the corresponding fresh peas, the ash content of peas blanched and canned by the usual high pressure process was found to be 46.1 per cent less, that of peas blanched and canned by the standard home process 50 per cent less, and that of peas unblanched and canned by the standard home process 22.6 per cent less. All these percentages were calculated for the water-free substance.

"The percentage of extraction of P_2O_5 in each case is rather higher than the total salt extraction, indicating a special solubility of the phosphorus compounds.

"Inspection of two varieties of commercial canned peas shows a high total of salts in the liquor."

[Food and drug inspection] (*Ann. Rpt. Bd. Health Mass.*, *45* (*1913*), *pp. VI+790, pls. 2*).—A review of the work of the department of food and drug inspection for the year ended November 30, 1913, is given.

The report of the state analyst, H. C. Lythgoe, presents in detail the results of the examination of 9,727 samples of foods and drugs, of which 7,560 were of good quality. The work of the department also included the inspection of cold-storage plants and the examination of articles placed in cold storage. Data are given showing the results of this examination and the disposition of condemned cold-storage foods.

The report also includes a résumé of the inspection of slaughterhouses and dairies.

Ohio food and drug laws (*Columbus, Ohio: State, 1913, pp. 60*).—This compilation, prepared by the Agricultural Commission of Ohio, gives the text of acts regulating the manufacture and sale of foods, drugs, paints, oils, etc., sanitary inspection, and weights and measures.

Meat and food inspectors' examinations, G. T. BILLING and A. H. WALKER (*London: Sanitary Publishing Co., Ltd., 1914, 2. ed., pp. XII+180+23, figs. 8*).—This revised edition, which is intended for the use of those preparing for meat and food inspectors' examinations, contains model answers to questions set by the Royal Sanitary Institute and other examining bodies.

Selection of household equipment, HELEN W. ATWATER (*U. S. Dept. Agr. Yearbook 1914, pp. 339–362, pls. 4, fig. 1*).—In this article the author takes up a number of principles which should govern the selection of household equipment. Among other considerations emphasis is laid upon the importance of planning before buying; the consideration of necessity, convenience, and pleasure; and economy in cost and care. More detailed information is given regarding the choice and selection of permanent equipment, the finish of woodwork and walls, and the selection of furniture and household textiles.

The school lunch service, E. F. BROWN (*Dept. Ed. N. Y. City, Div. Ref. and Research Bul. 3 (1914), pp. 20*).—This pamphlet gives a résumé of the origin, development, and present organization of the New York School Lunch Committee. The mechanism of the service and the methods employed, together with the cost and nutritive value of the food supplied, are considered somewhat at length. Sample menus, including figures showing their fuel value and cost, are also given.

Memorandum on methods of providing meals for children in connection with public elementary schools and on dietaries suitable for the present circumstances, L. A. SELBY-BIGGE (*Bd. Ed. [London] Circ. 856 (1914), pp. 20*).—This pamphlet, issued by the Board of Education of London, considers somewhat at length the necessity for the feeding of school children under certain conditions, gives suggestions regarding its supervision, and enumerates a number of the problems involved in such work. It is stated that a good dietary can not only contain suitable quantities of nutritive and energy-producing material, but can be varied, palatable, easily digested, and obtained at reasonable cost.

Tables of meals are given which contain recipes for the preparation of the food, the amounts of the ingredients given being such that the meal will supply 100 children. Approximate cost data are given, together with supplementary notes on equipment of dining room and kitchen, and notes upon cooking. The meals described include four classes of 1-course dinners, namely, soup dinners, meat dinners, fish dinners, and cheese dinners. Tables are also given for 2-course dinners and for breakfasts and teas.

Prevention of beri-beri among Philippine scouts by means of modifications in the diet, W. P. CHAMBERLAIN (*Jour. Amer. Med. Assoc., 64 (1915), No. 15, pp. 1215–1220, fig. 1*).—This report, which supports the theory that beri-beri is a disease due to the ingestion of a diet deficient in some essential principle, gives the results of clinical observation and experience. Following the addition of beans or mongos to the ration and the substitution of unpolished rice for polished rice, beri-beri almost entirely disappeared among the scouts.

The metabolic relationship of the proteins to glucose, N. W. JANNEY (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 321–350, figs. 8*).—From results of feeding experiments with laboratory animals (dogs), the author concludes in part as follows:

"Each protein produces a definite amount of glucose in the phlorizinized organism. The various yields represent 50 to 80 per cent by weight of the protein administered. These yields approximate the ratios which the glucogenetic amino acids of the proteins in each case bear to the total amino acids, as actually determined by hydrolysis. . . .

"The amounts of glucose yielded by the metabolism of proteins stand in no obvious relationship to their ability to promote growth. . . .

"Vegetable and animal proteins under optimal conditions are metabolized at the same rate in the animal organism. All the extra glucose and nitrogen are eliminated by the ninth hour after ingestion."

The influence of the plane of protein intake on growth, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 415–428, figs. 12*).—Laboratory animals (rats) were fed a ration consisting of dextrin, butter fat, and varying amounts of skim-milk powder, for which was substituted in a part of the experiments wheat protein, wheat embryo protein, and egg protein. A number of curves are given to show the influence of protein intake on growth.

The results of these tests may be summarized in part as follows: "The lowest plane of protein intake derived from milk which can maintain young rats without loss of body weight is 3 per cent of the food mixture. There is a progressive increase in the rate of growth with rations derived from milk, as the plane of protein intake is raised between 3 and 8 per cent of the diet. . . .

"For a time at least rats may grow at about half the normal rate when the protein is supplied by the wheat kernel to the extent of 6 per cent of the food mixture.

"Two and forty-five hundredths per cent of protein derived from desiccated egg is not sufficient to maintain young rats without loss of body weight.

"During six weeks a ration carrying but 4 per cent of protein from wheat embryo compares favorably with a similar plane of protein intake derived from milk powder, and is somewhat better than 6 per cent of protein from the entire kernel.

"This plan of experimentation [is believed to offer] a valuable method of comparison of the proteins from various sources, provided all deficiencies are made up by suitable additions."

The comparative nutritive value of certain proteins in growth, and the problem of the protein minimum, T. B. Osborne, L. B. Mendel, et al. (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 351–378, figs. 10*).—In continuation of previous work (E. S. R., 31, p. 558), relative to the importance of amino acids in maintenance and growth, the authors report further feeding experiments with laboratory animals (rats). The diet used contained protein-free milk and milk fat with varying amounts of casein, edestin, lactalbumin, and several other proteins.

It was found that growth could be facilitated or repressed at will by the addition or withdrawal of cystin from a diet containing 9 per cent of casein. With only 9 per cent of lactalbumin in the food, growth was about normal. This protein contains both lysin and tryptophan in relative abundance, which it is thought make up a more perfect balance in the proportion of the amino acid groups essential to nutritive efficiency.

It would seem from these and similar observations that the amino acid content of proteins is an index of the comparative values of these proteins as nutrients in growth. The required minimum of the protein lowest in its yield of any one amino acid essential to maintenance or growth may be expected to exceed greatly that of some other protein containing an abundance of the necessary amino acid.

Further observations of the influence of natural fats upon growth, T. B. Osborne, L. B. Mendel, et al. (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 379–389, figs. 6*).—In previous experiments (E. S. R., 31, p. 560) the authors have observed that if rats are given a ration consisting of isolated and purified protein, a carbohydrate like starch, protein-free milk, and commercial lard, they usually grow normally for about three months, but never attain their full size. A partial or complete cessation of growth which results in a decline of body weight occurs sooner or later, and ultimately ends in death if the diet is not changed. The authors found that if part of the lard were replaced by other natural fats recovery resulted.

The results obtained in the present series of experiments are summarized as follows:

"The failure of lard to promote growth in the same manner as do other natural fats (i. e., butter fat, egg yolk fat, cod liver oil) is not attributable to deteriorating changes arising from heat or chemical agents in the commercial manufacture of the product. Heating butter fat with steam does not destroy its growth-promoting efficiency.

"Beef fat also renders the inefficient diets used by us more suitable for producing growth in rats than does lard.

"When butter fat and beef fat are subjected to fractional crystallization from alcohol, the growth-promoting factor remains in the mother liquid or 'oil' fractions. The fractions containing the fats with high melting points are ineffective."

Purin metabolism of man.—III, The decomposition of purin compounds in the digestive canal, V. O. Sivén (*Pflüger's Arch. Physiol., 157 (1914), No. 11–12, pp. 582–586*).—It was found by artificial digestion experiments that the purin compounds contained in bouillon were easily decomposed by cultures of *Bacillus coli.* It is concluded that the loss (about 50 per cent) which the exogenous purins undergo during their passage through the human organism occurs in the digestive canal, principally due to the action of the intestinal bacteria. See also former work (E. S. R., 29, p. 63).

The metabolism of vegetarians as compared with the metabolism of nonvegetarians of like weight and height, F. G. Benedict and P. Roth (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 231–241*).—Employing a unit respiration apparatus, investigations were carried out to study the metabolism of vegetarians and nonvegetarians, both male and female. In a discussion of the experimental data the authors conclude "that living upon a vegetarian diet for a longer or shorter period does not fundamentally alter the basic gaseous metabolism. . . .

"The average respiratory quotient found with the 22 vegetarians (i. e., 11 men and 11 women) was 0.83, while the average quotient found with 132 individuals subsisting on a mixed diet (77 men and 55 women) was 0.81. This difference is slight and is wholly incompatible with the belief that vegetarians, when in the post-absorptive condition, have available any considerably larger proportion of easily combustible carbohydrate material than have nonvegetarians."

The metabolism of athletes as compared with normal individuals of similar height and weight, F. G. Benedict and H. M. Smith (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 243–252*).—In these experiments the authors studied the effect upon basal metabolism of abnormal amounts of protoplasm such as are present in the body of the trained athlete. The subjects of the experiments were divided into groups of approximately equal weight and height, each group including athletes and nonathletes. The average heat production per kilogram of body weight was for the athletes 26 calories and for the nonathletes 24.4 calories. The heat production per square meter of body surface was for the athlete 863 calories and for the nonathlete 807 calories.

From these experiments the authors conclude as follows: "Athletes have a somewhat higher metabolism, both per kilogram of body weight and per square meter of body surface, than do the nonathletes with whom we have compared them. . . .

"The greatly increased proportion of active protoplasmic tissue present in the trained, hardened athlete is alone sufficient to account for the increase in the metabolism, and . . . this is not only an absolute increase, but from the nature of the comparison the metabolism is likewise increased per kilogram of body weight and per square meter of body surface. It would thus appear that the increase in the metabolism noted with athletes points strongly toward the earlier conception that the catabolism of the body is proportional not to the surface of the body, but to the active mass of protoplasmic tissue."

A comparison of the basal metabolism of normal men and women, F. G. Benedict and L. E. Emmes (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 253–262*).—In this investigation the metabolism of 89 normal men and 68 normal women was studied. The computed heat production for 24 hours per kilogram of body weight averaged 25.5 calories for men and 24.9 calories for women. From these observations the general deduction is drawn that the metabolism of men is from 5 to 6 per cent greater than that of women of like weight and height.

Factors affecting basal metabolism, F. G. Benedict (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 263–299, figs. 6*).—In this paper the author draws general deductions from a large number of metabolism experiments, which have been made for various purposes, with a view to determining the most important factors affecting basal metabolism. These deductions may be summarized in part as follows:

"Unquestionably body weight plays an important part. In general, large bodies give off larger amounts of heat than smaller ones, but there is no direct relationship between the total body weight and the total heat production. . . .

"Careful analysis of metabolism measurements obtained on athletes, normal men and women, and normal and atrophic infants, leads to the conclusion that the metabolism or heat output of the human body, even at rest, does not depend upon Newton's law of cooling, and is, therefore, not proportional to the body surface. While certain disturbances in this supposed relationship between the heat production and the body surface may correctly be ascribed to errors in the formulas used for computing body surface, nevertheless the vast bulk of the evidence shows that the variations between metabolism and body surface are far outside of any possible errors in formulas."

The proportion of inert body fat and active tissue greatly affects basal metabolism, and on this basis is explained the greater metabolism of athletes as compared with nonathletes. "The apparent influence of sex, as brought out in the comparison of the metabolism of men and women, may also be attributed to the greater proportion of inert body fat in the latter, with a consequent smaller amount of active protoplasmic tissue."

The effect of height upon basal metabolism is "due without doubt to the fact that the taller individual has the larger amount of active protoplasmic tissue. All these variables deal directly with the mass of the heat producing organism; i. e., the amount of active protoplasmic tissue."

Another very important factor is the stimulus to cellular activity which is influenced by several factors. "One of these factors is age, and it has been noted that with the growing organism of youth there is a much greater cellular activity than with the adult, and a consequent higher metabolism. It has been brought out, however, that in old age there may be actual atrophy of protoplasmic material.

"Sleep has also been shown to have an influence upon the basal metabolism, the stimulus to the cellular activity being greater with an individual when he is lying awake than when he is asleep.

"Considerable fluctuations in the basal metabolism have been found from day to day not only with a fasting man, but with normal individuals studied over considerable periods of time. These variations could not logically be attributed to changes in body weight or body surface, and obviously there was no change in height. Even in the course of 24 hours the fasting subject was found to have three distinct metabolic planes, showing clearly a diurnal variation in the stimulus to the cellular activity.

"Still other factors considered as influencing the stimulus to cellular activity are prolonged fasting, the character of the preceding diet, and the after effects of severe muscular work.

"From the evidence gathered with the various subjects studied it is clear that the basal metabolism of an individual is a function, first, of the total mass of active protoplasmic tissue, and second, of the stimulus to cellular activity existing at the time the measurement of the metabolism is made. Apparently at present no law can be laid down that will cover both of these important variables in the basal metabolism of an individual."

A respiration apparatus for small animals, F. G. BENEDICT (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 301–313, figs. 3*).—A description is given of a modified universal respiration apparatus of the closed-circuit type, which was designed for the measurement of the carbon dioxid production and oxygen consumption of small laboratory animals. It is also provided with a device for graphically recording the muscular activity of the animal. The results are reported of test experiments with the rabbit and the guinea pig.

Corrections in bomb calorimetry, G. N. HUNTLY (*Analyst, 40 (1915), No. 467, pp. 41–48*).—This article, which is supplemental to an earlier one,[a] gives numerous other corrections which are to be applied in bomb calorimetry.

ANIMAL PRODUCTION.

Animal husbandry (*Missouri Sta. Bul. 131 (1915), pp. 466–469, figs. 2*).—Notes on the following investigations are presented:

Age as a factor in animal breeding, by F. B. Mumford and L. A. Weaver.—The results seem to indicate that early pregnancy and lactation causes arrested development in the mother. Pregnancy itself did not cause retarded growth. The growth curves of young pregnant sows followed the same general direction as the growth curves of young nonpregnant sows when each was subjected to the same conditions of food, shelter, and exercise. The growth curves of young sows with suckling pigs, compared with the growth curves of nonsuckling sows of similar age and breeding, give evidence of the retarding effect of lactation on the growth.

Use of feed experiment, by H. O. Allison.—In this experiment comparing the influence of various planes of nutrition upon breeding cattle, no definite conclusions have been reached, but indications are that the higher the plane of nutrition the more food there is required for beef production.

Preparation of corn for fattening steers, by H. O. Allison.—Five lots of six choice 2-year-old steers each were fed a ration composed of corn silage, hay, cotton-seed meal, and corn prepared in various ways. The steers receiving finely ground corn chop made the highest average daily gain and the greatest

[a] Jour. Soc. Chem. Indus., 29 (1910), No. 15, pp. 919–921.

profit per steer. More beef and pork were produced from a bushel of corn by the lot which received broken ear corn. This lot produced the second highest profit per steer.

Forage crop rotations for pork production, by L. A. Weaver.—It was found that after deducting the gain put on by corn fed to hogs grazing on different forage crop plats, the returns per acre with pork at 7 cts. per pound were as follows: With rape, oats, and clover, $47.04; rape and oats, $44.10; rape in rows (cultivated), $44.95; rape broadcasted, $34.09.

Relative efficiency of pregnant mares for farm work, by E. A. Trowbridge, E. H. Hughes, and S. T. Simpson.—The results indicate that draft mares can produce healthy and normal foals and still do their share of ordinary farm labor. Mares with suckling foals show a greater loss in weight in the spring and summer seasons than do mares not suckling. Mares nursing foals make very rapid gains in weight after weaning.

Feeding wheat to fattening swine, by L. A. Weaver.—A ration composed of corn, wheat, and tankage 5:5:1, or of wheat and tankage 10:1, made very economical gains on swine. When wheat was fed in one of the above combinations more gain was produced than when it was fed alone or with corn only, and more gain was produced by corn alone or corn and tankage 10:1.

A study of the residual effects of forage crops for swine, by L. A. Weaver.—The first year's work indicates that there is but slight advantage in feeding hogs that have been previously on pasture, as compared to hogs that have been previously kept in a dry lot.

Self-feeders for fattening swine, by L. A. Weaver.—A slight advantage has been observed in feeding pigs by a self-feeder over the ordinary method of feeding.

Some factors affecting fetal development, J. M. Evvard (*Proc. Iowa Acad. Sci., 20 (1913), pp. 325–330*).—This is a progress report of work being carried on at the Iowa Experiment Station to determine the effect of the nutrition of the dam during the pregnancy period upon the developing fetus. Studies with five lots of 5 gilts each have been previously noted (E. S. R., 28, p. 574).

Three lots of 10 yearling sows each and four lots of 12 ewes each were also fed upon different feed stuffs with the following results:

Effect on offspring of feed fed pregnant swine and ewes.

Kind of dam.	Daily pregnancy ration.						Offspring record.					
	Corn.	Meat meal.	Clover hay.	Alfalfa.	Oil meal.	Silage.	Average number of offspring born.	Average weight of offspring born.	Vigor.			
									Strong.	Medium.	Weak.	Dead.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*		*Lbs.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Sow..	4.97	......	....	....	....	......	9.2	1.85	41	35	20	4
Do.	4.11	.500	....	....	....	......	10.1	2.42	85	5	5	5
Do.	4.06	......	....	....	1.129	......	8.8	2.22	76	15	5	4
Ewe.	.802	......	2.91	....	....	......	1.67	6.58	60	30	5	5
Do.	.799	......	....	2.71	....	......	1.75	7.91	85	5	5	5
Do.	.587	......	1.74	....	....	2.88	1.67	7.44	80	20	0	0
Do.	1.021	......	....	....	....	4.72	1.33	8.36	81	19	0	0

From this it is seen that the supplemented rations not only produced larger but stronger pigs at birth. Even though the carbohydrates were limited as in the meat-meal lots, the increase in protein and ash was such as to influence markedly the size and strength of the newborn pigs. The meat-meal ration gave somewhat better results than where a vegetable protein supplement such as linseed-oil meal was allowed. It was noted that both meat meal and oil meal increased the coat as well as the color of the skin. The meat meal produced a larger bone than oil meal, and both of these surpassed corn alone.

Attention is called to the small number of offspring per ewe in the corn silage lot, which contributes largely to the increased size of the young. Where silage was fed in addition to clover the vigor and size of the offspring was increased, whereas alfalfa as compared with clover, being richer in protein and ash than clover, produced the strongest and largest lambs, even though there were more of them. It is stated that more recent experiments have shown quite clearly that cotton-seed meal added to corn and corn silage increases the strength as well as the size of the offspring.

On the variation in the growth of mammalian tissue in vitro according to the age of the animal, A. J. Walton (*Proc. Roy. Soc. [London], Ser. B, 88 (1915), No. B 606, pp. 476–482, pl. 1*).—The author concludes from his investigations that "growth of tissues in vitro affords a valuable means of investigation as to the effects of age upon growth. The tissues of young animals grow more rapidly and vigorously than those of adult animals. The plasma of young animals is a much less suitable medium for the growth of tissue in vitro than the plasma of old animals. The unsuitability of the plasma of young animals as a medium is probably due to the presence of an increased amount of some inhibiting substance."

The English rabbit and the question of Mendelian unit-character constancy, W. E. Castle and P. B. Hadley (*Proc. Nat. Acad. Sci., 1 (1915), No. 1, pp. 39–42, figs. 6*).—In breeding experiments with rabbits the authors disprove the idea of unit-character constancy, or "gametic purity." It is said that "if crossing is likely to produce considerable changes in the characters which it is desired to combine in a new race, it is evident that Mendelian crosses must be used judiciously and with caution by the practical breeder," and that "if unit characters are not constant, selection reacquires much of the importance which it was regarded as possessing in Darwin's scheme of evolution, an importance which many have recently denied to it.

Breeding of farm animals, M. W. Harper (*New York: Orange Judd Co., 1914, pp. XVII+335, figs. 104*).—This is a general treatise on animal breeding designed for the farmer, breeder, and student. It discusses the fundamental principles underlying animal breeding such as development, selection, variation, and heredity, together with the more practical phases of the work. An appendix contains tables giving data as to breeds and breeders' associations.

The jack bean (Canavalia ensiformis), F. Barnstein (*Landw. Vers. Stat., 85 (1914), No. 1–2, pp. 113–122*).—The composition of the jack bean (*C. ensiformis*) is reported as water 13.26 per cent, protein 31.51, fat 2.18, nitrogen-free extract 41.99, fiber 8.59, and ash 2.47. The coefficients of digestibility as determined in a 4-week test with sheep are given as dry matter 87.5 per cent, organic matter 88.6, protein 80.5, fat 72.1, nitrogen-free extract 99.1, and fiber 72.9. The starch value is estimated to be 63.7, with 18.69 per cent of digestible protein, making it somewhat lower in nutritive value than the common field bean. The sheep were fed 0.44 lb. of crushed beans per day without apparent injurious effects.

Beet residues for farm stock, J. B. Lindsey (*Massachusetts Sta. Circ. 48 (1914), pp. 7*).—A general discussion of the feeding value of dried beet pulp, molasses beet pulp, and beet leaves, based in part on work previously noted (E. S. R., 30, p. 176).

Ensiling potatoes with a lactic acid culture, AHR and C. MAYR (*Illus. Landw. Ztg., 34 (1914), No. 86, pp. 737, 738*).—Successful experiments are reported in ensiling steamed and raw potatoes when the material was inoculated with a lactic acid culture. The silage was fed to cattle, sheep, and swine with favorable results.

Factors affecting range management in New Mexico, E. O. WOOTON (*U. S. Dept. Agr. Bul. 211 (1915), pp. 39, pls. 9, figs. 3*).—This is a general résumé of range conditions in New Mexico. It is said that the present status of the stock raising industry in New Mexico is but one phase of the adjustment of the various industries of the State among themselves and to the physical environment. The topographic, climatic, and soil characters of the State restrict by far the greater part of its total area to the business of stock raising so long as the present agricultural methods continue. It is recommended that some form of range control be instituted which will prevent the present system of overstocking.

Meat production in the Argentine and its effect upon the industry in the United States, A. D. MELVIN and G. M. ROMMEL (*U. S. Dept. Agr. Yearbook 1914, pp. 381–390*).—A paper presented before the section on experiment-station work of the Association of American Agricultural Colleges and Experiment Stations and previously noted (E. S. R., 32, p. 12).

Meat production in Australia and New Zealand, E. C. JOSS (*U. S. Dept. Agr. Yearbook 1914, pp. 421–438, pls. 4*).—A report of a study of the conditions under which the meat and meat food products of Australia and New Zealand intended for entry into the United States are produced, slaughtered, treated, and shipped.

It is stated that stock raising comprises the leading industry in both Australia and New Zealand, the former exceeding all other countries in the number of sheep and the amount of wool exported. In Australia, where the production of wool rather than mutton has been in the past the chief aim of sheepmen, the Merino or fine-wool type of sheep predominates. In New Zealand considerable attention has been given to the breeding of sheep for meat production, with the result that trade reports show the Downs, Romney, Leicester, and Lincoln lamb carcasses of New Zealand are highly regarded in the European market. In New Zealand the government has lent considerable encouragement and aid in developing the live stock industry by fostering the raising of sheep and dairy cattle, searching out and opening up new markets, granting subsidies to steamship companies, etc.

The meat-inspection laws and regulations of Australia and New Zealand are briefly described.

It is said that Australia's beef exports have increased rapidly in recent years, there being at present a prospect of large dealings with the Pacific ports of the United States. Australian mutton is quite widely distributed also, although to a less extent than the beef. The beef trade of New Zealand is small compared with that of Australia, but the exports of mutton and lamb are in most years more than twice as large as those of Australia. In addition, these countries export large numbers of frozen rabbits and hares.

Raising the dairy calf, E. G. WOODWARD (*Nebraska Sta. Bul. 149 (1915), pp. 3–16, figs. 8*).—This bulletin gives information on the raising of a calf on skim milk, and other items of general management.

Three dairy steers were fed from birth up to about one year of age. Whole milk was fed for about 3 weeks. The grain consisted of a mixture of corn chop and ground oats 2:1. The results were as follows:

Results of feeding three dairy steer calves on skim milk.

Kind of calf.	Period fed.	Feed consumed.				Weight of calf.		Average daily gain.
		Whole milk.	Skim milk.	Alfalfa hay.	Grain.	Birth weight.	Final weight.	
	Days.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Jersey	360	258	5,958	1,609	1,178	60	580	1.44
Holstein-Jersey	384	251	6,366	1,696	1,652	48	750	1.83
Grade Holstein	344	245	5,620	1,584	1,238	74	700	1.82

It is estimated that it requires 175 lbs. of whole milk, 2,700 lbs. of skim milk, 125 lbs. of grain, and 450 lbs. of hay, costing a total of $12.88, to raise a calf to the age of six months when skim milk is used. Such a calf will weigh from 250 to 400 lbs., depending upon the size of the breed and the thrift of the calf. Whether or not it will pay to raise steer calves of the dairy breeds or the inferior dairy heifers for meat will depend entirely upon conditions. It is estimated that if the calf is raised on whole milk, shortening the milk feeding period to about three months, about 900 lbs. of whole milk, 250 lbs. of grain, and 600 lbs. of hay, costing a total of $19, will be required to raise the calf to six months of age.

Feeding sour milk to young calves, T. E. Woodward (*Hoard's Dairyman, 49 (1915), No. 7, pp. 248, 256*).—As a result of experiments conducted by the Dairy Division of the U. S. Department of Agriculture, in which skim milk allowed to sour naturally was fed to 22 young calves of different breeds and at different seasons of the year, and sour whole milk fed to two calves, it was found that "in no case did the sour milk cause digestive disturbances, even when the change from the sweet to sour was made abruptly and with calves only a few days old.

"The sour milk is not so palatable as the sweet milk; some very young calves refuse to drink the sour milk, especially if the temperature of the milk is low. The calves made as rapid gains on sour skim milk as upon sweet skim milk, and seemed to do as well on a diet alternating between sweet and sour skim milk as upon either alone.

"Sour milk is not as satisfactory as sweet milk for winter feeding; it chills the calves, and some drink it reluctantly when the weather is cold. It seems, however, that any calf which drinks the sour milk readily will do well upon it even in cold weather. In warm weather sour skim milk gives as good results as sweet skim milk. These experiments indicate that the dairyman might just as well let the milk for calf feeding become sour during the summer months instead of going to trouble and expense to keep it sweet."

It is suggested that the milk for feeding calves should be allowed to sour quickly and be fed as soon as possible; otherwise there is danger of contamination with harmful bacteria.

Calf-rearing experiments in Hungary, G. Kerekes (*Köztelek* [*Budapest*], *24 (1914), No. 61, pp. 2172, 2173; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, pp. 1473–1475*).—Calves were fed separated milk, the cream being replaced by rye flour at the rate of 4 to 5 oz. per gallon of separated milk. The mixture was thoroughly churned and warmed to the temperature of fresh milk. The calves were fed whole milk until four weeks old, when a gradual substitution was made of the emulsion until eight weeks old. They were then fed entirely on the milk emulsion, with a gradual substitution of separated milk at three months of age, when the calves were receiving approximately 2¼ gal. per head daily. The average weight at three months of calves fed in this manner was 297.5 lbs. per head, while calves fed whole milk weighed 248.2 lbs.; at four months the weights were 380 and 305 lbs., respectively.

Notes on degeneration in the teeth of oxen and sheep, J. W. JACKSON (*Ann. and Mag. Nat. Hist., 8. ser., 15 (1915), No. 87, pp. 291–295*).—The author comments on the absence of the first lower premolar tooth in the jaws of oxen often found among animal remains. This feature is thought to be due to disuse, probably through change of food or habit under domestication.

The woolgrower and the wool trade, F. R. MARSHALL and L. L. HELLER (*U. S. Dept. Agr. Bul. 206 (1915), pp. 32, pls. 11, fig. 1*).—The items discussed in this bulletin are present methods of disposing of wool by the growers, factors that determine the value of wool, wool grading, market grades, sorting wool, pounds of wool per pound of cloth, the need of improvement in handling American wools, how American methods of handling wool may be improved, and fundamental rules for the wool trade. A glossary of terms used in the wool trade is appended.

Suggestions from Australasia to American sheep raisers, F. R. MARSHALL (*U. S. Dept. Agr. Yearbook 1914, pp. 319–338, pls. 2, fig. 1*).—The American and Australasian attitudes toward sheep raising are compared, on the basis of a visit in 1914 to Australia and New Zealand, and suggestions given for the improvement of the manner of disposing of the wool clip and the breeding of sheep in this country.

It is said that the Australian's idea of what constitutes an economical wool-producing animal is governed not by the price per pound received for the greasy wool, nor by the weight of the fleece, but by the total value of wool produced per acre of land. The type of wool is closely associated with the type of sheep, and the type of sheep must be varied to withstand regional variations in altitude, temperature, rainfall, and vegetation. The general effort in Australia to-day is to produce a wool which, compared with what is aimed at by American woolgrowers, is decidedly longer and coarser. It is argued that the larger framed and stronger constituted sheep that produce this robust wool suffer less from heat, drought, and scant feed than do the smaller and less vigorous producers of ultrafine wool. The newer type also has fewer skin folds on the body and is easier to shear. This robust wool is lighter in oil than are the finer wools and possesses a whiteness and an attractive character not easy to secure when fineness is paramount. The gain in the amount of wool produced per acre by the robust-wooled sheep more than offsets the extra price that has commonly been paid in the markets for the very fine wools. Other claims for the robust wool are that it retains its character in bad seasons or in a hard country, that it is not so easily pulled off on bushes, and that it is less likely to shed from sheep in low condition or poor health.

Methods of preparing wool for market in Australia are deemed far in advance of those used in the United States. It is said that because of their poor preparation American wools bring less per pound than imported wools of similar character. This is substantiated by showing the results of sorting and scouring two lots of wool—one grown in Idaho, the other imported. What remained of the Idaho wool after sorting and scouring was considered fully equal to the clean imported wool and was mixed with the imported lot for manufacturing, but had received 3.3 cts. per clean pound less than its actual value.

The adoption of the Australian system in preparing American clips for market is recommended. It would be necessary to allow selling agents to group together lots of similar wools from various clips to make up sufficiently large offerings to interest the buyers in the trade who prefer to buy in lots of 50,000 lbs. and upward. In time it is thought that buying agents would be more willing to buy in smaller lots in order to insure the continuation of the improvement.

Breaking and training colts, V. G. STAMBAUGH (*U. S. Dept. Agr., Farmers' Bul. 667 (1915), pp. 16, figs. 11*).—A general discussion.

Average and frequency curves, C. POTTS (*Dept. Agr. N. S. Wales, Farmers' Bul. 93 (1914), pp. 12, 13*).—The author demonstrated, by the use of average and frequency curves, that in the pens supplied for the egg-laying competitions for the past ten years "there appear to be two distinct families in each breed throwing true as regards egg-laying capacity, one of these families, aptly called the 'low-bred,' having a lower average egg-laying capacity than the other. While each family has a definite average egg-laying capacity, individual pullets will lay above or below that average.

"Examining the curves for three breeds it was shown that the high and low bred families are about equally balanced in the case of the White Leghorn; hence there should be scope for considerable improvement by careful selection. Further, the Leghorns exhibit indications of having a higher egg-laying capacity than any other breed. The low-bred family predominates in the case of the Black Orpingtons; hence improvement by selection has a great deal of bad material to dispose of. The possibilities of the high-bred family, however, show that they are worthy of more attention than they have so far received. In the case of the Silver Wyandottes the high-bred family predominates. The curve indicates that they could not attain the egg-laying capacity of either of the breeds mentioned above; still with the high-bred family predominating, it should be a matter of ease to establish a flock having a good average capacity for egg laying."

It was further demonstrated that "if a pullet of exceptionally high egg-laying capacity is chosen, it is more than probable that she belongs to the high-bred family, while it is doubtful whether a pullet of average capacity belongs to the low or to the high bred family; and, in all probability, she is a cross between the two. To establish the high-bred family it is essential to choose the breeders from the family of higher egg-laying capacity. It has been seen that the exceptionally good layer probably belongs to this family. However, it would appear to be unwise to breed from her; she is an exception, and her progeny, in order to maintain the average of the family, would be low layers by way of compensation. The best birds to breed from would be the true sisters and brothers of the exceptional pullet, and the hens should not be much above the average of the family."

Sex-linked inheritance in poultry, G. LEFEVRE (*Missouri Sta. Bul. 131 (1915), pp. 488, 489*).—In continuation of work previously noted (E. S. R., 31, p. 368) a Silver Spangled Hamburg male was crossed on an F_1 hybrid female (from Leghorn male×Hamburg female), the resulting F_2 generation being spangled in both sexes. In mating an F_1 hybrid male and F_1 hybrid female (both from Hamburg male×Leghorn female) the resulting F_2 generation gave spangled and nonspangled females, the males showing all degrees of spangling. In mating an F_1 hybrid male and F_1 hybrid female (both from Leghorn male×Hamburg female) the resulting F_2 generation showed spangling and nonspangling in both sexes.

It is concluded that "a spangle factor is present in the Hamburg which is transmitted in a sex-linked fashion, but evidently the pattern is affected by other factors, as the spangling varies from a condition which is practically identical with that of the pure Hamburg to one in which the pattern is disturbed to a considerable degree, both in its purity and its distribution over the body."

In crossing a Black Bantam male and F_1 hybrid female (from Black male×Seabright Bantam female) the resulting F_2 generation showed a full cock-feathered condition, a hen-feathered condition, and an intermediate condition in the males. In crossing an F_1 hybrid male×F_1 hybrid female (both from Seabright male×Black female) the resulting F_2 generation showed a full cock-feathered condition in all the males. In crossing an F_1 hybrid male×F_1 hybrid female (both from Black male×Seabright female) the resulting F_2 generation showed the full cock-feathered, hen-feathered, and intermediate conditions in the males.

No conclusions are drawn, and it is proposed to continue these experiments.

Changes in the secondary sexual characters of Gallinæ, A. PÉZARD (*Compt. Rend. Acad. Sci.* [*Paris*], *160* (*1915*), *No. 7, pp. 260–263, fig. 1*).—The results of experiments in ovariotomy with poultry indicate that spurs and the male plumage may be developed in the female, but that the turgid comb and the crow of the cock are characters peculiarly belonging to the male bird and do not accompany ovariotomy as do the other secondary sexual characters.

Sexual differentiation of pigeons' eggs (*Carnegie Inst. Washington Year Book, 13* (*1914*), *pp. 117–119*).—A brief account of the work of O. Riddle, who has shown that "in pigeons, which usually lay two eggs at a time, commonly one male and one female, eggs destined to produce males are smaller, and have higher water content and smaller energy content, than those that produce females." By the use of the bomb calorimeter it has been demonstrated "that eggs destined to become males contain less stored energy than eggs destined to develop into females. Whether the difference in energy content (however it may have arisen) is the cause of the difference in the eventual sex or whether it is induced by a certain difference in the unfertilized egg which determines the difference in storage metabolism is uncertain. There is reason for thinking that the ova of birds are of two kinds, those destined to produce males and those destined to produce females, and there is also evidence that the former contain a sex chromosome which the latter lacks. This difference in the chromosomal content of the eggs destined to be males and females, respectively, may therefore be the cause of the difference of energy content of the two kinds of eggs."

A study is being made to determine "whether a modification of the amount of yolk stored in the egg can control the sex of the resultant chick. One result secured is that when the female pigeon is subjected to alcohol vapor it lays smaller eggs than normal. Other substances used (phloridzin and urotropin) have caused a reduction in the fertility of the egg, but have not markedly altered its size."

It has further been found that "when two full sisters from such series are hatched from the two eggs of a single clutch the first hatched behaves in copulation as though it were a male. Also females hatched early in the season (the period when most males are produced) are more masculine in behavior than are their own sisters hatched late in the season. . . . If extracts from the ovary of a pigeon be injected into those females that are behaving like males, they come to behave like females. Contrariwise, if testicular extract be injected into those females that are acting like females they come to act like males. . . . The sex behavior of a bird is probably determined by internal secretions from its sex glands carried to its central nervous system. On this hypothesis the quality of the internal secretions of the ovaries of birds that act like males must be different from those of birds that act like females. The effect of the injected extract may perhaps be regarded as superior to that induced by the natural secretion of the ovaries."

The Campines, edited by F. L. PLATT (*Quincy, Ill.: Rel. Poultry Jour. Pub. Co., 1914, pp. 87, pl. 1, figs. 80*).—This treats of the history, care, and management of this breed of poultry.

The White Leghorn, P. B. HADLEY (*Jour. Heredity, 6 (1915), No. 4, pp. 147–151, fig. 1*).—This material has been previously reported from other sources (E. S. R., 30, p. 71; 32, p. 671).

Chickens: Milk feeding and its influence on growth and mortality.—Comparative study of the value of sweet and sour milk, L. F. RETTGER, W. F. KIRKPATRICK, and L. E. CARD (*Connecticut Storrs Sta. Bul. 80 (1915), pp. 28, figs. 17*).—This is a continuation of work previously noted (E. S. R., 31, p. 484). The former experiments demonstrated that the feeding of milk to young chicks has a most favorable influence on the growth and on the lessening of mortality of the chicks. It tends to prevent mortality from all causes, and if fed soon enough and for a sufficiently long period, greatly reduces the death rate caused by bacillary white diarrhea.

The later experiments demonstrated that sweet and sour milk are apparently of equal value in their relation to growth and mortality, and that the different degrees of souring do not alter the results of milk feeding. The combined results on the 2,250 chicks fed show that those which received the sour milk gained 0.26 lb. per ten chicks for each pound of total solids consumed; the chicks that were fed sweet milk made a corresponding gain of 0.25 lb., and those which were not given any milk, 0.2 lb. In the lots of chicks which had been infected with *Bacterium pullorum* the mortality percentage was in the case of the sour-milk-fed chicks 40, sweet milk 39, no milk 54, and with uninfected lots 17, 16, and 30, respectively.

It is concluded that the value of milk as a food for chicks does not depend upon any acids that may be present, nor upon any particular types of microorganisms, but upon the natural constituents of the milk. It is said that when milk is supplied freely to chicks it is important that they have abundant exercise, otherwise they are subject to leg weakness. This applies more particularly to early hatched chicks that are brooded wholly or for the most part indoors. The feeding of sweet or sour milk to young chicks has not been found in any way injurious to the chicks. If the milk is clean and not too old, none but the most favorable results should accompany its use as a food for chicks. There is no preference in the choice of sweet or of sour milk, but it seems very desirable that the same kind of milk be supplied throughout the milk feeding period.

The poultry industry in New York State (*N. Y. Dept. Agr. Bul. 65 (1914), pp. 202–445, figs. 109*).—This bulletin includes articles on the various breeds of poultry, the breeding of poultry for egg production, incubation, brooders and brooding, rearing chickens, feeding for egg production, poultry house construction, poultry diseases, market egg problems, and other related topics.

The egg and poultry demonstration car work in reducing our $50,000,000 waste in eggs, MARY E. PENNINGTON, H. C. PIERCE, and H. L. SHRADER (*U. S. Dept. Agr. Yearbook 1914, pp. 363–380, pls. 4, fig. 1*).—This is a popular review of work previously reported (E. S. R., 31, p. 570), describing the various grades of eggs, their defects, and methods of remedying these defects. The work of demonstrating these facts to farmers and egg dealers in Kansas, Oklahoma, Texas, Arkansas, and Missouri is described.

Edible snails, E. W. RUST (*U. S. Dept. Agr. Yearbook 1914, pp. 491–503*).—This article gives a description of the principal edible species of snails and treats of their commercial production and the possibilities of the industry in the United States.

DAIRY FARMING—DAIRYING.

Dairy husbandry (*Missouri Sta. Bul. 131 (1915), pp. 471–473*).—The following investigations are in continuation of previous work (E. S. R., 31, p. 370):

Silage investigation, by C. H. Eckles.—Little difference was found in the temperature of silage preserved in silos built of concrete, wood, or tile. The temperature of the silage rarely exceeds 100° F. unless the silage is deficient in moisture or air is present. There was found to be a wide variation in weight per cubic foot, depending upon the amount of moisture and probably upon the amount of grain in proportion to stalk. It was found that shock corn may be ensiled with good results if there is added an amount of water approximate to the amount of dry fodder used.

Factors influencing the normal composition of milk. The effect of cotton-seed meal and cotton-seed by-products, by C. H. Eckles and L. S. Palmer.—A marked superiority in the keeping quality of butter made from a ration containing cotton-seed meal was noted. The butter is firmer when cotton-seed meal is added. The character of the roughage fed, however, determines the effect of the cotton-seed meal in the ration to a considerable extent.

Factors influencing the development of dairy heifers, by C. H. Eckles, T. C. Reed, and W. M. Regan.—Two 6-months-old dairy heifers were started on a ration much below the normal in content of mineral matter; one received bone meal and chalk in addition. After a year's feeding on this ration typical symptoms of calcium shortage were observed. It was found possible to restore the animals to normal condition by increasing the calcium in the ration.

From the data at hand it appears that an animal receiving approximately one-half of the protein called for by the feeding standard is able to make a growth that is almost normal. This indicates that the protein required is considerably less than that generally recommended.

From measurements taken of calves and other growing animals in the station herd it appears from the data so far obtained that the different breeds follow the same curve with the exception that certain ones reach maturity quicker than others. It has also been found that the animal reaches maturity in skeletal growth very much quicker than it reaches maturity in weight. Holstein cattle reach their mature development of skeleton at the age of between four and five years, while they continue to increase in weight normally for at least two years longer.

A height measurement taken from the top of the shoulder blade has been found to be more accurate than one taken at the withers. This is due to the fact that certain fluctuations occur in the latter owing to the relaxation of certain muscles which attach on the chest and shoulder blades and serve to hold the body up. During periods of rest these muscles relax with a consequent decrease in height.

Development and present state of dairying in Sweden, E. HAGLUND (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 179–185*).—A general résumé of the dairying industry in Sweden.

It is said that the best known varieties of Swedish cheese are Swedish large-eyed cheese, which in type and appearance resembles the Swiss Emmental cheese, about 14 in. in diameter and 4¾ in. high; and Norrland whole-milk cheese with small eyes, very soft, with a slightly pungent taste, about 16 in. in diameter and 6 in. in height, and made both with and without spices (caraway and cloves). Småland shepherds' cheese resembles the preceding cheese, but is more pungent and compact and is never spiced. Besides these cheeses, imitations of most of the well-known Dutch and English cheeses are made.

A study of three thousand advanced register records (*Guernsey Breeders' Jour., n. ser., 7* (*1915*), *No. 5, pp. 25–28, figs. 9*).—In a comparison of 1,500 records taken of Guernsey cattle between 1901 and 1911, and a like number taken between 1911 and 1914, it was found that the records showing less than 6,000 lbs. of milk per annum have decreased 49.6 per cent, and those from 6,000 to 8,000 lbs. 32.2 per cent. In the 8,000 to 10,000 lbs. division there has been a 9.1 per cent increase, in the 10,000 to 12,000 lbs. division 96.5, in the 12,000 to 14,000 lbs. division 181.9, and in the over 14,000 lbs. division 228.5 per cent. There has been a decrease in the number of records falling in the division of under 400 lbs. of milk fat, and increases in all the other divisions.

In a comparison as regards the percentage of milk fat in the milk it was found that very few records show less than 4 per cent. There has been a large increase in the 4 to 4.5 per cent division. This condition prevails to a lesser degree in the 4.5 to 5 per cent division, while in the divisions above this there is a decrease in the proportion of records in the second lot. However, a greater number of records fall in the 5 to 5.5 per cent division than fall in any other division. The average percentage of milk fat for the breed at the time these figures were compiled was 5.002.

Nearly as large a proportion of records is made by the 2-year-old heifers with first calf as by the older cows, and while the proportion of aged cows has slightly decreased in the second lot of records, that of the 2-year-olds has slightly increased.

Champion cows of each breed (*Hoard's Dairyman, 49* (*1915*), *No. 19, p. 700*).—The names are given of the cows of each breed holding the highest semi-official yearly records in their several classes, corrected to May 1, 1915.

Rations for dairy stock, J. B. Lindsey (*Massachusetts Sta. Circ. 50* (*1915*), *pp. 8*).—Some principles of feeding dairy cattle are discussed, and suggestive rations are given.

Feeding dairy cows cassava meal, J. E. Lucas (*Ann. Sci. Agron., 4. ser., 3* (*1914*), *No. 7–12, pp. 337–342*).—It is concluded that cassava meal when used as supplementary feed with a basal ration of sugar beets, chopped straw, alfalfa hay, and wheat bran exerted a favorable influence on both the milk yield and the fat content, being more desirable in this respect than gluten meal.

Influence of grazing and of dry-stall feeding on milk, K. Brunovsky (*Moloch. Khoz. i Skotov., 13* (*1914*), *No. 38, pp. 791–794; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 2, pp. 277, 278*).—A cow was fed for 20 days as follows: The first four days the whole time in a meadow; the next four days half the day in the stable where she was fed 11 lbs. of meadow hay; the third four days in the stable, 22 lbs. of hay being fed; the fourth four days like the second; and the fifth like the first.

It was found that while grazing the cow yielded 20.3 lbs. of milk per day and when stall fed only 16.3 lbs. The fat percentage increased when the cow was transferred from the meadow to the stall from 3.7 to 4.05.

The relation of the quality of proteins to milk production, E. B. Hart, G. C. Humphrey, et al. (*Jour. Biol. Chem., 21* (*1915*), *No. 2, pp. 239–253, figs. 4*).—

The authors present data on the comparative efficiency for milk production of the proteins of milk, corn, and the wheat grain.

It was found that "on a nutritive ratio of 1:8, equivalent to about 7 per cent of digestible protein and 9 to 10 per cent of total protein, positive nitrogen balances were maintained with milk proteins for the production of as high as 35 lbs. of milk per day, but negative balances resulted when the proteins were derived from the corn or wheat grain. During the negative nitrogen balances increased tissue autolysis resulted, and for a brief time at least there was no decrease in the milk protein or milk solids elaborated.

"The results indicate clearly that the quality of the proteins is an important factor in maintenance and production, and that the synthetic powers of the mammary gland will not compensate for deficiencies in protein structure. The fact that negative balances were observed on the 1:8 nutritive ratio of corn or wheat proteins explains the results of experience which has wisely dictated a narrow nutritive ratio for milk production. The narrow ratio, of course, may not be so necessary when we learn with what efficiency the commercial protein concentrates may supplement a basal group of proteins like those of corn, oats, wheat, alfalfa, etc. . . .

"Milk proteins had an efficiency for milk production and tissue restoration of about 60 per cent, while the corn and wheat grain proteins showed an efficiency of 40 and 36 per cent, respectively. These results were obtained under experimental conditions requiring a roughage of low nitrogen content."

The cost of milk production, H. A. Hopper and F. E. Robertson (*New York Cornell Sta. Bul. 357 (1915), pp. 135–162, figs. 6*).—From a study made of the costs incident to milk production for 834 dairy cows with full year's records in 53 dairy herds in Jefferson County, N. Y., it was found that 7 of the 53 herds, comprising 97 cows, were kept at a loss of $1,335.71. On the basis of net cost and actual receipts, 161 cows, or 19 per cent of the total number, caused a loss to their owners of $1,799.87, or $11.18 per cow. The average production was 6,621 lbs. of milk and 241 lbs. of milk fat. The milk was produced at a net cost of 1.21 cts., and the milk fat at 33.3 cts. per pound. The average selling price of the milk was 1.52 cts. per pound, and the net profit per cow was $20.39. The net cost per cow was $80.24 and the receipts were $100.63. The average cost of feed per cow was $51.57, and the labor cost $23.12. The average cost of delivering 100 lbs. of milk 2.14 miles was 11.7 cts. The profit from cows yielding 10,000 lbs. of milk a year was 51 per cent greater than from those yielding 6,000 lbs.

[Second and third reports] on the cost of food in the production of milk in the counties of Kent and Surrey (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 19–160*).—The work noted in the second report, by G. H. Garrad and J. Mackintosh, is similar to that previously reported (E. S. R., 25, p. 679). In the third report, by G. H. Garrad, extensive data are given on the cost of feed in the production of milk in England—about 6½d. (15.8 cts.) per gallon, exclusive of labor and other charges.

It is suggested that cows should be fed according to the yield of milk they give. If they are already getting a liberal feed, it is not possible to increase materially the yield of milk by extra feeding, at least not sufficiently to pay for the increased cost of feed. The records show that the cost of feed per gallon of milk is much lower for a 4 or 5 gal. cow than it is for a 2 or 3 gal. cow, the reason assigned being that the maintenance ration required for either cow is practically the same, while the feed required for the higher-producing cow is not proportionately higher in cost.

Milk and cream (*Maine Sta. Off. Insp. 67 (1915), pp. 9–28*).—Analyses are given of samples of milk collected during the months of October, November, and December, 1914. A discussion of the results by A. M. G. Soule is appended.

Condensed milk, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 304 (1915), pp. 27*).—Analyses are given of condensed milk.

Evaporated milk, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 305 (1915), pp. 19*).—Analyses are given of evaporated milk.

Devonshire "clotted" cream, W. Sadler (*Rev. Gén. Lait, 9 (1914), Nos. 20, pp. 457–466, pl. 1; 21, pp. 481–489*).—This article describes the method of making clotted cream, a dairy product of Devonshire and Cornwall, England.

It is said that in the production of clotted cream, milk is placed in shallow pans and allowed to remain in a cool room for the cream to rise. The pans are then heated over a hot water stove, and after the heating is completed, are placed in a cool room until the contents of the pans are sufficiently cooled, after which the cream is skimmed off and is ready for sale.

The practice has been to add a small quantity of water to the milk before setting the pans for the cream to rise. The author finds, however, from his experiments that this is not desirable, since it does not add to the actual weight or the percentage of fat in the cream, and the cream so produced does not possess the keeping qualities of similar cream raised from normal milk.

The principal and most recent applications of bacteriology to the dairy industry, G. Fascetti (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 168–179, pl. 1*).—This is a résumé of the results of experiments in the use of selected ferments in the cheese-making industry.

It is said that the pure cultures of lactic ferments, cocci, or bacilli, according to the type of cheese, when added to raw milk have given results which have led to their adoption in practical cheese factories, especially for the elimination of the principal and most frequent defects in the products.

The problem now confronting the bacteriologist is to determine which of the typical forms of lactic ferments at present known are to be used and with what precautions. Such information is necessary in developing the process of manufacturing cheese from pasteurized milk, which is said to be still enveloped in uncertainty.

A bibliography of 29 references is included.

The part played by micro-organisms in the ripening and in the production of the pungent flavor of Brindza, the ewes' milk cheese made in Hungary, O. Gratz and K. Vas (*Kisérlet. Közlem., 17 (1914), Nos. 3, pp. 347–394; 4, pp. 635–644; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1674, 1675*).—Bacteriological tests were made, at intervals of from four to six weeks for six months, of five samples of fresh Brindza cheese.

It was found that the microflora varied, probably due to the want of cleanliness in handling ewes' milk, the use of bad rennet, and contamination. It is said that there is no cheese with so high a germ content as Brindza even though after it is made and during storage the multiplication of micro-organisms ceases. Most of these are lactic bacteria, although not so large a percentage as in other cheeses. The large majority of accidental micro-organisms are probably introduced during the process of manipulation. These soon disappear, the streptococci and cocci dying much sooner than the lactic bacilli. The accidental micro-organisms do not take part in the ripening of the cheese, because the conditions do not favor either their development or the activity of their enzyms. The lactic enzyms cause the ripening, although the enzyms of the rind of the curd ball also play an important part in the ripening process.

It is said that the origin of the piquant flavor of some ewes' milk cheeses is usually in a decomposition of the fatty matter, and in exceptional cases butyric fermentation. This decomposition is not caused by the bacteria attacking fatty matter, but to enzyms, the most important being the lipase of *Oidium lactis*. If the outside of the curd balls (rich in butyric ferments and on which *O. lactis* is always present) and the fat layer under this outside (in which the enzyms are found) are not carefully removed when the cheese is worked up again, these come in contact with the whole of the kneaded paste and communicate a pungent flavor to the cheese.

Strongly flavored Brindza has a pale orange color, is dry, subject to crumbling, strong smelling, and never turns moldy. Sweet Brindza is of normal consistency, but becomes sticky and moldy if it is not kept hermetically closed.

Part 2 of the paper describes "some new species of micro-organisms found during the research on the flora of Brindza and the part they play in the ripening and production of the special flavor of this cheese. Considering the various properties of these bacteria observed during their culture and their biochemical action, they do not resemble any of the micro-organisms known so far to the literature of bacteriology. These new species are *Bacterium saponificans*, *B. adipis*, *B. rufum*, *Bacillus gravidus*, *B. submergens*, *B. exilis*, *B. cerasinus*, *B. parabutyricus*, and *B. indolicus*."

Production of a nutritive beverage from skim milk, R. EICHLOFF (*German Patent 280,446, June 14, 1913; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 9, p. 507*).—"The milk is heated with an acid, e. g., hydrochloric acid, to sterilize it and invert the lactose, and is then submitted to the simultaneous action of peptonizing enzyms and fermentation organisms; for example, trypsin and yeast. The fermented liquid is sterilized by heat, filtered, and evaporated to the desired consistence."

VETERINARY MEDICINE.

[Report of the veterinary department], J. W. CONNAWAY ET AL. (*Missouri Sta. Bul. 131 (1914), pp. 486–488*).—*Study of contagious abortion.*—The complement fixation test was found to be a very reliable method for detecting animals infected with the *Bacillus abortus*, confirming results obtained at other experiment stations. In old infected herds the percentage of reactors varied from 60 to 90 per cent. With the methylene blue treatment, judging from the reports sent in by owners of herds under experiment, good results are being obtained. "In one herd where the loss from abortion in heifers carrying first calf averaged 58 per cent during the preceding two years the loss was reduced to 28 per cent—apparently from the methylene blue treatment."

Tuberculosis of cattle and swine—transmission of same.—Post-mortem examinations made during the past year indicated that tuberculosis is not so easily transmitted from sows to their offspring as from cows to calves and cows to pigs. This is probably due to the destruction or mitigation of the virulence of the tubercle bacilli in infected swine by the prolific fat production of that animal. This may throw some light on the question of the value of fat-producing foods in treating tuberculosis in man.

A study of internal parasites of swine and the efficiency of various vermifuges.—The condition of the infested animal is not deemed a reliable guide to the extent of parasitic infestation. "The diagnosis in some animals is readily made by noting the passage of worms. In others the presence of worms was detected only by finding ova in the feces by microscopic examination; and in other hogs, but slightly infested, the presence of worms was detected only by post-mortem examinations. When worms were present in large numbers, all the recognized vermifuges were effective in expelling the greater number of the parasites, but nearly all the 'remedies' failed to expel all the worms. The most effective vermifuges tried in the experiments were turpentine, iron sulphate, copper sulphate, santonin, tobacco, and areca nut. Copper sulphate was found to be the most efficient in expelling the thorn-headed worm. Each experimental animal was kept in a separate pen during the experiment and was slaughtered to determine the efficiency of the vermifuge administered."

Experiments on complement fixation—hog cholera.—The blood sera of swine were found hemolytic for the red blood cells of one experimental horse, one goat, and two cows, but not for a third cow (No. 3) which was a reactor to tuberculin. "Hemolysis occurred whether the blood serum used was from normal hogs susceptible to cholera, hogs affected with acute cholera, or from hogs hyperimmunized to cholera.

"In the attempts to prepare an 'antigen,' extracts were made from the blood of six pigs suffering from the acute hemorrhagic type of cholera; six alcoholic extracts and six extracts with normal saline solution were used. The alcoholic extracts prevented hemolysis, but check experiments showed this to be due to the alcohol and not to an 'antigenic content' of the blood. The normal saline extracts, from blood, also failed to show the presence of a deviating antigen."

Separate saline extracts made from the spleen of six virus pigs failed to prevent hemolysis. Saline extract prepared from the spleen of virus pigs gave a distinct deviation with the erythrocytes of cow No. 3 and with the blood serum of a hog hyperimmunized to both the filterable virus and *B. suipestifer*. In quantities of 0.01 to 0.02 cc. of the spleen extract negative results were obtained from the sera from other immune hogs and from hogs suffering with acute cholera. The positive deviation obtained with the serum of the hyperimmunized hog might have been caused by the *B. suipestifer* antigen and not by the filterable virus antigen. "Some further tests are to be made with the serum from this hog and cultures of *B. suipestifer*. Extracts from kidneys of 'virus pigs' failed to show any 'deviating content.'"

Studies from the Rockefeller Institute for Medical Research (*Studies Rockefeller Inst. Med. Research, 20 (1915), pp. 591, pls. 32, figs. 25*).—Reprints of papers on work done at the Rockefeller Institute or under grants therefrom. The topics dealt with are pathology and bacteriology, physiology and pharmacology, chemistry, experimental biology, and contributions from the Hospital of the Rockefeller Institute.

Some diseases, whose etiology is unknown, discussed in the light of the vitamin theory, R. REINHARDT (*Berlin. Tierärztl. Wchnschr., 30 (1914), Nos. 37, pp. 645–647; 38, pp. 657–661*).—Amongst the diseases discussed are polyneuritis gallinarum, trembles in sheep, and paralysis of the vestibular nerve in pigeons. See also a previous note by Funk (E. S. R., 32, p. 578).

Some important animal parasites affecting Ohio live stock, D. C. MOTE (*Ohio Sta. Bul. 280 (1914), pp. 23–52, figs. 21*).—This introduction to the subject calls attention to some of the animal parasites prevalent in Ohio and control measures therefor. A bibliography of 17 titles relating to the subject is included.

A revised check list of the animal parasites of domesticated animals in India, S. H. GAIGER (*Jour. Compar. Path. and Ther., 28 (1915), No. 1, pp. 67–76*).—A revision of a check list previously noted (E. S. R., 22, p. 791).

Abderhalden's protective ferments, C. BRAHM (*Ztschr. Angew. Chem., 27 (1914), No. 60, Aufsatzteil, pp. 464–466*).—A discussion of the different protective ferments and their value for diagnosing disease.

About the nature of the meiostagmin reaction with malignant tumors, G. IZAR (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 301–308*).—The author concludes that the sera from subjects affected with malignant growths have a lesser surface tension reducing power in enveloping certain fatty acids than the sera from normal subjects. A number of facts elicited seem to point to the belief that this is dependent upon the increased content in the tumor sera of lipoids or lipoid-fixing substances.

Abderhalden's reaction and its relation to the presence of antithrombin in the blood, H. DE WAELE (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 83–90*).—The injection of a hydrolyzate consisting chiefly of peptones and amino acids yielded defensive ferments for the proteins from which the peptones and amino acids were obtained. Proteins administered per os also stimulated the development of protective ferments. Abderhalden's reaction apparently stands in exact relationship to the antithrombin phase. The nature of the relationship will be considered in a future communication.

Preparation and standardization of vaccines, antitoxins, and serum, C. P. FITCH (*Cornell Vet., 4 (1915), No. 4, pp. 171–183*).—A general discussion of the topic.

The pharmacological action of some serum preservatives, C. VOEGTLIN (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 96 (1914), pp. 87–119, pls. 2, figs. 13*).—The effect on animals of normal serum free of preservative and containing trikresol (0.1, 0.25, 0.3, and 0.5 per cent) phenol serum (0.1, 0.25, and 0.5 per cent), formaldehyde serum (1 : 1,000) and chloroform serum (saturated) was studied.

"From the experiments described it would seem that chloroform when added to serum, even to the point of saturation, is not capable of imparting to the serum a degree of toxicity which could be compared with that obtained on mixing serum with phenol and trikresol (0.25 and 0.5 per cent). Practically the only effect which could be produced by the subdural injection of chloroform serum is the result of an increase in intracranial tension. With the use of the gravity method such results are not very apt to follow and it seems very doubtful that they occur at all. We, therefore, strongly suggest that chloroform be used as a preservative for antimeningitis serum. It is well recognized that serum preserved with chloroform after long standing will show a cloudiness which is probably due to the partial precipitation of the serum proteins. This fact, however, does not alter the efficiency of such a serum in the treatment of the disease."

The gravity method is given preference over the syringe method.

Studies on complement action; with special reference to the fractioning of complement by means of ammonium sulphate, C. H. BROWNING and T. J. MACKIE (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 422–446*).—In these experiments the hemolytic complement of guinea pigs was fractionated with ammonium sulphate.

In the fractionation of complete serum the pseudoglobulin fraction was found in some cases to contain the entire complement, whereas in others it was necessary to add albumin to develop the complement action of the native serum. Albumin and euglobulin when used together added some complement action, but when used separately no action whatever. In the fractionation of the middle and end portion by ammonium sulphate the entire euglobulin and a little pseudoglobulin were found in the middle portion. The end portion contained the entire albumin and the greater amount of pseudoglobulin. The pseudoglobulin was divided into two fractions, one of which was inactive but when mixed with its other component exerted a stronger complement action. The various globulin fractions possessed in varying amounts the activity of the third component (Ritz's). The albumin of guinea-pig serum was inert.

In the article the various theories on the constitution of the complement are discussed, and the earlier view of the authors in this connection, viz, that complement action is a complicated process, is considered correct. Serum-silicic acid hemolysis is deemed dependent upon the hemolytic complement of the serum. Definite parallelism exists between the toxic action of various sera and blood corpuscles sensitized with immune bodies, or silicated. Treatment of a mixture of serum and silicic acid with carbon dioxid yields a precipitate which contains the entire cobra venom inactivating powers possessed by the serum.

The fraction (precipitate) when tested against blood loaded with immune bodies indicates the presence of only the middle portion.

The hemolysis stimulating action of serum on mixtures of various di- and tri-phenylmethane coloring matters, brilliant green, etc., is not dependent upon complement.

Dialysis of native sera against hydrant water and dialysis of the serum remaining after precipitation with ammonium sulphate results in a decrease in deviability of complement without affecting the hemolytic powers of the serum. This is said to indicate that hemolytic power and deviability are two different functions of complement-holding serum. Frozen complement retains its hemolytic titer and deviability for many weeks.

The method is effective for obtaining standard complement.

Investigations of the nature of anaplasms, E. C. DIAS and H. DE B. ARAGÃO (*Mem. Inst. Oswaldo Cruz, 6 (1914), No. 3, pp. 231–249, pls. 2*).—The authors' investigations led them to conclude that the Anaplasma are not protozoans, but products of degeneration of erythrocytes. What has been described by Theiler as anaplasmosis is considered by the authors a clinical form of piroplasmosis. The anaplasmosis of mammals is ascribed to different causes.

A bibliography of 37 titles is included.

The status of bacilli from fish meal which give a positive Ascoli reaction, M. ZINGLE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 2, pp. 131–134, fig. 1*).—The growth in bouillon and negative results with experimental animals led the author to conclude that the organism in the fish meal examined was the pseudoanthrax bacillus, notwithstanding its close relation to the anthrax bacillus as indicated serologically. The conclusions agree with those of Pfeiler and Drescher (E. S. R., 30, p. 682).

Investigations of foot-and-mouth disease, LOEFFLER (*Amer. Jour. Vet. Med., 10 (1915), No. 6, pp. 381–388, 410, 428, 429, figs. 2*).—This is a general discussion with a review of recent work.

Foot-and-mouth disease, its nature, cause, and treatment, compiled by J. C. SMITH (*Saskatchewan Dept. Agr., Live Stock Branch [Pamphlet], 1915, Apr., pp. 7, figs. 2*).—A popular account.

An improved method for the detection of mange acari, A. L. SHEATHER (*Jour. Compar. Path. and Ther., 28 (1915), No. 1, pp. 64–66*).—The method here described is based upon the maceration of acari through boiling in a 10 per cent solution of caustic potash for a period not longer than 10 minutes. The material is then centrifuged, water added, and the sediment examined. It is stated that the method is not destructive to the eggs of mange parasites and that on more than one occasion when acari were not discoverable it has been found possible to arrive at a diagnosis by the detection of eggs.

The relapse in piroplasmosis, M. CARPANO (*Centbl. Bakt. [etc.], 1. Abt., Orig., 74 (1914), No. 5–6, pp. 482–487, figs. 2*).—The author describes a typical case of relapse in the donkey brought about by a decreased resistance.

Piroplasmosis of Rhodesian sheep, as observed by Bevan, C. M. WENYON (*Jour. Compar. Path. and Ther., 28 (1915), No. 1, pp. 60, 61*).—This article relates to a sheep which suffered from a double infection of anaplasmosis and piroplasmosis. Reports by Bevan of the occurrence of piroplasmosis in sheep have been previously noted (E. S. R., 27, p. 482).

Laboratory studies on tetanus, E. FRANCIS (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 95 (1914), pp. 73, figs. 2*).—Studies reported herein were on the conditions surrounding tetanus spores artificially implanted into vaccine virus, the behavior of tetanus spores injected subcutaneously into guinea pigs and white mice, and miscellaneous observations upon tetanus.

Antigenic properties of various strains of East African trypanosomes, C. SCHILLING (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 358–365*).—Old laboratory strains of nagana trypanosomes are, generally speaking, deemed of little value for preparing immune antigen outside of the animal body. Strains obtained in East Africa were found to be inferior antigen stimulators.

The effect of daylight and drying on the human and bovine types of tubercle bacilli, L. FINDLAY and W. B. M. MARTIN (*Brit. Med. Jour., No. 2820 (1915), pp. 110, 111*).—To account for the absence of aerial infection of man by the bovine type of bacillus, the authors sought to determine whether atmospheric influences, especially desiccation and daylight, are more deleterious to the bovine than to the human type. Three different kinds of experiments were made, as follows:

"(1) *Effect of desiccation alone.*—Weighed amounts of cultures, four weeks' growth, were placed in small sterile test tubes, loosely plugged with cotton wool, and kept in a dark, well-ventilated cupboard. Under these circumstances definite desiccation occurred. Emulsions were finally made in salt solution and amounts equivalent to 0.01 mg. of moist culture were injected intravenously into rabbits.

"(2) *Effect of diffuse daylight alone.*—For this purpose cultures, five weeks' growth, sealed with paraffin to conserve water of condensation, were exposed at the window. After desired intervals weighed quantities of growth were removed, emulsified, and injected as before.

"(3) *Effect of diffuse daylight with simultaneous desiccation.*—Weighed quantities of cultures, four weeks' growth, were exposed at the window in small sterile test tubes loosely plugged with cotton wool. Desiccation rapidly occurred. At intervals emulsions were made and injected as before."

The bovine type of bacillus was found to be distinctly more susceptible to the effects of daylight and drying than the human type. This difference between the types may in part explain why aerial infection with the human type is the more frequent.

Histological studies on serous tuberculosis of bovines, E. JOEST and V. MARJANEN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 1, pp. 1–38, pls. 4, figs. 11; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 33, p. 602*).—The authors find that in every case of serous tuberculosis in bovines there are produced nonspecific inflammatory new formations. These later become infected with tubercle bacilli and result in the formation of pearl nodules.

The significance of fowl tuberculosis for the pig, M. CHRISTIANSEN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 6, pp. 323–340*).—The investigation involved the examination of 118 pigs. The pig is considered highly receptive to avain tubercle bacilli, and an infection from this source is noted frequently. Views relative to the determination of avian tuberculosis to swine must accordingly be changed.

Organ tuberculosis in pigs caused by the avian type of tubercle bacillus, M. Christiansen (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 4, pp. 264–274, figs. 2*).—The new investigations have confirmed those reported above, inasmuch as avian types of tubercle bacilli were noted in the organs having a typical appearance. Giant cells were noted in the tuberculous processes. According to this, the finding of giant cells does not indicate that the tuberculosis is not caused by the avian type of bacillus. They were found in all mesenteric tuberculous processes, and in every case they were of the avian type.

The iodin content of tuberculous tissues, P. A. Lewis and R. B. Krauss (*Jour. Biol. Chem., 18 (1914), No. 2. pp. 313–317*).—"Tuberculous tissue derived from animals to which no iodin preparation has been knowingly administered may contain amounts of iodin very appreciably higher than normal control tissue of the same animal. While it is quite probable that tuberculous tissue in animals treated with iodin products may store up iodin, this has been by no means clearly shown in any experiments so far reported. The highest figures for the tuberculous tissue of untreated animals in our experience may equal the highest figures of those reported by others as evidence for the localization in the tissue of iodin intentionally administered."

A note on the use of purified antigen of Besredka in the serum diagnosis of tuberculosis, J. Bronfenbrenner and J. Rockman (*Biochem. Bul., 3 (1914), No. 11–12, pp. 375, 376*).—In some previous work it was found that when Besredka tuberculin was used as antigen seemingly specific results were obtained with the sera of tuberculous subjects by the complement fixation test. The fact that the antigen contains lipins (derived from the culture medium) allowed the possibility, however, that certain nontuberculous sera having lipotropic properties might fix complement with this antigen. In a large series of experiments in which the Besredka tuberculin was deprived of its lipins by means of extraction with ether in a separatory funnel it was proved that the lipins have no antigenic value in the complement fixation test. The relations of the constituents, such as proteins, etc., of the tuberculin to the antigenic properties are being studied in this connection.

On the value of a new skin test for diagnosis of tuberculosis, J. Bronfenbrenner (*Abs. in Science, n. ser., 39 (1914), No. 1013, pp. 803, 804*).—"Subcutaneous injection of 0.55 cc. of a mixture of fresh blood of patients suffering from tuberculosis (1 cc.) with tuberculin (crude diluted 1:10, 0.1 cc.) into a normal guinea pig causes a local reaction, similar in its aspect to a tuberculin reaction, which is of good prognostic value in diagnosis of tuberculosis."

The behavior of tuberculin in the tuberculous and nontuberculous organisms, W. G. Ruppel and K. Joseph (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 277–295*).—It was found that dead, intact, or rubbed up tubercle bacilli when given intravenously to guinea pigs and to rabbits do not excite the symptoms of an acute intoxication. The chronic symptoms which result after giving normal guinea pigs killed tubercle bacilli may simply be caused by introducing foreign bodies and bringing about anatomical changes.

Aqueous extracts made from disintegrated tubercle bacilli when given subcutaneously to tuberculous guinea pigs produce a fall of temperature and are lethal in amounts of 0.0005 gm. Smaller doses of the soluble poison produce first a rise and then a fall in temperature. In healthy animals the poison extracted by water from tubercle bacilli produces a rise in temperature, and only with large amounts (0.025 gm. of soluble dry substance) is a fall of temperature with subsequent death observed. The lethal dose for healthy animals is 500 times greater than that for tuberculous animals.

The germ-free filtrates from tubercle bacilli bouillon cultures do not contain substances toxic for normal guinea pigs, these originating from the metabolic processes of the bacillus. Pure glycerol was found to kill normal guinea pigs in doses of 4 cc., but its toxicity can be markedly increased by an addition of nontoxic amounts of soluble tubercle bacillary substances. One gm. nucleic acid from tubercle bacilli (tuberculinic acid) contains 400 normal doses for tuberculous guinea pigs, but only 4 lethal doses for healthy guinea pigs, and 0.025 gm. of thymus nucleic acid is lethal for a healthy or tuberculous guinea pig. The specific breadth, that is, the relation of the lethal amounts of poison in 1 gm. of substance for 1 gm. of live weight of a tuberculous subject to the amount of poison necessary to kill 1 gm. of a healthy guinea pig, is for tuberculinic acid 100, whereas for thymus nucleic acid it is —1.

It is believed that the method for testing tuberculin on guinea pigs in use at the present time should be retained. The tubercle bacilli poison can not be regarded as a true bacterial toxin because it does not yield antitoxin nor specific amboceptor in normal animals. In tuberculous animals, however, it produces normal precipitins and specific amboceptors. It seems, therefore, that in the tubercle bacilli there are present two different antigens, one which induces the formation of precipitins and the other specific amboceptors. By treating tubercle bacilli with silicic acid it is possible to separate the precipitinogen from the specific toxin.

Tuberculosis protective vaccination with antiphymatol, T. KRAUTSTRUNK (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 14 (1913), No. 6, pp. 366–382*).—The Klimmer method was tested in three establishments. Autopsies were made on 55 animals, 21 of which were protectively vaccinated, 10 curatively treated, and 24 served as controls.

Nine of the protectively vaccinated animals were found tuberculous, 2 animals receiving curative treatment after 3½ years had open tuberculosis, and 1 animal receiving a second injection of antiphymatol had udder tuberculosis. The substance is considered of no value as a protective or curative agent.

The tuberculosis problem in rural communities, S. A. KNOPF (*Pub. Health Rpts. [U. S.], Reprint 243 (1914), pp. 11*).—The author believes that because of lack of knowledge and of the enforcement of well-known methods of prevention it is difficult to control the spread of tuberculosis among persons in rural communities. He suggests that there is need of a campaign of education to be followed by a more vigorous control of those afflicted with the disease.

Contribution to the serodiagnosis of infectious abortion in bovines, A. KLOUBOK (*Österr. Wchnschr. Tierheilk., 1914, pp. 133, 139; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 43, p. 721*).—This is a study of the agglutination and complement fixation tests as regards their value for diagnosing infectious abortion in bovines, 8 animals from a healthy establishment and 145 animals located in 8 infected barns being used.

Both tests were found valuable for this kind of work, but on account of its simplicity the agglutination test is preferred. A positive test indicates that the animal is infected with *Bacillus abortus*, but not as to whether a specific infection of the uterus has taken place. It also will not determine whether abortion will take place, as pregnant, positive-reacting animals have gone on to full term.

A note on Syngamus laryngeus from cattle in the Philippine Islands, M. C. HALL (*Amer. Jour. Vet. Med., 10 (1915), No. 6, pp. 395, 396, figs. 3*).—This nematode, previously known from Annam only, is here recorded from the cow and the carabao in the vicinity of Manila. Aside from the irritation at the point of attachment, no pathological condition results from its presence.

Hog cholera and paratyphoid of pigs, H. Miessner (*Deut. Tierärztl. Wchnschr., 22 (1914), No. 5, pp. 70–73*).—A criticism of a circular sent out by a commercial concern to the veterinary profession in regard to vaccination against shoat typhoid. Shoat typhoid is not considered a separate entity, but must be regarded as paratyphoid of pigs caused by the paratyphoid B bacillus. The name shoat typhoid is not deemed well chosen. A chart issued by the concern gives a differential diagnosis between shoat typhoid and hog cholera.

What is hog cholera? F. Hutyra (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 5, pp. 338–340*).—A criticism of the nomenclature suggested for hog cholera, etc., by Schern and Stange (E. S. R., 33, p. 182).

Remarks on the hog cholera question, E. Joest (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 6, pp. 427–441*).—The present conception of hog cholera is said to comprise two etiologically different diseases, viz. one caused by the filterable virus and the other by bacteria of the typhoid coli group (*Bacillus suipestifer*, *B. voldagsen*, *B. typhi suis*, etc.). To this can also be added a third condition caused by the filterable virus and bacteria, viz, mixed infection.

The names shoat typhoid and paratyphoid are not thought to be well chosen, a more appropriate term seeming to be bacillary hog cholera. The name parapest, suggested by Schern and Stange (E. S. R., 33, p. 182), should also receive due consideration. Hog cholera in the unrestricted sense may be classified into two groups: (1) Virus pest and pest (mixed infection), and (2) bacillary hog cholera (parapest). Group 1 comprises hog cholera in the restricted sense. The hog cholera usually met with in Germany is probably a mixed infection.

Much difficulty is experienced when attempting to classify hog cholera on the basis of the patho-anatomical findings. Hog cholera appears clinically and pathologically as a hemorrhagic septicemia, especially when the filterable virus is virulent and has the upper hand. In Germany hog cholera patho-anatomically considered is very severe in nature, and is characterized by inflammation and necrotic changes in the intestinal canal, especially in the large intestine. Septicemic-hemorrhagic manifestations are often absent, especially when the disease is chronic in course, or they are in a minority when compared with the other intestinal changes.

Doubt is expressed as to whether hog cholera, considered in the restricted sense, and parapest (shoat typhoid) can be differentiated on the basis of the patho-anatomical findings. Shoat typhoid usually runs a chronic course, while hog cholera is chiefly an acute condition. According to the author's experience the necrotic processes in chronic hog cholera (restricted sense) seems to lie in the solitary lymph glands of the intestinal mucosa, whereas in the bacillary disease (shoat typhoid) the changes are often diffuse. Button formation is by no means a regular thing in hog cholera. In chronic hog cholera the necrosis plays a part. The wall surrounding the intestinal lesions, said to be characteristic of shoat typhoid, is also found around the typical necrosed areas undergoing a process of healing in hog cholera.

Immunization against erysipelas in hogs especially with killed cultures and bacterial extracts, K. Burgkart (*Abs. in Berlin. Tierärztl. Wchnschr., 31 (1915), No. 4, pp. 41, 42*).—The purpose of this work was to determine whether immunization could be made with either killed bacteria or bacterial extract. The tests were carried out with gray mice, rabbits, horses, bovines, and a sheep, pig, and goat. Although agglutinin production was noted no satisfactory protective serum could be elaborated.

Filariasis in native horses, D. Wirth (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), No. 2–3, pp. 161–174, pl. 1; 12 (1912), No. 3, pp. 295–298; 15 (1914), No. 2, pp. 135–138*).—The first two papers report upon four cases under observation and a like number are dealt with in the third.

The use of neosalvarsan, J. FÜRI (*Állatorvosi Lapok, 37 (1914), No. 27, pp. 321–323; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 47, p. 769*).—Neosalvarsan was employed for influenza in horses with good results. The substance can be suspended in glycerin, or, in what is still better, from 10 to 20 cc. of physiological salt solution for injections. This chemotherapeutic agent is also recommended for treating emaciated horses or those affected with acne.

RURAL ENGINEERING.

Irrigation and soil conditions in the Sierra Nevada foothills, California, R. D. ROBERTSON and J. W. NELSON (*California Sta. Bul. 253 (1915), pp. 325–378, pl. 1, figs. 26*).—This report is based on work done under cooperative agreements between the Office of Experiment Stations, the state department of engineering, and the station. Its purpose "is to show the present status and the possibilities of irrigation in the foothills along the western slope of the Sierra Nevada, California, to describe in general the soils of this region, and to discuss the adaptation of these soils to various crops."

The area dealt with is about 5,000,000 acres, the topography consisting of deeply dissected canyons, rugged, rocky ridges, slopes, rounded hills of gentle to moderate contour, and small, narrow, winding valleys. The soils of the region are chiefly of granitic and metamorphic origin. They are relatively high in iron and are prevailingly red in color, although areas of gray, brown, and black occur. The prevailing textures are those of loams and clay loams. The soils generally have a friable, mealy texture when damp, are tilled without difficulty, and are said to be particularly adapted to the growing of fruit. Their humus content is relatively low, but usually increases with the elevation. "The topography and drainage of the foothills are not favorable in most places for the development of a high-water table or for the accumulation of alkali. . . . The abundance and thrift of native vegetation over the entire belt is a fair indication of the depth, fertility, and moisture-retaining properties of the soil."

Water for irrigation is said to be available for much of the land from numerous streams and reservoirs. The principal rivers furnishing water for irrigation from south to north are as follows: "Above San Joaquin Valley—Kern, Tule, Kaweah, Kings, San Joaquin, Merced, Tuolumne, Stanislaus, Calaveras, Mokelumne, and Cosumnes rivers; above Sacramento Valley—American, Bear, Yuba, Feather, and Sacramento rivers. Throughout the Sierra foothills there are numerous springs which may be made to yield a large revenue if the flow from them is stored in small reservoirs. . . . Only storage works are needed to conserve large volumes now running to waste to make this belt of elevated land one of the most important agricultural districts in California."

It is stated that the principal irrigation developments of the foothill region are found in the Tulare and Fresno counties citrus belt, in the Placer County deciduous fruit belt, and in the vicinity of Oroville in Butte County. Irrigation conditions in these localities are described more or less in detail.

[Irrigation experiments on the Koppenhof experimental field], G. RICHTER (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, pp. 46, 47*).—Irrigation on a light sandy soil was accompanied by profitable increases in the yield of potatoes, winter rye, and oats with reference to the cost of irrigation. Complete fertilization of the potatoes without irrigation was accompanied by the same increase in yield as irrigation without complete fertilization. The increase in winter rye was profitable only with heavy irrigations of 240 mm. (9.5 in.). Frequent harrowing of the rye was found a decided advantage. advantage.

[Irrigation experiments on the Bromberg experimental field], G. RICHTER (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, pp. 39–43*).—Irrigation by spraying amounting to 130 mm. (5.1 in.), extending from April 1 to June 30, plus 120 mm. of rain was accompanied by a decided increase in the crop of winter rye. An irrigation of 180 mm. only slightly increased the yield further. One hundred and ten mm. and 290 mm. of spray irrigation plus 403 mm. of rain water were accompanied by a decided but unprofitable increase in the yield of hay on sandy soil. The root development was also decidedly increased.

The results with beans on a sandy soil using 125 mm. of irrigation were not profitable, but the increase accompanying an irrigation of 165 mm. was quite profitable. Negative results accompanied the irrigation of white and red cabbage on sandy soil and of red beets on heavy soil. Tomatoes on sandy soil burst and rotted badly on account of an abnormal rainy period, especially on the irrigated plats. In spite of this the profit due to increase of crop accompanying irrigation was marked. An excellent profit was obtained by the irrigation of fruit bushes and trees on sandy soil using 70 mm. and 150 mm. of irrigation plus 120 mm. of rain. Profitable results accompanying irrigation were obtained with sugar beets on a heavy soil in only two out of four cases, but irrigation was quite profitable with carrots on this soil with 40 mm. and 50 mm. of irrigation plus 400 mm. of rainfall from May 1 to September 30. An irrigation of 110 mm. slightly increased this profit.

The water economy of the soil, G. Richter (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg, 1913, pp. 43–45*).—In studies of the influence of cultivation on the water economy of light sandy soil it was found that harrowing five times immediately after rains was accompanied by a marked increase in the yield of corn. Irrigation increased the water content of both the surface soil and subsoil of grass land, but the water content of the subsoil decreased with the depth and with the amount of living and dead root matter. The water content of meadow and barley soils even when unirrigated was greater than that of grass and rye land, indicating, it is thought, that rye and grass possess a greater ability to utilize the water. Plowing and harrowing of the rye soil after harvesting followed by fallowing increased the water content of the surface soil about 2.1 per cent by weight, but did not affect that of the subsoil.

Studies in water supply, A. C. Houston (*London: Macmillan & Co., Ltd., 1913, pp. XII+203, pl. 1, figs. 42*).—The contents of this monograph have been previously noted (E. S. R., 31, p. 416).

River discharge, J. C. Hoyt and N. C. Grover (*New York: John Wiley & Sons, 1914, 3. ed. rev. and enl., pp. XII+182, pls. 10, figs. 38*).—This is the third edition of this book (E. S. R., 29, p. 487), and has been further expanded to present the latest information on the subject.

Surface water supply of the Yukon-Tanana region, Alaska, 1907 to 1912, C. E. Ellsworth and R. W. Davenport (*U. S. Geol. Survey, Water-Supply Paper 342 (1915), pp. 343, pls. 13, figs. 5*).—This report gives a detailed summary of the water-supply studies in the Yukon-Tanana region since 1907, these having been discontinued indefinitely. The work of 1907 and 1908 has been previously noted (E. S. R., 21, p. 309).

The physical and climatic features of the region are first described, followed by descriptions of stream basins and the results of measurements of flow therein. It is stated, among other things, in conclusion that the stream flow in the region is generally unfavorable for hydraulic development. "The conditions of the Yukon-Tanana region are particularly unfavorable for the development of water power. The combinations of low minimum run-off without natural storage or favorable means of developing artificial storage, of low and uniform stream grades, of short seasons, and of variable market make the use of water power a last resort."

Report on the surface water supply of New Mexico, 1913, J. A. French (*Santa Fe, N. Mex.: State Engin. Dept., 1913, pp. 216, pls. 5*).—This report covers floods in the Chico Rico Creek basin in June, 1913; Cimarron River basin in June, 1913; Mora River and Sapello Creek drainage basins in 1913; and Rio de Arena and Cameron Creek drainage basins in August, 1913. It also gives miscellaneous measurements in the Canadian and Gila River basins, seepage investigations of the Rio Grande, and evaporation data.

The inverted weir, E. W. Rettger (*Engin. News, 73 (1915), No. 2, pp. 72, 73, figs. 4*).—The author in dealing with special properties of certain weir forms when used inverted calls attention especially to the proportional-flow inverted weir. See also a previous note (E. S. R., 31, p. 784).

Report upon the Cypress Creek drainage district, Desha and Chicot counties, Arkansas, S. H. McCrory, O. G. Baxter, D. L. Yarnell, L. A. Jones, and W. J. Schlick (*U. S. Dept. Agr. Bul. 198 (1915), pp. 20, pls. 4, figs. 2*).—This drainage project, the survey for which was completed in March, 1912, embraces a district in southeastern Arkansas having an area of 466 square miles and classed as Mississippi bottom land. The topsoil generally is the ordinary Mississippi alluvium, more or less modified by decayed vegetation.

"The water from which the district must be protected comes from two sources—first, direct precipitation upon the watershed in which the district lies, and, second, overflow from the Mississippi River, whose backwater enters the district through the gap in the levees at the mouth of Cypress Creek, damaging not only the district itself but a large area in Chicot County, Ark., and northern Louisiana, since such water, once behind the Mississippi River levee, must flow south to the Red River. The drainage problem, then, is not only to provide the necessary outlets and laterals to care for the run-off from the 658 square miles tributary to that district but so to design and locate these outlets that the drainage water now entering the Mississippi River through the levee gap will be diverted, thus making it possible to close this gap."

From run-off observations made in this and similar districts, the following formula of the Fanning type was deduced for use in calculating run-off in this project: $R=\frac{35}{\sqrt[6]{M}}$. R=the run-off in second-feet per square mile and M=the area of watershed in square miles.

The proposed improvement includes 421.72 miles of ditches, the total cost of construction of which is estimated at $2,207,493, or $7.49 per benefited acre.

Excavating plant for heavy drainage work in Arkansas (*Engin. Rec., 71 (1915), No. 2, p. 41, fig. 1*).—This article deals with the type and dimensions of machinery adapted to channel and levee construction in timbered alluvium. The floating dipper dredge is preferred for this work.

The economy of farm drainage, R. D. Marsden (*U. S. Dept. Agr. Yearbook 1914, pp. 245–256, pls. 4*).—In this article a brief discussion of the beneficial effects of land drainage and of surface and subsurface drains and their adaptations is followed by a more detailed discussion of the economic phases of the subject.

The cost of drainage is shown to be a factor varying not only with location, owing to differences in the cost of tile and labor, but with the nature of the soil and with the consequent depth and spacing of drains. It is stated that in considering the economy of farm drainage it is proper first to compare the anticipated results with the probable returns from otherwise investing the money that the drainage work will cost.

Proper planning of drainage projects is considered essential. "To determine the most economical plan of drainage usually requires engineering judgment of no mean order and a thorough knowledge of the drainage properties of soils.

One not experienced in this kind of work should not take the responsibility of planning any considerable expenditure for drainage. . . . Construction work should be carefully done, under the supervision of some one at least qualified to see that the tile are laid according to the grades established by the engineer who planned the work. . . . The fertility of the soil should be assured before drainage is planned and if any element of plant food is lacking the cost of supplying it must be reckoned."

Clean water and how to get it on the farm, R. W. Trullinger (*U. S. Dept. Agr. Yearbook 1914, pp. 139–156, pls. 3, figs. 4*).—This article discusses the sanitary aspects of farm water supplies, illustrates good and bad well and spring surroundings, gives information regarding the protection of farm water supplies from contamination, and describes convenient methods for obtaining running water in the house. A report by the author dealing in part with the same subject has been previously noted (E. S. R., 30, p. 690).

Annual report on highway improvement, Ontario, 1913, W. A. McLean (*Ann. Rpt. Highway Imp. Ont., 1913, pp. 62, figs. 24*).—This report deals with model and experimental roads, road models, road machinery, specifications for road machinery, concrete roads, and pavements in Ontario, and township road administration.

As regards grading machines, it is stated that they are of greatest value in purely agricultural districts, working constantly in uniform clay, loam, and sandy soils. Steam rollers are considered a necessity wherever broken-stone roads are being built, 10-ton rollers being the best for ordinary country use. It is stated that traction haulage, displacing horses, for hauls of 2 miles or over shows distinct economy, in some cases reducing by one-half the cost of hauling gravel and stone. The objections presented to concrete as a material for roads are that the surface is too hard to give a proper foothold for horses, it is rigid and hard on their feet, it reflects heat, it has an unpleasant glare, it is brittle, expansion joints chip at the angles and under constant traffic deepen to holes, and cracks are unavoidable and difficult to repair. On the other hand, concrete for pavements is said to be low in first cost as compared with other high-class pavements, and is one of the cheapest materials yet available for a permanent pavement or roadway.

The present concrete road practice in Ontario is said to favor one-course construction, rich in cement, coupled with careful drainage of the subsoil.

Traffic factors, J. Eastwood (*Surveyor, 46 (1914), No. 1185, pp. 408–412*).—The author deals with the conditions influencing the value of coefficients of potential damaging effect under English conditions and reports a traffic census on two roads, from the results of which he proposes factors for certain classes of traffic for both macadam and paved roads as shown in the following table:

Proposed traffic factors.

Kind of traffic.	Macadamized roads.		York stone paving.		Granite.	
	Level.	Steep.	Level.	Steep.	Level.	Steep.
Led or ridden horses	1	2	½	1	¼	½
Single-horse vehicles (light)	2	4	1	1¾	½	¾
Single-horse vehicles (heavy)	4	6	2	3	¾	1¼
Two-horse vehicles (light)	4	6	2	3	¾	1¼
Two-horse vehicles (heavy)	6	9	3	4½	1	1¾
Three-horse vehicles	7	12	3½	5½	1½	2¼
Four-or-more-horse vehicles	9	15	4⅓	6½	2	3
Motor cycles	½	½	⅛	⅛	0	0
Motor cars	8	8	1½	1½	½	½
Motor wagons (rubber tires)	12	12	2	2	1	1
Motor wagons (steel tires)	20	20	20	20	20	20

Relation of road maintenance to traffic, W. D. Sohier (*Eng'n. Rec., 70 (1914), No. 22, pp. 582–584*).—Studies of traffic and repair on Massachusetts highways with reference to the influence of volume, weight of units, relative number of rubber and steel tired vehicles, and cost of maintenance are reported.

The largest cost of upkeep on macadam roads in Massachusetts is said to be due to heavy automobile travel and heavy hauling on narrow tires. Traffic values of gravel and water-bound macadam roads are given in the following table:

Traffic values of gravel and water-bound macadam roads.

Conditions of traffic.	Average daily traffic.			
	Light teams, carriages, wagons.	Heavy teams, one-horse.	Heavy teams, two or more horses.	Automobiles.
A good gravel road will wear reasonably well and be economical with.	50–75	25–30	10–15	50–75.
It needs to be oiled with	50–75	25–30	10–15	Over 75.
Oiled gravel, fairly good heavy cold oil ½ gal. per square yard, applied annually, satisfactory with.	75–100	30–50	20	500–700 or more.
Water-bound macadam will stand with	175–200	175-200	60–80	Not over 50 at high speed.
Cold oil or tar will prove serviceable on such macadam with.	175–200	175–200	60–80	50–500.
Macadam will then stand, but the stone wears, of course, with.	175–200	175–200	60–80	500 or more.
Water-bound macadam with hot asphaltic oil blanket will be economical with.	100–150	50–75	25–30	1,500 and more with fewer teams.
Do., will stand at least	....	....	....	50 trucks.
Do., will crumble and perhaps fail with more than (on narrow tires, ice, farm, and wood teams, etc.).	150	75	30	
Water-bound macadam with a good surface coating of tar (½ gal. per square yard recoated annually with ¼ gal. of tar per square yard) will stand with.	100–150	50–75	25–30	1,500 or more.

Notes on the selection of pavements for heavy-traffic roads, H. G. Shirley (*Engin. and Contract., 42 (1914), No. 24, pp. 537, 538*).—An outline of the factors involved in the selection of pavements for use on country roads subjected to heavy traffic, including excessive loads hauled by tractors, is given.

It is stated that before selecting the type of pavement to be used a more or less accurate census of the different kinds of traffic should be taken and an estimate made as to the possible increase or decrease of the different kinds. The following criterion for the selection of the type of pavement is suggested: "Where the annual cost of maintenance of a less durable type of road surfacing will exceed the annual cost of maintenance of a more durable type of surfacing, plus 4 per cent on the excess cost of the more durable type over the less durable type, the more durable type should be used, and vice versa."

State management of public roads, its development and trend, J. E. Pennybacker (*U. S. Dept. Agr. Yearbook 1914, pp. 211–226, pls. 2, figs. 3*).—In this article, dealing mainly with economic phases of the subject, it is stated, with reference to the progress of state road management, that forty-two States have thus far established highway departments for educational or administrative work, and of these thirty have made actual appropriations in aid of road construction or maintenance. "In all, $208,000,000 had been appropriated from state funds between 1891 and January 1, 1915, for construction, maintenance, administration, and educational road work, and a total of about 31,000 miles of improved roads is the evidence to show that this expenditure was not in vain. These roads were built for the most part as a joint state and local undertaking, so that a large local outlay not included in the state total was involved. . . .

"The systems of road management now prevailing in the various States may be grouped in six general classes. The first class comprises those States in which the construction of all roads is more or less under state control. In the second class are comprised those States in which state control of road construction is limited to those roads on which state funds are expended. In the third class are included the States which grant aid in the form of state funds, but allow the expenditure to be made under local control. In the fourth class are those States which have established highway departments for educational and advisory work. The fifth class is composed of the States which devote the labor of state convicts to road improvement, and the sixth class comprises those States in which the control of all road construction is entirely local. . . .

"Summarized briefly, the essentials to successful state highway administration, as demonstrated by the experience of the various state highway departments, are as follows: (1) The elimination of politics as a factor in state highway work, (2) the control by the state highway department of all work on which state funds are expended, (3) adequate appropriations for continuous maintenance of highways under efficient supervision from the day the highways are completed, and (4) state supervision as to surveys, plans and specifications of roads and bridges constructed under bond issue, and supervision of such other road and bridge work as requires considerable cash outlay and the exercise of engineering skill and knowledge."

Standard concrete culverts recommended by the Michigan Highway Department (*Engin. and Contract., 43 (1915), No. 2, p. 44, fig. 1*).—Tables and diagrams showing the standard type of concrete culvert for spans varying from 6 ft. to 18 ft., as recommended by the Michigan State Highway Department, are given.

Making fences, walls, and hedges, W. H. BUTTERFIELD (*New York: McBride, Nast, & Co., 1914, pp. 66, pls. 8, figs. 17*).—This book deals with the construction of fences, gates, and walls. The text is divided into sections dealing with fences and their construction, walls (stone), and hedges.

Mechanical cultivation in Belgium, P. DIFFLOTH (*Vie Agr. et Rurale, 3 (1914), No. 26, pp. 716–721, figs. 5*).—The actual experimental data of motor-plow tests previously noted by De Chassart et al. (E. S. R., 31, p. 487) are reported in complete form. The more important results are given in the following table:

Results of mechanical plowing tests.

Kind of machine.	Rated horse-power.	Number of plows.	Average plowing width.	Plowing depth.	Total surface plowed in test.	Volume soil turned per hour.	Fuel consumption in test.		Lubricating oil consumed in test.
							Essence.	Coal.	
Steam:			*Meters.*	*Cm.*	*Hectares.*	*Cu. met.*	*Liters.*	*Kg.*	*Liters.*
Tractor	40	8	2.80	17.0	11.3479	1,292.0		1,325	6.17
Do	55	12	4.25	15.5	13.1195	1,557.0		893	10.75
Internal combustion:									
Cable and tractor	30–35	3	.90	20.0	4.0255	548.0	198.50		10.20
Tractor	55–60	8	2.85	15.5	15.6014	1,566.0	341.00		34.00
Do	40	6	2.20	16.5	9.4113	967.0	191.00		15.67
Do	60	10	3.55	19.0	10.3491	1,224.0	219.99		14.16
Do	15	2	.55	16.0	2.8036	281.0	87.30		10.00
Auto plow	30	7–8		15.0	3.2907	543.0	80.00		2.40
Do	85–105	6		17.0	13.9167	1,483.0	261.07		13.70
Do	42–50	6		18.0	12.4346	1,526.0	272.00		19.44
Scarifier	30		2.00	15.5	3.4116	345.5	132.00		4.18

Results of some experiments made to determine the effect of varying the percentage of water in concrete (*Engin. and Contract., 42 (1914), No. 11, pp. 244–246, figs. 4*).—The results of a series of experiments, using 6-in. cubes and reinforced beams 2 in. by 2 in. by 3 ft. of a 1:2:4 mixture and a water content varying from 20 to 42.5 per cent of the weight of the cement, are reported. The cubes were broken at the end of 7, 30, and 60 days and the beams at the end of 30 and 60 days. The beams were reinforced with two ⅛-in. round rods and designed to carry a load of 274 lbs. placed at the center of the span.

In breaking the cubes the 27.5 per cent of water mixture appeared to be the most desirable as regards strength. A drier mixture than this was noticeably weaker and a slight increase in the amount of water resulted in a decided decrease in strength. In breaking the beams the 27.5 per cent of water mixture also proved the strongest, both at the end of 30 and 60 days. The relative strength of the concrete beams varied as regards the water percentage, and was practically the same as in the cubes of the same consistency.

Tensile tests of mortar briquettes containing 20 oz. of sand and 12 oz. of cement showed that the mixture which gave the maximum strength was a trifle drier, containing 25 per cent of water against 27.5 per cent for the beam and cube tests, but the general relation of consistency to strength was the same.

RURAL ECONOMICS.

The organization of a rural community, T. N. Carver (*U. S. Dept. Agr. Yearbook 1914, pp. 89–138, figs. 2*).—The author presents a plan for the organization of a rural community, intended as a general guide for those interested. He classifies the needs of rural communities which require organization as business needs and social needs. Under each of these he has selected five major needs, for each of which he suggests the appointment of a special committee.

The committees on business interests are those on farm production, marketing, securing farm supplies, farm finance and accounts, and communication and transportation. Those on social interests are on education, sanitation, recreation, beautification, and household economics. There is also a central committee consisting of the officers of organization and the chairmen of the various committees.

Concerning the organization of agricultural enterprises (*Bol. Agr. Téc. y Econ., 6 (1914), Nos. 67, pp. 610–620; 68, 702–712; 69, 818–827; 70, 915–924; 71, 1001–1011; 72, 1097–1107*).—These articles relate to the type of agriculture found in Spain, and suggest reforms to make it more efficient.

Information on rural economy and administrative organization of agriculture (*Brussels: M. Weissenbruch, 1913, pp. 48, pls. 5*).—This report contains a brief description of the various activities of the department of agriculture in Belgium. It relates principally to methods used in improving the live stock, controlling animal diseases, and carrying on educational work in agriculture and home economics and experimental work.

[Winter agricultural work], A. Hofmeister (*Mitt. Deut. Landw. Gesell., 29 (1914), Nos. 47, pp. 637–639; 48, pp. 648–650; 49, pp. 661, 662; 51, pp. 688–691*).—This article indicates methods that may be used to keep the men and women on farms fully employed at profitable work during the winter season.

The cost of production on Missouri farms, O. R. Johnson and W. E. Foard (*Missouri Sta. Bul. 125 (1915), pp. 287–316, figs. 5*).—The authors outline their method of investigation and indicate the cost per acre of the principal crops on the farms studied and the cost of keeping the different farm animals. A portion of the work was in cooperation with the Office of Farm Management of this Department.

It was found that the cost of using equipment varied from 1.3 cts. per horse-hour on one farm to 3.8 cts. per horse-hour on another, the average for 12 farms being 2.28 cts. The average cost per year of keeping a work horse on 14 farms was $88.33, of which 77.4 per cent was spent for feed, 10.7 for labor, and 11.9 for miscellaneous. The average length of workday per horse on 28 farms was 3.57 hours, and the average cost per hour of horse labor on all farms 7.9 cts. The average length of workday per man on 28 farms was 9.64 hours, and the average cost per hour on 6 farms 13 cts. The following table indicates the cost and the amount of man and horse labor required to produce the crops mentioned:

Acre cost of producing various farm crops.

Crop.	Man labor.	Horse labor.	Cost.
	Hours.	*Hours.*	
Corn	23.92	42.32	$13.52
Oats	10.83	19.48	10.87
Wheat	11.78	21.37	12.30
Soy beans	24.73	36.31	13.53
Cowpeas	24.25	40.06	13.60

The authors found that when the yields of corn were less than 30 bu. per acre, the corn paid practically nothing for the man labor. They also found that the average annual cost of keeping a cow for supplying home needs was $47.95 on 6 farms, while on a single dairy farm of 12 cows it was $85.10. The latter returned a net loss of $4.18. They found that the cost of keeping a brood sow was $25.91; the cost of keeping a hen a year under farm conditions was 65.7 cts.

Market distribution (*Amer. Econ. Rev., 5 (1915), No. 1, Sup., pp. 112–161*).—The papers and discussions included under this topic relate primarily to the marketing of agricultural products.

R. Meeker maintains that the only way to bring the producer and consumer effectively and permanently together is through the organization of the market. The first step should be to organize the farmers into local cooperative associations. The object of these associations should be, (1) to determine upon the crop or crops to be grown for shipment to market; (2) to insist upon proper methods of growing the crops; (3) to standardize and guarantee the quality of the products shipped; (4) to superintend the gathering, grading, and packing of crops; (5) to arrange for proper and sufficient means of transportation, handling, shipping, and terminal facilities; and (6), to bargain with railroads and other transportation companies for a freight rate that will be a livable rate for both the farmer and the transporter.

L. D. H. Weld calls attention to the fact that the principal reasons for variation in the cost of marketing agricultural products are the degree of perishability, regularity and irregularity of supply throughout the year, waste and shrinkage, volume in which the products are handled, extent into which a commodity may be subdivided, existence of well established qualities or grades, and the relation between bulk and intrinsic value.

The remaining papers relate principally to a discussion of the points brought out in these two addresses.

Retail public markets, G. V. BRANCH (*U. S. Dept. Agr. Yearbook 1914, pp. 167–184, pls. 4*).—The author discusses the local needs and demands for markets, types, location, construction, financing. market regulations and management, and news service of public markets, as factors which should be considered in the establishment of such markets. He concludes that "while the municipal retail market surely has its place in the present system of food distribution, its introduction should be accompanied with even more mature judgment than would attend the establishment of business institutions by private agencies, for, in committing itself to the retail-market policy, a city is departing somewhat from the conservative path. The public market is not a panacea for the weaknesses of the retail system, nor is it advocated that its use should displace the old established agencies of retail marketing. Rather, its service should supplement, cooperate with, and to some extent regulate that which they give."

Farmers' market bulletin (*North Carolina Sta. Farmers' Market Bul., 2 (1914), No. 2, pp. 31*).—This bulletin outlines methods for marketing eggs through creameries and for organizing to grade and market corn, and discusses the work of the state division of markets. It includes the text of the act of 1915 to provide for the incorporation and maintenance of cooperative organizations, and the usual list of products for sale.

Cooperative marketing, and financing of marketing associations, C. E. BASSETT, C. W. MOOMAW, and W. H. KERR (*U. S. Dept. Agr. Yearbook 1914, pp. 185–210, pl. 1*).—This article points out the advantages of the cooperative marketing of farm products, discusses the basic principles and conditions favoring success, and describes some forms of organization and different methods of financing cooperative enterprises.

Departmental committee on agricultural credit in Ireland (*Dept. Agr. and Tech. Instr. Ireland, Dept. Com. Agr. Credit Ireland, Minutes of Evidence, etc., 1912–13, pp. XIV+671*).—This volume contains the minutes of the evidence gathered in connection with the report previously noted (E. S. R., 32, p. 286).

[Transportation of agricultural products in France] (*Bul. Mens. Off. Renseig. Agr. [Paris], 13 (1914), Nos. 2, pp. 194–212; 3, pp. 300–329; 4, pp. 394–406; 6, pp. 725–732*).—These articles note the various means used in distributing agricultural products in France, giving the tariff rates, quantities moved, time in transit, and movement between distributing centers.

Movement from city and town to farms, G. K. HOLMES (*U. S. Dept. Agr. Yearbook 1914, pp. 257–274*).—The author points out, as the result of a questionnaire sent to about 45,000 crop correspondents, that there are five main classes of people appearing in the movement from city and town to farms: (1) Those who move to the country for the purpose of owning a farm on which to live throughout the year and of devoting their entire time to agriculture, (2) those who reside on the farm for the entire year but continue their former occupation in a nearby city of town, (3) seasonal residents, (4) those who move to the country to become farm tenants, and (5) those who seek temporary employment as farm laborers. The author considers that the movement consists primarily of the first class, and points out that it is highly varied and covers a wide range of quality, quantity, and efficiency in the contributions. It is a phenomenon of the denser populations and is most evident in the North, east of the Mississippi River, and is quite generally an accompaniment, if not a consequent, of nearly urban conditions.

The American farm woman as she sees herself, E. B. MITCHELL (*U. S. Dept. Agr. Yearbook 1914, pp. 311–318*).—This article is a brief review of the replies received to the Secretary's letter regarding the needs of the farm woman, previously noted (E. S. R., 32, p. 890). The author summarizes these replies as follows: The farm women "believe that the Government can help them in their struggle in two ways—by economic legislation that will make agriculture more profitable, and by advice and education that will enable them to make the best of what they have."

Conference on rural life and work (*Agr. Gaz. Canada, 2 (1915), No. 2, pp. 177–180*).—These pages contain a summary of addresses and resolutions adopted at a conference on rural life at the Ontario Agricultural College in January, 1915.

The organization of the agricultural statistical service in various countries (*Inst. Internat. Agr. [Rome], Organ. Serv. Statis. Agr., 2 (1913), pp. 144*).—This report describes the methods of gathering statistics relating to agriculture in Australia, Bulgaria, Spain, Nicaragua, Peru, Servia, Sweden, Tunis, and Uruguay.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 1 (1915), No. 1, pp. 8*).—This report succeeds the Agricultural Outlook, which has been discontinued, and is a resumption of the Crop Reporter, which was discontinued June 19, 1913. This report contains estimates of the condition on May 1 of winter wheat, rye, bees, hay, spring pasture, plowing, planting, apples in storage, acreage and condition of certain truck crops, stocks of wool January 1, etc., estimated farm values of some of the principal agricultural products on this date and of others for April 15, range of prices at important markets, and a yearly summary of the "world" production. Comparative data are given for earlier years.

It is estimated that the total production of straw in the United States is 117,754,000 tons, valued at $436,867,000, of which 54.9 per cent is fed, 15 burned, 7.8 sold, 10 plowed under, and 12.3 used for other purposes. The value of the straw burned is estimated as equivalent to $65,000,000.

Annual international report on agricultural statistics for 1911–12 (*Inst. Internat. Agr. [Rome], Ann. Internat. Statis. Agr. 1911–12, pp. XXXIV+622*).—This report shows for both those countries adhering and nonadhering to the International Institute of Agriculture, the total area and population, the productive, nonproductive, and arable area, the area and production of the principal agricultural crops, the number of live stock, international commerce, and prices for agricultural products. The estimated consumption for rye, barley, oats, maize, and wheat is included. Comparative data for earlier years are shown. An extensive bibliography is included indicating the sources used.

[Agricultural statistics] (*Statis. Abs. Brit. Self-Gov. Dominions [etc.], 51 (1899–1913), pp. 318–381*).—These pages bring up to date the statistical data previously noted (E. S. R., 30, p. 493) relating to the several British self-governing dominions, crown colonies, possessions, and protectorates.

[Agriculture in Argentina] (*An. Dir. Gen. Estad. [Buenos Aires], 2 (1912), pp. 10–57*).—These pages of the annual report contain information concerning the area and production of the principal crops, number of live stock, and trade and manufactures of agricultural products.

Agricultural statistics of British India (*Statis. Abs. Brit. India, 48 (1903–4–1912–13), pp. 126–135*).—These pages of the annual report contain statistical data showing the area devoted to different agricultural purposes, area and production of specified crops, number and amount of land transferred, and area in forests. The statistics for 1913 are shown by provinces. Comparative data for 1903–4 to 1912–13 are shown for the country as a whole (see also a previous note (E. S. R., 30, p. 392).

[Agricultural population of British India] (*Statis. Abs. Brit. India, 48 (1903–4–1912–13), pp. 15–17*).—The census of 1911 indicated that out of a total population of 313,470,014 people, 226,550,483 were dependent upon and engaged in agriculture. There were 72,577,476 males and 34,199,230 females actively engaged in the agricultural operations of the country.

Live stock in Germany (*Viertelj. Statis. Deut. Reichs, No. 1 (1914), Ergänzungsh., pp. 135*).—This report shows the number and value of the various kinds of live stock on December 2, 1912, by minor subdivisions and of different ages. Comparative data are given for earlier years for the more important items. The following table shows the number at different censuses:

Number of live stock in Germany.

Kind.	1873	1883	1892	1900	1907	1912
Horses	3,352,231	3,522,545	3,836,273	4,195,361	4,345,047	4,523,059
Mules	1,626	1,009	383	649	942	1,883
Asses	11,689	8,786	6,320	7,199	10,349	11,264
Cattle	15,776,702	15,786,764	17,555,834	18,939,692	20,630,544	20,182,021
Sheep	24,999,406	19,189,715	13,589,662	9,692,501	7,703,710	5,803,445
Swine	7,124,088	9,206,195	12,174,442	16,807,014	22,146,532	21,923,707
Goats	2,320,002	2,640,994	3,091,508	3,266,997	3,533,970	3,410,396
Hives of bees	2,333,484	1,911,797	2,034,485	2,605,350	2,594,690	2,630,837
Poultry	No data.	No data.	No data.	64,453,171	77,103,045	82,702,030

AGRICULTURAL EDUCATION.

[Agricultural] instruction (*Jahresber. Landw. Königr. Sachsen, 1913, pp. 79–103*).—Brief reports are given for 1913 of institutions in the Kingdom of Saxony giving instruction in agriculture and home economics, and of special courses in these subjects, together with tables showing the attendance by districts for 1913–14 in these agricultural and home economics schools, and the total attendance from 1875 to 1913–14 for the former.

[Agricultural education under the direction of the chamber of agriculture] (*Jahresber. Landw. Kammer Rheinprov., 1913, pp. 69–99*).—This is the annual report of progress in agricultural education under the direction of the chamber of agriculture of the Rhine Province, including the work of the Bacteriological Institute, the Educational and Experimental Dairy Institute at Cleve, the Poultry Breeding Station and School at Neuss, agricultural winter schools, special courses, instruction in the army, and itinerant instruction.

[School gardening and nature study] (*Nature-Study Rev., 11 (1915), No. 2, pp. 37–79, figs. 17*).—This number comprises the following articles: Children's Home Gardens, by Alice J. Patterson; Vegetable Gardening for City Children, by Ethel Gowans; School and Home Gardening in Portland, Oreg., Season of 1914, by M. O. Evans, Jr.; Beautifying Work as Nature-Study, by Margaret Dolan; Heuristic Method, by L. C. McLean; Nature-Study in the Gary Schools, Margaret Ahearne; The School Fair an Aid to Gardening, by L. A. De Wolfe; Plants for Class-Rooms, by Ellen E. Shaw; and Gardening at Bloomington, Ill., by J. K. Stableton.

The growth and influence of the nature-study idea, ANNA B. COMSTOCK (*Nature-Study Rev., 11 (1915), No. 1, pp. 5–11*).—The author reviews the progress of the nature-study idea and points out its influence and practical benefits.

Boys' and girls' contest clubs, L. H. BAILEY (In *York State Rural Problems, II. Albany, N. Y.: J. B. Lyon Co., 1915, pp. 71–79; Cornell Countryman, 12 (1915), No. 4, pp. 300–303, figs. 2*).—The author discusses four dangers in boys' and girls' agricultural contest work as some of it is undertaken at the present time, viz, (1) that these clubs or contests may not represent real effort on the part of the child, (2) the rewards may be out of proportion to the effort expended, (3) the effect of the contests may be to inflate the child and to give him an undue estimate of his own importance, and (4) the children are liable to be exploited, used in the making of political or other public reputation, or in accomplishing advertising and propaganda for institutions, organizations, publications, commercial concerns, and other enterprises, or to exploit the resources of the State or the agriculture of a region.

As safeguards against such dangers the author suggests the recognition of the essential nature and function of such contests. "The fundamental consideration is that all this kind of work is educational. It is not primarily agricultural work, not undertaken directly to improve the farming of a region. The primary consideration is its effect on the child." He thinks that this work should be a part of the public school system with laboratory work at home under the direction of the teachers.

Elementary agriculture, A. W. NOLAN (*Nature-Study Rev., 11 (1915), No. 1, pp. 27–29, fig. 1*).—The author suggests some points to emphasize in teaching boys and girls in an elementary course in agriculture to work out practical and profitable ways of improving farm animals.

Outlines in agriculture, domestic science, and manual training for twelve weeks of normal training (*Des Moines, Iowa: State Dept. Pub. Instr., 1915, pp. 14*).—Work is outlined under the following topics: Farm crops, soils; horses, cattle, swine, sheep, poultry; and food, clothing, house sanitation, personal hygiene, and manual training. The examinations for state and uniform county certificates in Iowa have been based upon these outlines since July 1, 1915.

Laboratory exercises in principles of agriculture, E. HOPT and R. R. SPAFFORD (*Chicago: W. M. Welch Manufacturing Co., 1914, pp. 192, figs. 97*).—Laboratory exercises in soils, plants, farm animals, and general farm problems, including seasonal fluctuation in the price of farm products, the cost of living, and an illustration of farm plans and crop rotation, are outlined to cover at least 36 weeks. It is suggested that three single periods a week devoted to classroom work and two double periods a week to laboratory work will probably fit most schools. A list of laboratory supplies for the complete course based upon the needs of a laboratory section of 12 students is appended.

Hotbeds: Their construction and use, S. A. MINEAR (*Rural Educator, 5 (1915), No. 2, pp. 37–39, figs. 5*).—The author points out the uses and location of school hotbeds, gives directions for the construction and management of temporary school hotbeds and for growing cabbage under glass, and suggests other vegetables and flowers that may be similarly grown.

Peppers, OLA POWELL, MARY E. CRESWELL, and W. W. TRACY (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 782 (1915), pp. 8*).—Instructions are given to the canning-club girls of the South on the cultivation, growing, canning, and some ways of using fresh and canned Spanish peppers.

Identification of potato varieties, C. L. FITCH (*Off. Pub. Iowa State Col. Agr., 12 (1914), No. 33, pp. 32, figs. 25*).—This subject is considered under the headings of varieties of interest to Iowa growers, the influence of conditions on shape and color, and varieties described and identified by the tuber form and color markings.

Studies of trees, J. J. LEVISON (*New York: John Wiley & Sons, 1914, pp. X+253, pl. 1, figs. 155*).—This book for the beginner, "which gives in a brief and not too technical way the most important facts concerning the identification, structure, and uses of our more common trees, and which considers their habits, enemies, and care both when growing alone and when growing in groups or forests," has been previously noted as a loose-leaf manual (E. S. R., 31, p. 494), with the exception of the chapters on the identification, properties, and uses of our common woods, and an out-door lesson on trees.

Farm forestry, A. AKERMAN (*Athens, Ga.: Jackson, Ga., Progress Print, 1914, pp. 2+54+4, pls. 9*).—This text has been prepared for use in agricultural high schools and colleges in Georgia and surrounding States. It discusses the life processes of trees, the distinguishing characteristics and utility of some of the more important trees of the South, reproduction, protection, thinning, cutting mature timber, preservatives, firewood, and the place of woodlands in farm management. A preliminary outline of this text has been previously noted (E. S. R., 21, p. 339; 22, p. 197).

A manual of exercises in forest mensuration, H. WINKENWERDER and E. T. CLARK (*Seattle, Wash.: Authors, 1915, pp. 146*).—This book gives detailed directions for conducting the various operations involved in the determination of the contents of logs, trees, and stands.

Modern methods of testing milk and milk products, L. L. VAN SLYKE (*New York: Orange Judd Co., 1913, 2. rev. ed., pp. XII+286, pl. 1, figs. 62*).—In this revision of this text (E. S. R., 18, p. 7), chapters have been added on methods of testing butter and cheese for fat, butter for water and for salt, and milk for casein, and several other chapters have been completely rewritten to cover new developments.

The nature-study course of the elementary school, O. W. CALDWELL (*Nature-Study Rev., 10 (1914), No. 9, pp. 358–367, figs. 3*).—A synopsis is presented of the purposes, projects, and materials of the nature-study course for the first to the eighth grades, inclusive. This outline is the result of several years of experience.

The nature-study course of the school of observation and practice, ADELINE F. SCHIVELY (*Nature-Study Rev., 10 (1914), No. 9, pp. 337–358, figs. 6*).—This is an outline of a course planned for grades 2 to 8, inclusive. The subject matter is arranged in seasonal sequence under plant life, animal life, minerals, experimental work (mainly in chemistry and physics), earth study, and miscellaneous. The work is correlated with geography and occasionally with physiology, and garden work, mostly at home, is encouraged.

Nature study, J. A. CHURCHILL (*Nature-Study Rev., 10 (1914), No. 9, pp. 368–374*).—The author outlines a grade plan of nature study for the elementary schools in Oregon and discusses methods of instruction.

Nature study and agriculture (In *A Manual Containing the Course of Study for the Elementary Schools of West Virginia. Charleston, W. Va.: Dept. Free Schools, 1914, rev. ed., pp. 141–169*).—An outline of a course in nature study for grades 1 to 6, inclusive, and in agriculture for grades 7 and 8 is presented, with directions for making an agricultural booklet. The use of notebooks and the bulletin board, collections, correlation, preliminary school exercises, contests, and home and community projects are recommended.

Nature study at the Van Vlissingen School, G. A. BRENNAN (*Nature-Study Rev., 11 (1915), No. 1, pp. 12–25, figs. 4*).—An outline is given of the course in nature study from the kindergarten to the eighth grade, inclusive, used in the Van Vlissingen School, located in Roseland, a Chicago suburb, which was for years a farming community. During the past 4 years the teaching has been subdivided into departments of horticulture, plants and propagation, including forestry, agriculture, molds and blights, floriculture, pollination, window gardens, etc., represented by committees of teachers, each group specializing in the department to which it was assigned. The publications in the library on nature study are listed and the school garden work is described.

Home work for winter months for canning-club girls of Tennessee, LOUISE G. TURNER (*Col. Agr. Univ. Tenn., Ext. Div. Pubs. 2 (1914), pp. 12, figs. 2; 3, pp. 16*).—The first bulletin discusses kitchen rules, setting the table, and beverages, and the second cereals and breads.

Homemakers' clubs for negro girls, J. L. SIBLEY (*South. Workman, 44 (1915), No. 2, pp. 81–86, figs. 6*).—This is an account of the negro girls' gardening, domestic science, and sanitation club work conducted in 10 counties in Alabama with funds provided by the General Education Board, and in Macon County with funds provided by the extension department of Tuskegee Institute. The work was under the direction of the state supervisor of negro rural schools. Ten community centers in each county were visited each week.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1914 (*U. S. Dept Agr. Yearbook 1914, pp. 715, pls. 53, figs. 45*).—This contains the report of the Secretary of Agriculture, previously noted (E. S. R., 32, p. 795); 22 special articles abstracted elsewhere in this issue; and an appendix containing 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, agricultural statistics from the census of 1910, and imports and exports of agricultural products.

A report on the work and expenditures of the agricultural experiment stations during the fiscal year ended June 30, 1913 (*U. S. Dept. Agr., Rpt. Work and Expenditures Agr. Expt. Stas., 1913, pp. 110, pls. 6*).—This includes the usual report on the work and expenditures of the agricultural experiment stations in the United States, including Alaska, Hawaii, Porto Rico, and Guam, together with detailed statistics compiled from official sources as to the organization, lines of work, revenues, additions to equipment, and expenditures of the stations.

Twenty-sixth Annual Report of Maryland Station, 1913 (*Maryland Sta. Rpt. 1913, pp. XX+271, figs. 64*).—This contains the organization list; a report by the director on the organization, work, and publications of the station; a financial statement for the fiscal year ended June 30, 1913; and reprints of Bulletins 168–177, previously noted.

Work and progress of the agricultural experiment station for the year ended June 30, 1914 (*Missouri Sta. Bul. 131 (1915), pp. 441–509, figs. 8*).—This contains the organization list, a report of the director on the work and publications of the station and the work of the college extension service, and a financial statement for the station for the fiscal year ended June 30, 1914. The experimental work reported is for the most part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 3 (1915), Nos. 2, pp. 16, fig. 1; 3, pp. 8*).—These numbers contain brief articles on the following subjects:

Vol. 3, No. 2.—Why Tolerate Mesquite, by H. L. Blanchard; Some Summer Fruit Insect Pests, by J. L. Stahl; Comb Honey, by J. W. Ware; Finishing Poultry for Market, by V. R. McBride; Concerning the Rainfall, by E. B. Stookey; and Bacterial Gummosis of Cherries, by H. L. Rees.

Vol. 3, No. 3.—Saving Hay Crops, by H. L. Blanchard; Extracted Honey, by J. L. Ware; and Production and Handling of Market Eggs, and Preserving Eggs, by V. R. McBride.

[Index to Wyoming Station publications, 1907–1914], J. E. ANDERSON (*Wyoming Sta. Index Bul. E (1915), pp. 94*).—This contains lists of the publications of the station from its organization to July 1, 1914, and a combined subject and author index to Bulletins 76–98 and annual reports from 1908 to 1913, inclusive, continuing previous work (E. S. R., 19, p. 695).

NOTES.

Connecticut College.—Dr. A. F. Blakeslee, professor of botany and genetics, has been appointed plant geneticist at the Carnegie Station for Experimental Evolution, beginning October 1.

Kansas College and Station.—The graduating class this spring numbered about 200, of whom 46 received the bachelor's degree in agriculture and 65 that in home economics. A course in plant breeding was offered in the summer school for the first time. The fifth school for rural leaders gave special prominence to rural sociology.

Dr. Paul S. Welch, who has been connected with the investigations of staple crop insects in the station, is now giving his full time to college work as assistant professor of entomology. W. P. Hayes, assistant in zoology in the college, has been added to the station staff as assistant in the staple crop insect investigations. L. E. Hobbs, D. V. M., assistant in hog-cholera work in the station, has resigned and has been succeeded by O. E. Strodtman. E. P. Harling has been appointed seed analyst and R. H. Needham assistant chemist. G. A. Gilbert, instructor in dairy husbandry in the college and assistant in dairy manufactures in the station, has resigned.

Maine University and Station.—H. D. Lucas, assistant chemist in the station, resigned July 1 and has been succeeded by Walter H. Rogers, a 1915 graduate of the university.

Massachusetts College and Station.—A bequest of $4,000 for assisting worthy students, made in the will of Major Henry E. Alvord several years ago, has now become available.

John Phelan, of the University of Wisconsin, has been appointed professor of rural sociology. Arnold P. Sturtevant, recently connected with a commercial laboratory in Philadelphia, has been appointed assistant in animal pathology beginning July 1 and will give special attention to studies of bee diseases.

New Mexico College and Station.—Dr. E. P. Humbert, station agronomist, has been appointed dean of agriculture, beginning July 1. Roland Harwell resigned as assistant agronomist May 1 to become county agriculturist for Torrance County, and was succeeded June 1 by J. G. Hamilton, a 1915 graduate of the college. R. L. Stewart resigned July 1 as assistant animal husbandman, and was succeeded by E. J. Maynard, also a 1915 graduate of the college. A. B. Fite, another 1915 graduate, has been appointed assistant horticulturist, beginning July 1. C. P. Wilson, formerly station stenographer, has been appointed editor of agricultural publications for the station and the extension division in addition to his previous duties as extension secretary. Dr. R. F. Hare, station chemist since 1904, resigned July 1.

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THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. XXXIII SEPTEMBER, 1915 No. 4

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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EXPERIMENT STATION RECORD.

VOL. XXXIII. SEPTEMBER, 1915. No. 4.

For the third time in its history the Association of American Agricultural Colleges and Experiment Stations this year held its convention on the Pacific coast. The first meeting there was at San Francisco in the summer of 1899 and the last previous one at Portland, Oregon, in 1909. This year members from the East and the Central West again journeyed across the plains and the mountains to meet with their colleagues of the West on their own field of action. The sessions were held at Berkeley in the spacious agricultural building of the University of California, August 11–13, 1915.

The meeting was generally considered a successful and satisfactory one from all points of view. The registration was unusually large—considerably over two hundred, the representation was very general from all parts of the country, and the attendance on the various sessions was good. Despite the attractions of the exposition the convention held the attention of the delegates, most of whom stopped at Berkeley, to a degree which showed the serious purpose of the meeting and the interest maintained in it. The number of special conferences was unusually large.

The convention was preceded by the summer meeting of the American Association for the Advancement of Science and the annual gathering of various distinctly agricultural associations, and it was followed by the meeting of the National Education Association. Rarely has so large a body of persons interested in education and research been brought together in a series of consecutive meetings.

While the convention took no action of outstanding importance, there were fully the usual number of matters of special interest to the land-grant colleges and the various departments of their work. The animated discussion of some of these matters showed the vital interest which surrounds them at this time, and in some instances a desire for greater opportunity for discussion than the limits of the sessions afforded.

The solidarity of the land-grant colleges was emphasized in the presidential address of President E. A. Bryan of the association, who pointed out the national character of these colleges, their common interests and purpose, and the place they have occupied in education. He described the line separating the old education from the new as represented by these institutions, which are to minister to our common welfare. They now comprise a national system of education, largely subsidized by the Federal Government and with certain prescribed relations to it. They have greater solidarity than any other class of institution.

President Bryan urged that unity should be maintained among the colleges of this great system—a balance, a coordination between them. Because together they constitute a national system of education he urged a closer relation of the national Bureau of Education to them in helping them to work out their mission; and he advocated a national Department of Education, presided over by a Secretary.

The U. S. Bureau of Education was represented on the program by Dr. S. P. Capen, who discussed the relation which the Bureau has sustained to the land-grant colleges. The specialist of the Bureau of home economics, Mrs. Henrietta W. Calvin, was also present and discussed that division of the work.

Dr. C. A. Duniway set forth the position of economic science in colleges of agriculture and mechanic arts. After pointing out the elementary character of the requirements in this line for graduation from most of these colleges, he emphasized the importance at this time of correlated courses in economics, in preparation for industrial life and citizenship.

The correlation of the college of agriculture of Ohio with other institutions in the State according to the plan previously noted,[a] was described by Prof. Alfred Vivian. The plan has now been in operation for two years and has proved quite satisfactory. It stimulates both of the participating institutions, and it has some advantages for the student, permitting him to take his elementary course in small classes, often at less cost, and to be an alumnus of the arts college as well as of the university. It was explained that such students are found to more readily take up graduate work.

In an evening address, Dean Thomas F. Hunt, of California, gave an interesting and informing account of the agricultural institutions now in operation in that State, equal in area to the nine northeastern States and having all the problems of those States and some others. Instead of nine separate agricultural colleges and experiment sta-

[a] Expt. Sta. Rec., 30, p. 397; 32, p. 798.

tions, as in that group of States, California has only a single organization, but it has eight centers of activity at present, three of which were designated as major centers and five as minor. The activity and the plans at each center or unit were set forth. Much interest was manifested by those who had not had opportunity to study the system, in this description of the manner in which the varied needs of the State are being met. A considerable number of the delegates took occasion to visit some of these units located away from the university.

The preparation of men for teaching and research in agriculture, and the means of securing it, was a live subject of consideration. This is recognized as one of the great problems of the day in the advancement of this agricultural work. It is common to each division of the undertaking and to every section of the country. The demand for workers has grown very rapidly, and the standards have advanced with the grade of the work now required of the institutions. The number of adequately prepared persons has not kept pace with this development. It was pertinent, therefore, that the subject should be one for extended discussion.

As bearing on the subject from the standpoint of the college as a preparatory agency, President A. Ross Hill reviewed the situation with reference to the service contemplated in the Nelson amendment. He showed from a canvass of the catalogues what the various colleges are attempting to do, and incidentally the inadequacy of their efforts. Not only is the provision inadequate but the colleges are not attracting or preparing the necessary numbers. The belief was expressed that probably all of the land-grant colleges combined are not training enough teachers to meet the needs of a single State. Dr. Hill urged the need of a propaganda to attract prospective teachers.

This paper resulted in a very interesting discussion, along a line which has heretofore not received much consideration by the association. Complaint was made by some of the difficulty of attracting persons to the field of agricultural teaching in view of the avenues open to them in other lines, especially agricultural extension. But, on the other hand, it was shown that the presentation of the larger field of the agricultural teacher had in some States inspired considerable numbers of persons to enter that field. In Minnesota, for example, there are one hundred and seventy schools teaching agriculture and it has been possible to get all the teachers needed, these being drawn from some twenty agricultural colleges. The opening up of an avenue for these teachers outside the school room in conducting community work has been a great incentive. These agricultural teachers often become county agents, and the teaching experience has proved a fine training ground for them.

The preparation required for workers in the three general divisions of the agricultural work—college teaching, research or station work, and extension work—was considered in a set of papers presented before the college section; and the report of the standing committee on agricultural instruction dealt specifically with college courses for the preparation of extension workers.

The comprehensive report as to the preparation of extension workers was based on about a hundred replies to a questionnaire sent to agricultural educators, extension directors and others in charge of extension work, and others interested therein. The committee advocated that a considerable number of the agricultural colleges should offer undergraduate courses for the purpose, and that a few should make special provision for graduate instruction.

In one of the general sessions Dr. H. L. Russell described a plan for promoting advanced study through exchange with other colleges. This had in mind the postgraduate preparation of men from the institution, and the purpose of the plan as explained was to "avoid inbreeding" and to promote "cross breeding" with other institutions. Dr. Russell believed that not more than one-half of the permanent staff above the assistant grade should be chosen from the home institution. At the University of Wisconsin assistants are required to go elsewhere for advanced study, and to provide for this and meet the financial difficulty which often confronts young men an exchange relationship has been established with certain other colleges. This cooperative arrangement provides for mutual exchange of staff members, with opportunities afforded for study. The description of this plan developed so much interest that the paper was referred to the committee on college organization and policy, with a view to arranging for a consideration of its suggestions.

The station section had before it the question as to what the stations can do to encourage more men to fit themselves for advanced research. It developed out of the discussion that considerable is being done in a systematic way by some of the institutions to advance this end. One station encourages its younger men to take graduate work in the local university, allowing part time for the purpose; and it followed the practice of sending older men away to other institutions, allowing them to take their station projects with them and work upon them under salary from the station.

The practice of providing fellowships has become quite common. In some instances promising men are selected in the senior year and fellowships offered in return for special work of a research character.

Other institutions offer such fellowships for graduate students only. The value of this method in attracting workers is proving quite important. It enables the prospective employee to get a deeper insight into the spirit of research, and kindles an interest and a desire which are not aroused in the ordinary course of instruction. The acquiring by this means of something of "the living, breathing spirit of research"—of going beyond the boundaries of knowledge, presents the field in a new light and is one of the greatest sources of stimulation to young men.

While the chief purpose of this plan is usually educational, the immediate advantages to the station work are not to be overlooked. In an increasing number of institutions graduate students are being utilized in conducting the station investigations, and in some instances this is looked upon as an economical means of securing assistance. Some have gone so far as to divide their main theme or project into various parts which can be worked out independently and assigned to advanced students to be conducted under the general direction of the leader of the project. The real advantage of this to the station depends largely on the nature of the subject and on the men assigned to it. The right kind of graduate assistants may be a real help, as has often been found to be the case, but instances have also occurred in which men well recommended by other institutions have proved disappointing as graduate assistants.

Evidently the station work must not be contingent upon this type of service, or subordinated in any sense to the purpose of teaching. It is based on the plan of the university in making provision for graduate work, and it is well recognized as largely a phase of the teaching activity. As a teaching function the responsibility for it should rest usually with the college or university, and for that reason doubtless the college has in specific instances provided the fellowships. Unless there is some direct advantage or aid to the station, it will rarely be able to do more than a quite limited amount in this direction. But the community of interest among the stations in promoting more thorough preparation of men for research work makes efforts of this kind worth encouraging.

The salary attractions in other directions, especially under the development of the extension work, make the recruiting of the station staffs more difficult and present real obstacles in the way of inducing men to take long and expensive courses in preparation for research activity. The need of arousing zeal for creative work and the encouragement of promising young men in preparing for it can hardly escape the attention of the stations at this time.

The opportunities of the Graduate School were again referred to in the report of the committee on graduate study, and it was urged that the younger men at the colleges and stations should avail themselves more largely of it. In emphasizing the importance of this the committee expressed the belief that college and station employees attending the school should be considered as on duty and that the time so occupied should not be deducted. The association endorsed this recommendation.

The effective correlation of station and extension work and the means of securing public recognition for that of the station was another live topic discussed in the station section. Considering the correlation of the two sets of workers from the standpoint of the extension director, Mr. Bradford Knapp suggested that the station men should go out enough to maintain contact with the farmers. They might exchange work to some extent with the extension men, especially in the preliminary stages of preparation for extending the results of station work in the field. Conferences between the two sets of workers, at least annually or semiannually, were advocated.

Prof. C. E. Thorne, speaking from the standpoint of the station director, pointed out that the experiment stations collectively are the source of the more exact knowledge with reference to factors which bear upon the progress of agriculture. They were organized to advance definite knowledge. They furnish the best means we have of reaching further into the unknown and of correlating and coordinating what is known. The teacher in the great outside must keep himself posted and in touch with the experiment station in his own State, and to some extent with the stations collectively.

In Ohio the station is extending the points of its work to various parts of the State, by maintaining branch stations. It is felt that the county agent is thus given an advantage by having available the help of these smaller agricultural farms, and that data of more local application can be secured and tested. Such arrangements will call for definite understanding, but will offer for men opportunity to work in both fields—on the local experiment farms and in the extension teaching.

Discussion of the best means of securing recognition and credit for station work through the extension staff brought out the fact that the attitude of the extension worker is a large factor in this matter, and that his closeness to the public affords a means of giving wide publicity to the station work and emphasizing its importance. The close contact which the stations formerly had with the public, through meetings, correspondence, personal visits, etc., will be diminished as the extension work is segregated and grows in extent. Obviously, the extension man can ill afford to claim to be the original source of the information he gives out, and the importance to his work of maintaining the support for station activity should lead him and those in general charge of the extension enterprise to give full prominence and credit to the station.

A feeling was expressed that unless this is systematically done the stations will ultimately suffer, and that the individual extension worker will be magnified in importance to the detriment and crippling of the institution which has given him his strength and appeal. The statement was made that the agricultural colleges are now in the greatest danger they have ever been by reason of the large amounts of money being appropriated for this popular line of work; they must watch to see that the research activity is continued and that the money for it is provided.

The matter of publications again came forward for consideration. The report of the standing committee on extension organization and policy dealt with extension publications and their distribution, showing that already the subject is being considered in this newer division of the work. The diversity of these publications and the lack of system or of definite policy in some instances makes the subject one well worthy of study.

The form of publication of station work was one of the main topics on the program of the station section, and occupied an entire afternoon's session. The consideration embraced the annual report, the station bulletin, and the publication of technical investigations in the Journal of Agricultural Research and elsewhere outside the regular station series. Further reference to this discussion is contemplated in a later issue of the Record.

A subject which affects a very large proportion of the stations was brought forward in the report of the committee on station organization and policy. This report dealt with the relation which the experiment stations should sustain to various lines of control work. It showed that while fundamentally the stations are for acquiring information and extending the boundaries of knowledge, they have gradually become involved in a great variety of control and regulatory work, until the modern station has become a complex and somewhat heterogeneous organization. The advantages and disadvantages of this kind of work were reviewed, and its special appropriateness to the stations and the necessity for them to continue to exercise such governmental functions was brought into discussion.

The report of the committee was in a large sense preliminary. The subject is one which deserves discussion and the main purpose of the committee was in opening up the question. At its suggestion the station section will place the subject on its program for the next meeting, in order to afford opportunity for wider consideration and the presentation of views. Ultimately it is expected the topic will be made one for a future report of the committee on station organization and policy.

The subject of experiment stations for engineering for mechanic arts came in for an unusual amount of consideration at the Berkeley meetings. The Land Grant College Engineering Association, which met in connection with the convention, held a symposium on engineering experiment stations, devoting two sessions to that subject. In his presidential address, President Bryan advocated the making of provision for such a system of stations, to round out the proper development of the educational movement started in the land-grant act of 1862.

In connection with a paper on the place of mechanic arts and engineering in the land-grant colleges, President R. A. Pearson expressed the need for investigation in the field of engineering, citing numerous examples of the problems awaiting such study and some results which have already accrued. He urged the desirability of establishing experiment stations for engineering, to do for that subject what the present existing system of stations has done for agriculture.

At one of the general sessions of the association, Hon. F. G. Newlands, Senator from Nevada, gave an address on the subject of federal aid to engineering experiment stations. In this he urged that the mechanic arts are not of less importance than agriculture, and present the same need for research activities. He favored the provision of appropriations for the purpose by the Federal Government, and advised that effort be directed to creating an intelligent sentiment and understanding in that direction.

On this point the association reaffirmed its belief in the desirability of engineering experiment stations and of securing appropriations therefor; and it instructed the executive committee to proceed in that direction whenever conditions were deemed advisable.

It will be apparent that the twenty-ninth convention of the association lacked nothing in variety of the topics discussed or in timeliness and importance. To the people of the East the meeting was well worth the trip across the continent; and to those of the West it was an opportunity which has come to them but rarely of meeting with their colleagues on their own ground. The interchange of benefit was undoubtedly mutual.

The trip gave those from the East a clearer insight into the conditions surrounding their agricultural colleagues of the West, the great size of the States they are attempting to serve, the diversity of conditions, and the consequent diversity of the problems of teaching and of investigation. It also brought a realization of the rapid development of the institutions of the West, which is difficult to gain except by observation and contact.

A most remarkable change has taken place since the former California meeting. In equipment, support, personnel, and grade of work the institutions of the West have made great strides. Their success and the appreciation which has marked their growth is not only gratifying to the whole country but it is stimulating and inspiring, for it gives new evidence of the position agricultural work has attained and the nation-wide character of its forward movement.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Handbook of biochemical methods, edited by E. Abderhalden (*Handbuch der Biochemischen Arbeitsmethoden. Berlin: Urban & Schwarzenberg, 1915, vol. 8, pp. XIII+684, pl. 1, figs. 298*).—The eighth volume of this work (E. S. R., 30, p. 201) deals with the following topics: Microscopical methods for determining molecular weights; measurement of oxidation and fermentation rapidity in cells, and some remarks on the technique of cell physiological investigations; methods of examining stomach contents; refractrometric methods for biological investigations; methods of accelerating seed germination, the growth of seedlings, and forcing; analysis of plant material (drying and total solid determination, pressing and extracting, and the treatment of the extracts); a supplement to previous chapters on sterilizing the higher living plants (E. S. R., 29, p. 408); the most important methods for preparing cell granulations in fixed objects; methods for studying the physiology of plant growth; quantitative methods for determining small amounts of tannin in plant juices; preparation of physiologically active amins by decarboxylation of amino acids; the analysis of the rarer elements; determining of ester-(i. e., fat) cleaving action of blood and other body fluids with the drop method; the raising of germ-free mammals; supplements to previous chapters on general chemical laboratory technique (E. S. R., 23, p. 410); a description of a scale which registers automatically weight decrease and weight increase; microscopic air analysis and its uses; microrespirometry; functional investigations on the lungs of man with gas analytical methods; the interferometric method for studying the defensive ferments; and mathematical methods in the biological sciences.

On the proteid substances of barley, in the grain itself and during the brewing processes, H. Schjerning (*Compt. Rend. Lab. Carlsberg, 11 (1914), No. 2, pp. 45–105, pl. 1, figs. 6*).—A review of the work noted (E. S. R., 32, p. 23), with a description of the material and methods used in the investigation.

Contribution to our knowledge of the carbohydrates of vegetables.—IV, The carbohydrates of Savoy cabbage, E. Busolt (*Jour. Landw., 62 (1914), No. 2, pp. 117–120*).—Continuing the work previously noted (E. S. R., 31, p. 11) the author reports that he was able to obtain in crystalline form from 15 kg. of Savoy cabbage 15 to 16 gm. of mannit and 3.1 gm. of grape sugar. The amounts present in this vegetable are probably greater.

The influence of temperature and time upon the direct reducing sugar of raw potatoes and potato juice, A. Baudrexel (*Ztschr. Spiritusindus., 37 (1914), Nos. 16, pp. 225, 226; 17, pp. 238, 239; abs. in Ztschr. Angew Chem., 27 (1914), No. 59, Referatenteil, p. 467*).—In this investigation the influence exerted by the respiratory process upon the sugars present in potatoes was excluded by comminuting the potatoes by grating and pressing out the juice in filter bags. The sugar was estimated in the juice by Bertrand's method.

In the experiments made for the purpose of finding the most appropriate methods for obtaining potato juice, it was found that the potatoes which were taken from storage where temperatures varying from 12 to 15° C. prevailed contained 29 per cent of glucose. By storing these potatoes for several days at 5 to 6°, one set of experiments showed an increase in glucose of 0.0283 per cent and in another of 0.0296 per cent per day of storage. The juices obtained from the potatoes were then kept at 3, 31, and 48° for various lengths of time. A marked increase in glucose was noted in all cases, the greatest production being at the higher temperatures. Glucose formation occurred most rapidly at the beginning of the storage process. The diastatic power of the juices was low, but greatest in the freshly obtained juices.

The bacteriological and chemical evidence of the occurrence of a hexose sugar in normal milk, H. M. Jones (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 357–366*).—Bacteriological and chemical evidence is presented which is said to indicate that milk normally contains a substance which reacts like dextrose.

Gossypol: A toxic substance in cotton seed.—A preliminary note, W. A. Withers and F. E. Carruth (*Science, n. ser., 41 (1915), No. 1052, p. 324*).—"We have separated from cotton-seed kernels a substance which appears to be identical with the substance which Marchlewski [E. S. R., 11, p. 510] separated from crude cotton-seed oil and called gossypol. We have administered in various ways to rabbits gossypol as prepared by us and have found it toxic in every case. We have found, as did Marchlewski, that gossypol is quickly oxidized in an alcoholic solution of sodium hydroxid.

"In a previous paper from this station [E. S. R., 28, p. 279] it was stated that '(alcoholic) alkaline treatment, very greatly diminishes, if it does not entirely remove, the toxic properties of the (cotton-seed) meal,' and it was suggested that the beneficial effect 'may be due to hydrolysis or to the formation of a sodium salt or to some other change not yet determined definitely.' We now offer as an explanation that gossypol is a toxic substance and that its oxidation by an alcoholic alkali renders it nontoxic and thus diminishes, if it does not entirely remove, the toxic properties of cotton-seed meal."

About the chemical nature of catalase, P. Waentig and W. Gierisch (*Fermentforsch., 1 (1915), No. 2, pp. 165–195*).—Catalase of liver (present to the extent of 0.3 per cent) is a water-soluble coagulable protein substance which was precipitated in the cold by mineral acids, especially nitric acid, but not by acetic acid. Heating caused an inactivation and the coagulum obtained showed mucin-like characteristics. It was precipitated by the so-called alkaloidal reagents and bromin water in an acetic acid solution. The well-known protein reactions were positive and the biuret test was obtained as a blue-violet coloration. The protein substance probably contains a sugar which can be identified by the Molisch test but not after hydrolysis by Fehling's solution. The quantity of mineral substances present in a catalase preparation can be considerably reduced without affecting the activity of the catalase, although it was found that iron and phosphoric acid were not removed by dialysis and were adsorbed by the active substance. It is doubtful whether these two constituents, especially iron, are an integral part of catalase. Purin bases could not be noted in the preparations.

Digestion tests on catalase solutions with proteolytic and peptolytic ferments, K. Winkler (*Fermentforsch., 1 (1915), No. 2, pp. 105–130*).—The ferment erepsin which is present in the intestine of vertebrate animals destroys catalase. This fact is said to justify the conclusion that catalase is a chemical substance protein-like in nature. Some data on ferments present in invertebrates (crabs, snails, etc.) are also included.

On vicine, P. A. Levene (*Jour. Biol. Chem., 18 (1914), No. 2, pp. 305–311*).—"Vicine was discovered by Ritthausen (E. S. R., 29, p. 501), who found that the substance could be hydrolyzed into a hexose and into a basic substance which was named by him di-vicine. The exact nature of the base and the configuration of the sugar were not recognized by the discoverer of the substance. Schulze and Trier,[a] on the basis of theoretical considerations, were the first to give expression to the assumption that vicine had the structure of a pyrimidin glucosid."

This article gives the results of investigations dealing with some of the principal points in the structure of the nucleo side of the substances. "The results point to the conclusion that vicine is composed of 4-6-dioxy-2-5-diamino-pyrimidin combined in glycosidic union with *d*-glucose."

On a starch-forming enzym from malt: Its action on hemicelluloses and its commercial application to brewing, C. B. Davis (*Jour. Indus. and Engin. Chem., 7 (1915), No. 2, pp. 115–118, figs. 8*).—A new enzym capable of hydrolyzing the hemicelluloses of yeast and cereals was isolated from barley malt.

"Hemicellutase is precipitated by metals, metallic salts, alcohol, and tannin. Its enzymatic action is destroyed at an elevated temperature above its optimum, 90° C., at which its action is irrevocably changed. Its action is catalytic and hydrolytic on hemicelluloses, otherwise known as granulose, starch cellulose, amylocellulose, amylopectin, pentosans, and hexosans, transforming them permanently into gelatinized starch between the temperatures of 15° and 90° C., and transforming the jelly of hemicelluloses which react yellow to iodin to gelatinous insoluble starch, giving an intense blue reaction with iodin. . . . Hemicellutase is without action on nitrogenous compounds, such as proteids, albumin, peptone, etc."

The application of this finding to practical brewing conditions was pointed out.

About the action of micro-organisms on betain, F. Ehrlich and F. Lange (*Ztschr. Ver. Deut. Zuckerindus., No. 697, II (1914), pp. 158–171; abs. in Ztschr. Angew. Chem., 27 (1914), No. 21, Referatenteil, p. 193*).—Betain is one of the nonsugar substances which is not removed during the separation and saturation of beet juices, and is found in the strontium molasses slops in amounts up to 15 per cent.

It was found that betain is not affected by the ordinary distillery, beer, and wine yeasts, although it serves as a source of nitrogen for other micro-organisms. In the presence of sugar or ethyl alcohol it is fermented by surface film-forming mycoderma and by mold fungi. When betain is assimilated by micro-organisms acid is usually formed. *Willia anomala*, when grown in a betain solution, leads to the formation of glycollic acid. In a symbiotic culture of yeast and mold fungi, trimethylamin is produced, and from the latter, ammonia. Neither substance, however, can be detected because they are quickly synthesized to proteins. It is only possible with a few molds, as, for example, *Penicillium glaucum* and other related varieties, to detect ammonia in appreciable amounts.

A simplification of the determination of total nitrogen by colorimetry, A. Gulick (*Jour. Biol. Chem., 18 (1914), No. 3, pp. 541–547, fig. 1*).—It has been found possible to improve and abbreviate the Folin-Farmer colorimetric nitrogen method by avoiding the aspiration of the products of oxidation. The method is said to be rapid to conduct, reliable, and simple.

The estimation of ammonia by the boric acid method, L. W. Winkler (*Ztschr. Angew. Chem., 27 (1914), No. 94, Aufsatzteil, pp. 630–632, fig. 1*).—In order to study the conditions under which the method operates, tests were

[a] Hoppe-Seyler's Ztschr. Physiol. Chem., 70 (1910–11), No. 2–3, pp. 143–151.

made with pure dried ammonium chlorid dissolved in water with the aid of a few drops of hydrochloric acid.

In using the boric acid method in the Kjeldahl procedures it is advisable to use a large excess of boric acid in the distillate collecting flask—i. e., 10 gm. of boric acid in 100 cc. of water for from 200 to 300 cc. of distillate. If the distillate amounts to only 100 cc. or less, 5 gm. of boric acid should be used.

The ammonia present is to be titrated with the standard hydrochloric acid solution, and not, as inadvertently stated in a previous abstract (E. S. R., 31, p. 108), the excess of boric acid. For this purpose the author recommends the employment of tenth-normal or fifth-normal hydrochloric acid solution, but discourages the use of sulphuric acid. If Congo red is used the solution to be titrated should be perfectly cool.

Remarks on L. W. Winkler's work on the estimation of ammonia with the boric acid method, E. BERNARD (*Ztschr. Angew. Chem., 27 (1914), No. 102, Aufsatzteil, p. 664*).—The boric acid method is deemed rapid and convenient and yields very accurate results.

The solubility of mineral phosphates in citric acid, G. S. ROBERTSON (*Jour. Soc. Chem. Indus., 33 (1914), No. 1, pp. 9–11; abs. in Ztschr. Angew. Chem., 27 (1914), No. 64–65, Referatenteil, p. 506*).—Determining in the usual manner citric acid soluble phosphoric acid in mineral phosphates destined for fertilizers is said to yield erroneous results. A single extraction with citric acid will not suffice and repeated extraction will dissolve almost all the phosphorus present in the fertilizer. The yields obtained with mineral phosphates on experimental plats are said to be as good as those given with slag or with bone meal.

A convenient method for separating iron and aluminum, H. BORCK (*Chem. Ztg., 38 (1914), No. 1, p. 7, fig. 1; abs. in Ztschr. Angew. Chem., 27 (1914), No. 29, Referatenteil, p. 249*).—The method depends upon the volatilization of the iron from a mixture of iron and aluminum oxids by heating in hydrochloric acid through which a current of air is being passed. It will yield constant results only when a quartz boat is used.

Copper sulphate of commerce and methods for determining copper therein, F. MACH and P. LEDERLE (*Landw. Vers. Stat., 84 (1914), No. 1–2, pp. 129–143*).—The fact that a sample of copper sulphate has a satisfactory appearance is not sufficient evidence of its value for spraying purposes. The Windisch method [a] for determining copper with sodium hypophosphite yielded low results, despite the fact that the filtrate from the reduced copper does not give a reaction with either ammonia or potassium ferrocyanid. Better results were obtained when the copper reduced by sodium hypophosphite was collected in an Allihn tube instead of roasting the precipitate as suggested by Windisch, but this method, unless modified, is of value only when speedy results are desired. Rhead's [b] and Moser's [c] methods were tried and also found unsatisfactory.

The following method, which embodies some of the essentials of the Rhead and Moser methods, is recommended: Dissolve 10 gm. of the copper sulphate in approximately 200 cc. of hot water, render slightly alkaline with ammonium hydroxid, oxidize the ferrous iron with about 5 cc. of a 2 per cent hydrogen peroxid solution (this is adequate for salts containing 2 per cent ferrous sulphate), keep the solution at the boiling point for two minutes, and filter off the ferric hydrate. Wash the precipitate, dissolve in a little hot hydrochloric acid, reprecipitate the iron with ammonia, filter, and add the washings therefrom to the original solution. Make the iron-free solution slightly acid with

[a] Ztschr. Analyt. Chem., 52 (1913), No. 1, pp. 1–13.
[b] Jour. Chem. Soc. [London], 89 (1906), II, pp. 1491–1495.
[c] Chem. Ztg., 36 (1912), No. 117, pp. 1126, 1127.

hydrochloric acid and fill to the 1,000 cc. mark. To 25 cc. of the same (representing 0.25 gm. of copper sulphate) add from 10 to 20 cc. of hydrochloric acid (specific gravity 1.125), heat to the boiling point for one minute, and stopper with a rubber which contains two glass tubes which reach half way to the bottom of the flask. Connect one of the tubes with a carbon dioxid generator and allow a strong stream of gas to pass through the flask. Cool, rapidly rotating the flask, and add 5 cc. of a 10 per cent potassium sulphocyanid solution and two drops of a decinormal iron chlorid solution. Pass a stream of carbon dioxid through a tube inserted in the mixture, and titrate with a decinormal titanium trichlorid solution until a milky white color is obtained.

Methods of estimation of carbohydrates.—III, The cupric reducing power of the pentoses—xylose and arabinose, A. J. DAISH (*Jour. Agr. Sci. [England], 6 (1914), No. 3, pp. 255–262, figs. 2*).—Tables are given to show that the reducing power of arabinose and xylose are almost identical. For practical purposes, when working with the unknown pentoses in plant extracts, it is considered probable that no large error will be incurred by taking as the divisor the average value for arabinose and xylose corresponding with the weight of cuprous oxid dealt with. The reducing powers of these two pentoses differ only very slightly from that of dextrose, the divisors for these three sugars for 100 mg. of sugar being, respectively, 2.536, 2.49, and 2.538. See also a previous note (E. S. R., 32, p. 807).

Estimation of cellulose in flours with a special regard to their degree of grading, L. LINDET (*Ann. Falsif., 7 (1914), No. 66, pp. 169–171*).—The method for determining cellulose in noting the extent to which the flour under examination had been bolted is as follows:

Ten gm. of flour from which the fat has been removed by either benzin or ether is treated in a beaker glass with 400 cc. of hydrochloric acid (specific gravity 1.025), boiled for one-half hour, and to the mixture is added 50 cc. of a 10 per cent solution of aluminum sulphate. The aluminum sulphate is then converted into an hydroxid with ammonia, the precipitated aluminum hydroxid which engulfs the cellulose particles collected on a filter, washed, and transferred from the filter to a flask or conical vessel, sodium carbonate solution (10 gm. per 100 cc. liquid) added gradually, and the mixture heated to 100° C. for one hour. The precipitate is then acidified with hydrochloric acid, made alkaline with ammonia, collected on a tared filer, and washed with dilute hydrochloric acid. After drying and weighing, the precipitate of aluminum cellulose is incinerated and weighed again. The quantity of ash found is deducted from the original weight and calculated as cellulose to 100 gm. of flour.

Dr. Herramhof's fat tester.—An apparatus for determining fat in cheese, dry milk, cream, etc., in practice, HERRAMHOF (*Molk. Ztg. [Hildesheim], 28 (1914), No. 36, pp. 677–679, fig. 1*).—The apparatus employed consists of two parts, a flask which receives the cheese to be tested and the butyrometer proper, The outer wall of the mouth of the flask and the inner wall of the butyrometer are so ground as to form a sealed joint. The butyrometer is graduated to 0.5 per cent.

In the test 2.5 gm. of cheese is weighed into the flask and 6 cc. of sulphuric acid (specific gravity 1.5) is added. The flask and contents are heated on an asbestos plate until the cheese is completely dissolved, and 16.5 cc. of sulphuric acid (specific gravity 1.5) and 1 cc. of amyl alcohol are added. The butyrometer attachment is then placed on the flask and the apparatus kept for about one-half minute on the hot plate. After going through the other details of the procedure, the butyrometer attachment with its contents is stoppered with a rubber, whirled in a centrifuge for three minutes, and placed in a water bath at 67° C. The height of the fat column is then read. The total solids of the cheese may be estimated by drying the cheese in the flask previous to adding the sulphuric acid.

The methods of determining fat in dry milk, cream, and milk are also described.

Concerning the measurement of diastase activity in plant extracts, C. O. Appleman (*Abs. in Science, n. ser., 41 (1915), No. 1048, pp. 175, 176*).—"Several methods have been proposed for the measurement of the velocity of diastase activity in plant extracts. The procedure adopted by several investigators is based upon the determination of the amount of reducing sugar, usually calculated as maltose, produced by the action of a definite amount of extract upon an excess of soluble starch for a definite length of time at constant temperature. The Kjeldahl 'law of proportionality' is sometimes observed and sometimes ignored."

The general inapplicability of the method for plant extracts is very strikingly shown in the following, which refers to the diastase activity in glycerin extracts from cold-storage potatoes: The number of milligrams of sugar at 40° C. per hour per 100 gm. of potato pulp, calculated as maltose, was 17 mg. of total reducing sugar on March 28, and the total sugar was 3.6. On December 20 the former was 24.6 and the latter 3.7. On January 13 the amounts were 81.9 and 3.7, respectively.

"Calculated on the basis of increase in total reducing sugars or maltose in the extract after incubation with soluble starch, the tubers would show a very marked increase in diastase with storage, but when calculated on basis of increase in total sugar, the diastase activity remains practically constant. The amount of sucrose in the tubers increases with cold storage. It is extracted with the diastase and is inverted at the incubation temperature, according to the law of the mass action. Since nonreducing, hydrolyzable sugars are present in many plant tissues and are subject to wide variation in the same tissue, the above-described method in unmodified form is not reliable." See also a previous note (E. S. R., 32, p. 129).

Estimates of cholesterol in serum by gravimetric and colorimetric methods, P. G. Weston (*Jour. Med. Research, 29 (1914), No. 3, pp. 457–464*).—This is a continuation of work previously published[a] and consists of a comparative study of the gravimetric digitonin method with the author's colorimetric method. For the experiments pure cholesterol prepared from gall stones, human brains, and blood serum was used. Determinations were made of (1) pure cholesterol, (2) impure cholesterol extracted from serum, and (3) impure cholesterol extracted from serum plus a known quantity of pure cholesterol.

"Known quantities of pure cholesterol subjected to the same process as that employed in the extraction of cholesterol from serum yielded 99.44 per cent according to the colorimetric estimates and 108.56 per cent by weight. Serum to which 1 mg. of pure cholesterol had been added to each cubic centimeter yielded an excess of 1 mg. per cubic centimeter according to the colorimetric method and an excess of 1.3835 mg. by weight. In the 17 experiments in which a known quantity of cholesterol was estimated by both methods the results obtained by colorimetric estimation were uniformly more accurate than the results obtained by weight."

The use of the interferometer in agricultural investigations, H. Kappen (*Landw. Vers. Stat., 83 (1914), No. 5–6, pp. 385–396; abs. in Ztschr. Angew. Chem., 27 (1914), No. 37, Referatenteil, p. 298*).—This apparatus is employed for determining the refraction of fluids. It is said to be a decided improve-

[a] Jour. Med. Research, 26 (1912), No. 3, pp. 531–546.

ment over the immersion refractometer, inasmuch as it will give more dependable results for very dilute solutions. From some of the results obtained with the apparatus it seems clear that it can be employed for the examination of milk, water-soluble constituents of soils, dissolved substances in river water, etc.

The burning quality of cigar wrapper, III, S. TIJMSTRA (*Bul. Deli. Proefstat. Medan, No. 3 (1914), pp. 30, figs. 2*).—The burning quality of the wrapper is defined as the ease with which the burning of the wrapper keeps pace with the burning of the filler without lagging behind the latter. The glowing test is not believed to be a theoretical or practical test for determining the burning quality of a tobacco. Burning quality and glowing quality are to a certain extent opposing properties. The extinction capacity of the tobacco leaf could be determined or in its stead the thickness of the leaf. The denser the leaf the greater will be its glowing property and the less its burning power.

In determining the burning power of the tobacco, 4 trapezium-shaped pieces cut out of the tobacco leaf are rolled loosely on bamboo twigs, with the upper side of the leaf facing outwards. The small "cigars" thus prepared, containing the bamboo, are placed 1 cm. deep into small glass tubes 14 cm. high and 4 mm. wide. The surface of the "cigar" protruding from the glass tube should be just 12 sq. cm. The bamboo twig is then carefully removed from the tobacco, and the latter is dried over sulphuric acid (specific gravity 1.3) until a constant moisture content is obtained. The glass tube holding the "cigar" is inserted into the hole of a small rubber stopper, which is then put into a glass tube, bent four times vertically, and connecting with a 5-liter aspirating bottle provided with a 1-meter siphon tube. The cigar is lighted and the water is allowed to run from the aspirator flask at the rate of 500 cc. per minute. The number of seconds required to burn a cigar represents the burning quality of the tobacco, the less time required for burning the tobacco the better being the quality of the tobacco.

The methods for estimating burning quality of tobacco previously proposed by the author,[a] by Garner (E. S. R., 18, p. 35), and by other workers are discussed at length.

Studies on fruit juices, H. C. GORE (*U. S. Dept. Agr. Bul. 241 (1915), pp. 19*).—"The studies described in this bulletin were made with a view of finding methods for the preparation of juices from such fruits as the strawberry, blackberry, pineapple, orange, and lemon. . . . The actual fruit used wherever practicable was that produced under typical conditions in localities where it is grown extensively."

It was found that ordinary methods of sterilizing fruit juices by heat could be applied successfully to only a limited number of the special fruits as black raspberry, blackberry, black currant, sour cherry, and peach. The strawberry, red raspberry, red currant, pineapple, and citrus fruit juices, and apple cider were found to lose in flavor when sterilized by heat. Special tests were made with the latter named fruits for the purpose of devising methods of storing by refrigeration or sterilization with carbon dioxid.

The general methods of preparing fruit juices are discussed as a preliminary to the discussion of the special methods.

"Satisfactory yields of juice were easily obtained from all of the fruits studied. Lemon and orange juices were best expressed by cutting each fruit into several pieces and then pressing, a method which could be successfully used

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[a] Meded. Deli-Proefstat. Medan, 5 (1910), No. 2, pp. 25–45, figs. 3; 6 (1911), No. 8, pp. 257–288, figs. 3.

in pressing pineapples, although the method of pressing the fruit without previous cutting is probably superior. It was found advisable to pass all of the other kinds of fruit pressed without heating through an apple grater to facilitate the outflow of the juice.

"Heating before pressing in the case of black raspberry, blackberry, red currant, black currant, and huckleberry juices resulted in larger yields of juice and the development of more color and a more distinctive flavor than were obtained from cold pressing. Strawberries, red raspberries, cherries, peaches, pineapples, lemons, and oranges were cold pressed.

"Heating the juices sufficiently to sterilize them did not affect injuriously the color of any of the fruit juices, though pineapple, lemon, and orange juices usually darkened somewhat if heated in the presence of dissolved oxygen or if exposed to atmospheric oxygen during the heat treatment.

"The distinctive flavor of the fresh fruit was greatly injured and the familiar cooked-strawberry taste appeared when strawberry juice was sterilized by heat. The fresh fruit flavor of orange juice was also distinctly injured when the juice was heated. Although all lost in the quality of freshness, heating did not seriously affect the flavor of other fruit juices, except in cases where the heat employed was excessive.

"The extent to which color and flavor were retained on keeping the juice after sterilization varied greatly in the juices from the various fruits. In strawberry juice the brilliant red color of the freshly sterilized juices in all cases faded greatly and further flavor losses occurred. Sterilization and subsequent keeping in carbon dioxid were not effective in securing color retention.

"Red currant juice very gradually lost in distinctive color and flavor on being kept at room temperature after sterilization, and keeping in carbon dioxid was not effective in securing either color or flavor retention. Cold storage at from 32 to 35° F. was found to be a very satisfactory means of controlling color and flavor changes.

"The distinctive colors and flavors of black currant, blackberry, and black raspberry juices were satisfactorily retained during prolonged periods at common storage. The flavor of blackberries was, however, distinctly less well retained than that of black currants or black raspberries, though it did not undergo a perceptible change during a storage period of six months.

"In the case of red raspberries the distinctive color and flavor were poorly retained, even on keeping the juice in carbon dioxid in cold storage at from 32 to 35°.

"When sterilized and subsequently kept in carbon dioxid the distinctive color of pineapple juice remained practically unchanged. When exposed to atmospheric oxygen at juice surfaces during and after sterilization marked darkening occurred. Change in color was also found to be greatly, though not wholly, retarded by keeping the juice in cold storage at from 32 to 35°. On keeping the juice at ordinary temperatures the distinctive pineapple flavor gradually lessened, though the juices remained recognizable as pineapple. By keeping in cold storage at from 32 to 35° F. flavor change was almost wholly prevented,

"The distinctive colors and flavors of peach and cherry juices were quite well retained while kept at room temperatures. Huckleberry juice, hot pressed, lost in flavor on keeping.

"Lemon juice darkened in color if sterilized and kept in the presence of atmospheric oxygen, though the color was satisfactorily retained when the juice was sterilized and kept in carbon dioxid or in vacuum. In all cases an off-flavor, designated as a 'bottled lime-juice' flavor, appeared in the lemon juice after it had been kept for a time after sterilization, even though in cold storage at from 32 to 35°.

"Orange juice also underwent a marked darkening in color when kept at room temperatures after being sterilized. The color was fairly well retained when atmospheric oxygen was excluded by sterilizing the juice and subsequently keeping it in vacuum or in carbon dioxid, and the change in color was well controlled by keeping the juice at low temperatures. The flavor of sterilized orange juice, already slightly injured by the heating necessary for sterilization, underwent further changes when kept at room temperatures. It was found that by keeping the juice in cold storage at from 32 to 35° the flavor was well retained for long periods.

"The distinctive colors and flavors of all fruit juices kept in freezing storage at about −10° C. (14° F.) were found to remain practically unchanged during many months, except that a peculiar coagulation of much of the coloring matter appeared in the juice of the black raspberry. It was possible to concentrate fruit juices to sirups by freezing out the water as ice and centrifugalizing. Characteristic colors and flavors were well retained on concentrating.

"Infusorial earth greatly promotes the filtering of fruit juices, as it retards greatly the clogging of the filter."

When, what, and how to can and preserve fruits and vegetables in the home, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 27 (1915), pp. 3–8*).—A description of home canning methods. The material is arranged in seasonal form. A section on drying fruits and vegetables is included.

METEOROLOGY.

The rainfall régime of the several States, B. C. WALLIS (*Mo. Weather Rev., 43 (1915), No. 4, pp. 176–178, fig. 1*).—In this article an attempt is made to group the States which have similar rainfall conditions on the basis of rainfall data used in the construction of equipluves presented in previous articles (E. S. R., 32, p. 119). The results are shown in the following map:

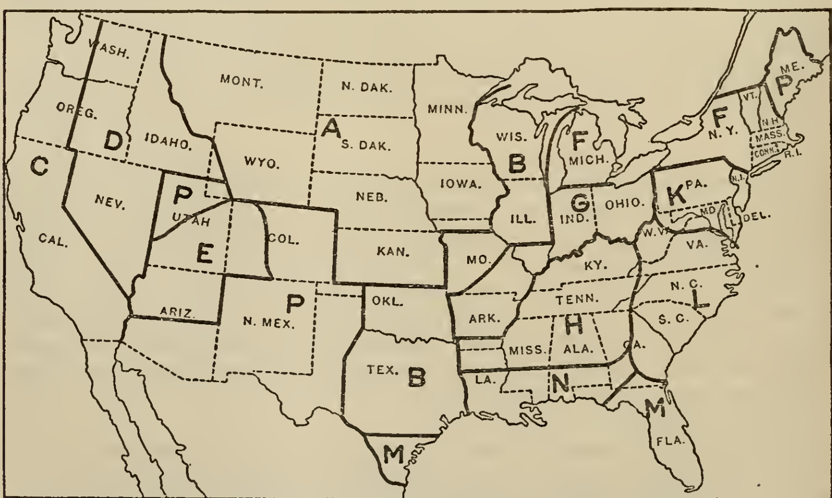

FIG. 1.—Approximate grouping of States as rainfall sections.

The rainfall regions shown on this map are as follows:

Summary of the rainfall régimes of the several States.

Sections (fig. 1).	Months bringing—		Average precipitation.	Range of intensity.
	Principal maximum intensity.	Principal minimum intensity.		
			Inches.	*Pluviometric coefficient.*
A	June	January	23	161
B	June	January	33	96
C	January	July	31	194
D	January	July	13	117
E	February	June	14	112
F	July	January	38	34
G	May	October	42	57
H	March	October	50	65
K	July	November	44	39
L	August	November	48	75
M	September	January	25	142
N		October	55	85

The distribution of the rainfall in the western United States, B. C. WALLIS (*Mo. Weather Rev., 43 (1915), No. 4, pp. 170–175, figs. 19*).—This is a discussion similar to that of rainfall intensity of the eastern United States already noted (E. S. R., 33, p. 117). It contains twelve monthly maps of equipluves besides charts of rainfall intensity, for the region west of the 103d meridian. These show " a notable regularity almost throughout the year, a very wet area gradually fades off into a very dry district. The exceptional month is October, when the raininess is uniformly below the average, and the elevated lands are wetter than the lowlands. The second general feature is the absence of very marked raininess or dryness on the mountains at any time of the year. This fact is well shown by the graphs for the mountain divisions. Consequently, in a broad way, the West contains three regions with three types of rainfall: (1) The far west, including the coast lands, with great rainfall intensity throughout the period November to March—i. e., winter rains; (2) the mountains, never very wet, never very dry; (3) the eastern slopes, with great rainfall intensity in the north from April to June, and in the south from July to September—i. e., summer rains."

A study of the rainfall charts for the western United States in conjunction with those of the eastern United States " indicates that the rainfall of the United States as a whole is determined by (1) continental influences which are exerted over a broad triangle of country, with the vertex to the south and with the edge of the Rocky Mountains as the eastern limb of the triangle; (2) oceanic influences exerted upon the coastal lowlands, (a) on the west from the Pacific and (b) on the east from the Atlantic; (3) intermediate regions (a) the Rockies in the west and (b) the western Appalachians on the east; and (4) direct solar influences which are manifest with some elements of variety along the southern boundary as far west as Yuma, Ariz."

The influence of a western yellow pine forest on the accumulation and melting of snow, A. J. JAENICKE and M. H. FOERSTER (*Mo. Weather Rev., 43 (1915), No. 3, pp. 115–126, pls. 3*).—This article reports a study of the influence of a virgin western yellow-pine forest on the accumulation and melting of snow. This study was made at the Fort Valley (Forest) Experiment Station, Ariz., during the winters of 1910–11 and 1912–13 "upon two areas, alike in all respects, except that one was forested and the other naturally treeless."

The results, reported in detail, indicate that there was no appreciable difference in the total amount or density but great difference in distribution on the ground of snow in the forested and nonforested areas. The rate of melting in winter was greater in the forest than in the open. Melting in spring was most rapid and the run-off greatest in the open. The snow disappeared more gradually and the absorption and retention of water by the soil was greater in the forest than in the open.

The authors conclude in general "that the value of forest cover in the conservation of snow waters is great, even when that forest cover is of such an open and broken character as the typical western yellow-pine forest on which observations were made in this study." Commenting upon this study and the deductions drawn from it, officials of the Weather Bureau question whether certain of the conclusions drawn, especially those relating to the causes of difference in conservation of snow in the forested and open areas, are sufficiently supported by the data presented.

Atmospheric influence on evaporation and its direct measurement, B. E. Livingston (*Mo. Weather Rev., 43 (1915), No. 3, pp. 126–131, figs. 2*).—This article deals briefly with some general principles of atmometry and discusses the relative merits of different types of atmometers, especially the porous clay-cup atmometer. It is stated that the latter "possesses all the advantages over the free water surface that are possessed by the Piche, Piche-Cantoni, and Bellani instruments. Its main advantage over these instruments lies in this, that its surface projects up into the air and is exposed equally to wind action in all directions. Its surface is somewhat similar to that of plants, which is also the surface of a water-imbibed solid, and its exposure to the surrounding aerial conditions is similar to the mean exposure of the surfaces of the foliage of an entire plant. For this reason it has proved especially valuable in studies bearing upon water loss from plants. The rigidity of the cups also makes them more satisfactory than the somewhat flexible paper disks."

A bibliography of literature relating to the subject is appended.

Monthly weather periodicity, V. Köppen (*Mo. Weather Rev., 43 (1915), No. 4, pp. 179–181*).—This article adduces evidence to show that there is no weather periodicity due to the influence of the moon.

Influence of the moon on weather (*Mo. Weather Rev., 43 (1915), No. 4, p. 182*).—A brief reference is here made to a memoir by G. Wagner which contains a critical summary of modern scientific investigations on the possible lunar influences on terrestrial weather. This refutes the popular belief that this influence is sufficiently strong to permit of its direct unaided observation, and that one can even deduce weather forecasts from it.

Monthly Weather Review (*Mo. Weather Rev., 43 (1915), Nos. 3, pp. 99–157, pls. 11, figs. 6; 4, pp. 159–209, pls. 8, figs. 27*).—In addition to weather forecasts, river and flood observations, and seismological reports for March and April, 1915; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; a condensed climatological summary; and the usual climatological tables and charts, these numbers contain the following articles:

No. 3.—The Total Radiation Received on a Horizontal Surface from the Sun and Sky at Washington, D. C. (illus.), by H. H. Kimball; Solar Radiation Intensities during January, February, and March, 1915, and the Total Solar and Sky Radiation during March at Washington, D. C., by H. H. Kimball; Thermo-isopleths for Washington, D. C. (illus.), by C. Abbe, jr.; The Influence of a Western Yellow Pine Forest on the Accumulation and Melting of Snow (illus.), by A. J. Jaenicke and M. H. Foerster (see p. 319); Atmospheric Influence on Evaporation and Its Direct Measurement (illus.), by B. E. Livingston (see p. 320); The Introduction of Meteorology into the Courses of Instruction in Mathematics and Physics, by C. Abbe; Lightning and Protection from It, by J. Larmor; Lightning Injury to Cotton and Potato Plants, by L. R. Jones and W. W. Gilbert; Weather and Health; and Huntington on the Climatic Factor, by W. J. Humphreys.

No. 4.—Solar and Sky Radiation Measured at Washington, D. C., during April, 1915, by H. H. Kimball; The Origin of the Wind (illus.), by J. W. Sandström; Some Recent Researches on the Motion of Fluids (illus.), by H. Bateman; The Distribution of the Rainfall in the Western United States (illus.), by B. C. Wallis (see p. 319); The Rainfall Régime of the Several States (illus.), by B. C. Wallis (see p. 318); Meteorological Observations Near Schiefflin, Liberia, 1913–1914, by P. C. Day; Monthly Weather Periodicity, by V. Köppen; Influence of the Moon on Weather; and Beaufort Wind Scale and New Russian Equivalents, by B. Galitzin.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 1 (1914), No. 13, pp. 386, pls. 2, figs. 44*).—This number contains brief summaries and detailed tabular statements of climatological data for each State for the year 1914.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 2 (1915), Nos. 3, pp. 234, pls. 2, figs. 7; 4, pp. 226, pls. 2, figs. 12*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1915, respectively.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander, R. E. McLain, and D. Potter (*Massachusetts Sta. Met. Buls. 317, 318 (1915), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1915, are presented. The data are briefly discussed in general notes on the weather of each month.

SOILS—FERTILIZERS.

[Soil analyses], A. N. Hume (*South Dakota Sta. Rpt. 1913, pp. 19–24*).—Incomplete chemical analyses of the brown sandy loam soil used in fertility experiments previously noted (E. S. R., 29, p. 728) indicate that the average nitrogen content of the surface soil to a depth of $6\frac{2}{3}$ in. over an acre weighing about 2,000,000 lbs. is 6,325 lbs. The acid-soluble phosphorus in the same amount of soil averages 1,151 lbs., and the incomplete analyses for potassium indicate a content of 23,720 lbs. The results as a whole are taken to indicate that phosphorus is the limiting element in this soil.

Gola's osmotic theory of edaphism, F. Cavers (*Jour. Ecology, 2 (1914), No. 4, pp. 209–231*).—It is the object of this article to summarize a series of contributions to edaphology by G. Gola.

Colloidal phenomena, with special reference to soil colloids, are first briefly considered as forming an essential part of the basis of Gola's theory. Gola's main thesis is "that the relations between plants and the soil are chiefly determined by the concentration of the soil solution and the limits between which this may vary, and he lays special stress upon the contrasting characters of the colloidal and crystalloidal constituents of the soil. . . .

"Soils may be divided into two main groups—(1) soils in which the soil solution is rich in mineral substances and its concentration is relatively high, though liable to vary within somewhat wide limits, and (2) soils in which the soil solution is poor in mineral substances and shows a relatively low and usually also a relatively constant concentration. The roots or other absorbing organs in contact with a soil solution of the first type are subject to high osmotic pressure, which is moreover very variable, so that the plant must use such means of regulation as it possesses in order to guard against the differences in tonicity of the solution around its absorbing surface. In plants growing in a soil solution of the second type the osmotic pressure around the absorbing surface is very low, and its relative constancy enables the plant to dispense with the regulatory mechanisms necessary for those growing in a more concentrated solution."

A list of Gola's papers bearing on the subject is appended.

The nature and methods of extraction of the soil solution, W. Stiles and I. Jørgensen (*Jour. Ecology, 2 (1914), No. 4, pp. 245–250*).—Results obtained by different experimenters using different methods in investigating the actual nutrient medium of plants by isolating and analyzing the soil solution are briefly reviewed.

It is thought that the investigation of the composition of soil water marks a great advance in soil investigations. "However, the complex character of the soil must not be forgotten, and it is especially necessary to remember that the presence of colloidal substances (hydrosols and hydrogels) will naturally alter the conditions of things."

It is also thought that in extracting the soil solution the relations between the crystalloids and colloids of the soil will suffer disturbance which will result in a corresponding difference between the actual soil solution and that obtained by extraction. It is concluded, therefore, that the advance along such lines "must depend very largely on further investigations into soil physics."

A list of references to related literature is appended.

The difficulty with which soils and finely pulverized substances generally are moistened, P. Ehrenberg and K. Schultze (*Kolloid Ztschr., 15 (1914), No. 5, pp. 183–192, fig. 1*).—The authors briefly review the work of others bearing on the subject, and report experiments with pulverized peat and lampblack, from the results of which they conclude that the difficulty of moistening lampblack, peat, and soil in the pulverized condition is due to the adsorption of air and not to waxy or resinous coverings on the particles.

The ground water, E. Grohmann (*Jour. Landw., 62 (1914), No. 2, pp. 121–123, figs. 2*).—This article deals with the relations between precipitation, water level in rivers, and ground-water level, with particular reference to the Elbe River district in the neighborhood of Dresden.

The results of several years' observations in this district show a marked influence of the precipitation on the ground-water level, which is, however, less marked with the heaviest and the lightest rainfall in a given time than with the rainfall of medium intensity, and less the lower the atmospheric humidity.

The low ground-water level and Elbe River level in the district during the past ten years, in spite of the heavy precipitations, is attributed to smaller water absorbing and retaining powers of the soil caused by the kind of cultivation practiced.

Water movement in peat, H. J. Franklin (*Massachusetts Sta. Bul. 160 (1915), pp. 113–115*).—Observations made, by means of test holes, on the movement of water in the peat soil of the cranberry bog at the substation at Wareham, Mass., indicated that if conditions in this bog are representative, the horizontal movement of water through the peat of cranberry bogs is very rapid.

Antagonism between anions as affecting barley yields on a clay adobe soil, C. B. Lipman and W. F. Gericke (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 201–218, pl. 1*).—Pot culture experiments with barley on a clay adobe soil mixed with sodium chlorid, sodium sulphate, and sodium carbonate, singly and in different combinations, are reported, the results of which establish for the first time, in the author's opinion, the existence of antagonism between anions for barley in a clay adobe soil. Two crops were grown in succession in the same pots, allowing the soil a rest period of three months.

Antagonism was shown between sodium chlorid and sodium sulphate and between sodium chlorid and sodium carbonate in the second crop. None was shown in the first crop. There was slight antagonism between sodium carbonate and sodium sulphate in the first crop but it is considered questionable whether any existed at all in the second crop.

In testing the toxicity of single salts, it was found that 0.1 per cent each of sodium chlorid and sodium sulphate stimulated barley in the first crop and was toxic in the second crop. Sodium carbonate did not manifest toxicity, but on the contrary showed stimulation even up to concentrations equal to 0.3 per cent of the dry weight of the soil.

In an experiment similar to these, in which sodium sulphate was used in constant toxic quantities of 0.4 per cent and calcium sulphate in varying quantities, it was found that the calcium sulphate strongly antagonized the sodium sulphate in both the first and second crops. "At least so far as some seasons are concerned, small quantities of gypsum are as efficient for the purpose as larger quantities, if not more so. . . .

"It would appear from the above results that it would not be a difficult matter to establish a mode of treatment which would involve the neutralization of the toxic effects of any one or even two of the alkali salts by another alkali salt. . . . It is clear that in a heavy soil, at least by additions of gypsum at the rate of about 2 tons to the acre or common salt in smaller quantity, we could change the soil from a very poor into a normally producing one, despite the fact that we have very considerably increased the total salt content thereof."

A list of references to literature bearing on the subject is appended.

Antagonism between anions as affecting soil bacteria.—III, Nitrogen fixation, C. B. Lipman and P. S. Burgess (*Centbl. Bakt.* [*etc.*], *2. Abt., 42 (1914), No. 17–18, pp. 502–509*).—In further studies of the effects of alkali salts on bacteria in soils (E. S. R., 32, p. 320), nitrogen fixation investigations were conducted from which the following conclusions are drawn:

"Very slight, perhaps questionable antagonism between anions occurs for the nitrogen fixing flora of . . . sandy soil when Na_2CO_3 and NaCl are mixed, whether one or the other is used as a constant toxic factor. The same is true when NaCl and Na_2SO_4 are combined, provided the first-named salt is the constant toxic factor. It is not true when Na_2SO_4 is used as the constant toxic factor. No antagonism obtains between Na_2CO_3 and Na_2SO_4 no matter how the salts are combined and no matter which of them is used as the constant toxic factor. The concentrations at which nitrogen fixation ceases are lower when the salts are mixed than when they are used singly.

"The nitrogen fixing flora differ totally in respect to antagonism between anions from the ammonifying and the nitrifying flora of the same soil. The resistance of these nitrogen-fixing flora, however, to salt effects is far greater than that of the other flora named."

Relation of carbon bisulphid to soil organisms and plant growth (*Wisconsin Sta. Bul. 250 (1915), pp. 18, 19*).—It was found in experiments by E. B. Fred that the effect of carbon bisulphid on plant growth is not a constant factor, but varies with the type of soil employed, a marked harmful effect being produced with acid soils. The most consistent beneficial results were obtained with plants demanding a large amount of sulphur.

New experiments on alkali soil treatment, C. B. LIPMAN and L. T. SHARP (*Univ. Cal. Pubs. Agr. Sci., 1 (1915), No. 9, pp. 275–290, pls. 4*).—Experiments on the treatment of alkali soils are reported which were based on the principle of antagonism between ions and between anions discussed in the two reports noted above, and on the behavior of soil colloids and chemical soil constituents in the presence of soluble salts.

The soil used contained 0.64 per cent of water-soluble salts, 0.459 per cent being sodium chlorid, 0.098 per cent sodium sulphate, and 0.083 per cent sodium carbonate. It had never been cropped and had borne only a sparse vegetation of plants resistant to alkali and drought. The different pots containing 6 kg. of the soil received the following treatments: 30.42, 41.76, and 11.02 grains of sulphuric acid, 62.08 grains of calcium sulphate, 6 grains of copper sulphate, 30 grains of ferrous sulphate, 12 grains of sodium sulphate, and 300 grains of air-dry barnyard manure. Three days after treatment the pots were planted to barley.

It was found that the sulphuric acid treatments were especially beneficial, particularly at the smallest application, to the growth of barley. The treatments with calcium and ferrous sulphates and barnyard manure were also instrumental in improving very materially the producing power of the soil for barley. Copper and sodium sulphates had no favorable effect on the yield of barley and appeared to render the soil a poorer medium for its growth. With reference to the total yields of grain produced, the smallest of the three sulphuric acid applications gave by far the best results of all the treatments. Gypsum stood second in this respect, while the intermediate sulphuric acid treatment and the manure treatment gave about the same results. The root development was most constant and regular in the sulphuric acid pots.

In explanation of the causes underlying these results "it may be said . . . that the H_2SO_4 exerted its influence both in the direction of neutralizing the Na_2CO_3 and that of improving the soil's physical condition through its shrinkage of colloids. In smaller measure gypsum exerted similar effects and in addition thereto exerted the characteristically strong antagonistic effect to the sodium and acid ions which calcium is known to exert in the plant world. The effects of $FeSO_4$ are to be explained in general as are those of $CaSO_4$. The effect of the barnyard manure is probably exerted through the organic colloids produced in its decomposition, which through the enormous surface they possess hold much of the salts or components of the latter in a condition which prevents their ready solution in the soil water."

A brief outline of further studies along this line, which are to be reported later, is given.

The dead moor on Steinhude Lake, C. BIRK (*Arb. Lab. Tech. Moorverwert., 1 (1914), No. 1, pp. 1–102, pls. 12, figs. 5*).—This paper describes the geography, geology, and climate of the district in Schaumberg-Lippe in which the dead moor occurs, and reports studies of the origin and development of the moor and of the chemical and physical properties of the different kinds of peat, with particular reference to their industrial uses. The new sphagnum peat is the predominating type.

It is stated that the industrial utilization of the peat must precede the successful agricultural development of this moor. Analyses of samples of the moor soil taken at two depths (the layer to a depth of about 8 in. and the layer from 8 in. to about 40 in.) indicate that the upper layer contains about 0.7 per cent nitrogen, 2.4 per cent mineral matter, 0.19 per cent lime, and 0.04 per cent phosphoric acid, while the lower layer contains about 0.9 per cent nitrogen, 1.97 per cent mineral matter, 0.29 per cent lime, and 0.05 per cent phosphoric acid.

The surface soil is somewhat lower in plant food content than the average northwest German high moor soil, but it is thought that with proper cultural treatment it is fit for farming purposes.

Management of marsh soils (*Wisconsin Sta. Bul. 250 (1915), pp. 12–14*).—Cooperative tests reported by H. Ullsperger demonstrate the importance of the use of commercial fertilizers containing potassium and phosphorus on marsh soils.

The results of technical moor utilization, G. Keppeler (*Arb. Lab. Tech. Moorverwert., 1 (1914), No. 1, pp. III–XIII*).—The author briefly discusses the agricultural development of peat moors and the use of peat for fuel and for the manufacture of illuminating gas and ammonia.

Changes in a sterile sand by cropping, E. Blanck (*Jour. Landw., 62 (1914), No. 2, pp. 129–140*).—In continuation of work along the same general lines (E. S. R., 31, p. 621), three years' pot experiments were conducted with oats and peas, using a sterile quartz sand from the Oder River to determine the extent to which the plant food in the sand is set free by the roots of the plants.

It was found that the small stock of plant food in the sand was readily yielded to plants and the sand rapidly impoverished in plant food, being by the fourth year without fertilization completely unfit for plant growth. The impoverishment in plant food, especially lime and magnesia, due to culture of peas was much more marked than that due to culture of oats, thus verifying the theory that leguminous plants possess greater power for setting free plant food than gramineous plants. The peas as a first crop favorably influenced the oats as a second crop, due to the great power of the former for setting free plant food. The reverse was not true.

It was also found that in cases of potash deficiency sodium was effective as a substitute.

Management of sandy soils (*Wisconsin Sta. Bul. 250 (1915), pp. 8–11, figs. 3*).—In a description of experiments by H. Ullsperger on the management of sandy soils it is stated that the incorporation of humus in the soil by a system of plowing under the second crop of clover has for two years greatly increased the water-holding capacity of the soil. It is believed that the use of commercial fertilizers in combination with green manuring crops will permit the profitable working of sandy soils when crops adapted to such soils are grown.

Farm manures, J. C. Beavers (*Indiana Sta. Circ. 49 (1915), pp. 20, figs. 3*).—"This publication is prepared for the purpose of acquainting farmers with the value and the best methods of conserving and using farm manures."

Farm manure, G. A. Olson (*Washington Sta. Popular Bul. 90 (1915), pp. 8*).—This gives a popular discussion of the value of farm manure, methods of preserving it, and its proper application, with particular reference to farming conditions in the State of Washington.

Data from various sources are reviewed to show the favorable effects of using manure in the State, particularly when consisting of a mixture of solid and liquid manure.

Chemical preservation of manure, P. A. Maignen (*Abs. in Science, n. ser., 41 (1915), No. 1054, p. 405*).—This is a brief note on a paper presented at the recent Philadelphia meeting of the American Association for the Advancement of Science, in which a plea was made for the better conservation of the valuable fertilizing matter which is now largely going to waste as sewage.

Manuring of farm crops (*Armstrong Col., Newcastle-upon-Tyne, Agr. Dept. Bul. 11, pp. 8*).—Directions based upon field experiments at Cockle Park and elsewhere in the northern counties of England for the use of manures and commercial fertilizers on various crops, including rutabagas (swedes), turnips, potatoes, mangels, cabbages, barley, oats, wheat, beans, and grass and clover mixtures, are given. The directions take account of the shortage in supply of potash salts and restrict, or entirely eliminate, the use of potash.

Influence of organic substances on the decomposition and action of nitrogenous compounds in the soil, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1915), No. 5, pp. 309–327*).—Pot experiments on this subject have already been noted (E. S. R., 27, p. 626).

The experiments here reported were made with pits each containing 1 cubic meter of soil. Otherwise the method of investigation was substantially the same as in the pot experiments, and the results were in the main the same. The organic matter was applied in the form of ground straw used in varying amounts alone and in combination with sodium nitrate.

The results were inconclusive as to the value of the straw alone for increasing the productiveness of the soil. They were, however, conclusive as regards the effect of such substances in reducing the assimilation of nitrate nitrogen. When the nitrate nitrogen was used alone 60 per cent of the amount applied was recovered in the crop. When it was applied in combination with straw only 20 per cent was recovered in the crop.

Conditions of Chilean nitrate industry, V. L. HAVENS (*U. S. Dept. Com., Com. Rpts., No. 73 (1915), p. 1249*).—The conditions as regards production, plants in operation, wages, freight rates, and prices up to and including January, 1915, are briefly summarized.

The fixation of atmospheric nitrogen, W. S. LANDIS (*Metallurg. and Chem. Engin., 13 (1915), No. 4, pp. 213–220, figs. 17; Jour. Indus. and Engin. Chem., 7 (1915), No. 5, pp. 433–438, figs. 3; abs. in Amer. Jour. Sci., 4. ser., 39 (1915), No. 234, pp. 676, 677*).—This article deals particularly with the cyanamid process and the factory established at Niagara Falls to manufacture nitrogen compounds by this process.

Fixation of atmospheric nitrogen, L. L. SUMMERS (*Amer. Fert., 42 (1915), No. 6, pp. 41–52*).—The various processes of fixation of atmospheric nitrogen which have shown promise of practical success are described and their commercial possibilities are discussed.

Is the loss of lime from the soil increased by kainit fertilizing? GERLACH and VECKENSTEDT (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1915), No. 5, pp. 382–388*).—The results of pot experiments here reported show that fertilizing with kainit caused a marked increase in the loss of lime in the drainage water. This loss was greater with kainit than with other fertilizing materials. There was, however, a considerable loss of nitrogen from unfertilized soils. It was also observed that the loss was much greater in very loose soil than in soil in natural condition. An examination of 120 different soils showed that the lime content of the subsoil was uniformly greater than that of the surface soil.

Manuring experiments with manganese carbonate in Italy, G. D'IPPOLITO (*Agr. Mod. [Milan], 20 (1914), No. 17, pp. 259, 260; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, pp. 1424, 1425*).—A marked increase in yield of wheat and alfalfa from applications of 180 lbs. per acre of a natural manganese carbonate (35 per cent carbonate) and of a natural phosphocarbonate (containing 35 per cent carbonate and 11 per cent phosphoric acid) is reported.

Wool and leather wastes, E. J. RUSSELL (*Jour. Bd. Agr.* [*London*], *21* (*1915*), *No. 12, pp. 1087–1092*).—The fertilizing value of shoddy as indicated by analysis and by the results of field experiments is briefly discussed. A note is also given on the fertilizing value of leather waste, emphasizing particularly the necessity of treating the leather with sulphuric acid to make it more available as a fertilizer.

A note on the export of manures from India (*India Tea Assoc., Sci. Dept. Quart. Jour., No. 2* (*1914*), *pp. 49–51*).—Data for the years 1910–11, 1911–12, and 1912–13 for exports of bones, fish manure and guano, oil cake, and other fertilizing materials are tabulated.

A pronounced increase in exports of all kinds of fertilizing materials occurred during the period named. The increase was especially marked in the case of oil cake. The figures for 1912–13 are as follows: Bones, 110,221 long tons, valued at $2,558,245.97; fish manure and guano, 21,408 tons, valued at $337,-768.52; oil cake, 3,235,703 tons, valued at $3,996,869.14; and other fertilizing materials, 8,338 tons, valued at $247,630.74. The largest importers of bones were, in the order named, Belgium, France, the United Kingdom, Germany, Japan, and Ceylon; the United States imported 7,761 tons. The larger proportion (17,885 tons) of the fish manure went to Ceylon. Of the oil cake the largest importers were, in the order named, Ceylon, United Kingdom, Japan, and Germany. The use of fertilizers in Ceylon, especially in tea culture, is comparatively large and steadily increasing.

AGRICULTURAL BOTANY.

Inorganic plant poisons and stimulants, WINIFRED E. BRENCHLEY (*Cambridge: University Press, 1914, pp. X+110, pls. 7, figs. 12*).—The author gives an account of investigations on the toxic effect of compounds of copper, zinc, arsenic, boron, and manganese on different species of plants.

Summarizing the results obtained, she states that copper compounds act as poisons to higher plants, and that only under particular and peculiar conditions and in very great dilutions is any stimulative action clearly demonstrated.

Zinc compounds are somewhat less toxic to higher plants, and their stimulating influence is still considered uncertain except in very great dilutions. In soil cultures increased growth seems to have been established, as certain species of plants respond to zinc salts, though no increase is obtained with other species. Among the fungi, particularly with *Aspergillus niger*, the stimulating effect is recognized.

The toxic effect of arsenic upon higher plants was found much more marked with arsenious acid and its compounds than with arsenic acid and its derivatives. With certain algæ stimulation may follow the presence of arsenic compounds under certain conditions, while with fungi it appears that some species are able to live in the presence of arsenical compounds.

Among the boron compounds boric acid is said to be less harmful than are the compounds of copper, zinc, and arsenic. There seems to be evidence that below a certain limit of concentration boron exercises a favorable influence upon plant growth, encouraging the formation of stronger roots and shoots. Fungi appear to be very indifferent to boron, and there is said to be evidence to show that certain green algæ can withstand large quantities of it.

Manganese exerts a toxic influence on the higher plants if present in high concentration, but in the absence of an excess of manganese compounds the poisoning effect is overshadowed by a definite stimulation. It is considered probable that manganese may prove to be an element essential to the economy of plant life, even though the quantity usually found in plants is very small.

In conclusion the author takes exception to the hypothesis that all inorganic plant poisons act as stimulants when they are present in very small quantities. She thinks a more accurate statement would be that some inorganic poisons act as stimulants when in small amounts, the stimulating concentrations varying with the poisons used and the plants on which they act.

A bibliography is appended.

Toxic effect of iron and aluminum salts on clover seedlings, R. W. Ruprecht (*Massachusetts Sta. Bul. 161 (1915), pp. 125–129, pl. 1*).—The author claims that either iron or aluminum sulphate is harmful to the roots of clover plants, even in dilute solutions. This toxicity is overcome in large measure by the use of calcium carbonate up to a certain point, beyond which it is ineffective. Calcium sulphate does not have this beneficial effect, which would seem to indicate that it is the combination involved, and not the mere presence of the calcium, which is here effective.

Calcium carbonate counteracts iron and aluminum by precipitating them as hydroxids. The toxic action of the higher concentrations of iron and aluminum, despite the excess of calcium carbonate present, is thought to be due to the solubility of the iron hydroxid.

The idea that the toxicity of iron and aluminum salts is due to the penetration of the salts into the seedlings does not seem to be borne out. Evidence is offered in favor of the view that the toxic action is limited to the first layer or two of the cells in the growing portion of the root. The final death of the seedlings is due to a lack of nourishment rather than to a poisoning of the seedling itself. No appreciable increase in iron content is found in roots or tops of clover plants showing poor growth attributed to the influence of iron.

Effect of salicylic aldehyde on plants in soil and solution cultures, J. J. Skinner (*Biochem. Bul., 3 (1914), No. 11–12, pp. 390–402, pls. 2*).—On account of the reported presence of salicylic aldehyde in agricultural soils (E. S. R., 28, p. 418), the author has conducted experiments with various plants in solution cultures and in soil in pots. In addition the action of this substance, it is said, is being tested with various crops in the field.

Wheat, corn, cowpeas, cabbage, and rice have been tested in solution cultures, and wheat, corn, clover in soil cultures, and it was found that salicylic aldehyde was harmful to wheat and rice seedlings in distilled water, and to all the crops tested in nutrient solutions and in soil in pots. The effect of solution cultures with various fertilizer ingredients was also tested with wheat, and it was found that in amounts as small as 10 parts per million, salicylic aldehyde was injurious to its growth. The effect of this substance on the absorption of nutrient salts indicated that there was a more nearly normal absorption of phosphate than of nitrate or potash under the influence of salicylic aldehyde. In the presence of calcium carbonate the injurious influence was somewhat ameliorated. Experiments show that under alkaline conditions the harmfulness of salicylic aldehyde can not be attributed to any slight acidity it may possess.

On the decrease of permeability due to certain bivalent cations, W. J. V. Osterhout (*Bot. Gaz., 59 (1915), No. 4, pp. 317–330, figs. 11*).—It is stated that while sodium chlorid and other salts of monovalent metals increase the permeability of protoplasm, calcium chlorid has the opposite effect. This effect, however, is not permanent. If exposure is sufficiently prolonged, it will be found that it gradually passes away and is followed by increase of permeability. The question of the behavior of other bivalent cations has arisen, and the author investigated the action of a number of them on living tissues of *Laminaria saccharina.*

It was found that there was a remarkable difference between monovalent and bivalent cations in their effects on permeability. While none of the monovalent cations, except hydrogen, are able to decrease permeability, all of the bivalent cations so far investigated (Mg, Ca, Ba, Sr, Mn, Co, Fe, Ni, Zn, Cd, Sn) are able to do so to a marked degree.

The production of anthocyanins and anthocyanidins, II, A. E. EVEREST (*Proc. Roy. Soc. [London], Ser. B, 88 (1914), No. B 603, pp. 326–332*).—In a previous paper (E. S. R., 31, p. 626) the author showed that the red pigments obtained as the result of careful reduction of the yellow flavonol derivatives are identical with the natural anthocyans of plants. This point having been controverted, he has repeated some of his investigations and shows that by the reduction of flavonol glucosids, the yellow pigments present in many flowers, a series of red pigments may be obtained whose properties agree with those of the anthocyanins.

Apart from the question of anthocyan the author reports that where he obtained an anthocyan by reduction of the flavone or flavonol present in the flower extracts, he was able to show that the pigment was an anthocyanin. It would therefore follow that in each case the flavone or flavonol derivative in the plant must have been present in the form of a glucosid.

A comparative study of oxidation by catalysts of organic and inorganic origin, A. J. EWART (*Proc. Roy. Soc. [London], Ser. B, 88 (1914), No. B 603, pp. 284–320*).—This paper is a report of investigations carried out on the influence of poisoning on apples and potatoes, and in the author's judgment it necessitates a general revision of the oxidase ferments, in particular a general comparison with metallic oxidases. Detailed studies are given of apple and potato oxidase, and a comparison is made with inorganic catalysts, as well as oxidases from a number of different species of plants.

The author claims there is no justification for the use of such terms as peroxidase, catalase, etc., to indicate specific substances, ferments, or groups of ferments. It is, however, permissible to use such terms as catalase action or peroxidase action. Comparison with metallic oxidases shows that there is at present no reason for assuming the existence of specifically distinct plant oxidases.

Cytological studies of Azotobacter chroococcum, A. BONAZZI (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 225–241, pls. 3*).—From these studies as described, the author concludes that the cells of *A. chroococcum* present a complex nature and different stadia of cytological make-up. The organism shows peculiar granulations apparently not related to reproduction. These take the basic dyes and are constituted neither of fats nor glycogen, starch nor chromatin, but appear to be of a metachromatic nature. They seem to have their genesis from the nucleus. Their disposition in the cells is not constant, but changes in different individuals. Their regular appearance in the cells of *A. chroococcum* might be caused by the special conditions of life.

A bibliography is given.

Physiological studies of Bacillus radicicola of Canada field pea, M. J. PRUCHA (*New York Cornell Sta. Mem. 5 (1915), pp. 83*).—In view of the fact that the results of inoculating legumes with pure cultures have not always proved satisfactory, the author has carried out extensive investigations involving the isolation and identification of the organism causing nodule development on the roots of the Canada field pea, a study of the influence of various factors on nodule development on the plant when in water or soil cultures, and a study of the influence of various environmental conditions on the infecting power of the organism. It is stated that the causal organism is *B. radicicola*.

Nodules developed readily and continuously in light, but still more in darkness, also readily in soil extract and in synthetic nutrient solutions in which nitrates were either omitted or replaced by chlorids, but in a full nutrient solution containing nitrates continual development seems to be inhibited soon after inoculation. No nodule development takes place in nutrient solutions in which the individual essential elements are omitted, except in the case of nitrogen. In sandy soil the optimum moisture content was from 20 to 40 per cent. The addition to sandy soil of small percentages of peptone or of KNo_3, $Ca(NO_3)_2$, NH_4Cl, $FeCl_3$, or KCl inhibited nodule development, while the addition of tannic acid or of $MgSO_4$, KH_2PO_4, or $Ca(H_2PO_4)_2$ showed a beneficial effect.

Nutrition markedly influences the morphology of the nodule organisms. The effects are described of several media and modifications thereof, as employed. The infecting power of *B. radicicola* on field pea was not affected after 2½ years on a given medium in the laboratory, the culture being transferred each month. It was not appreciably influenced by nitrogenous or other media, all living cultures producing nodules. In some media and under certain conditions the organisms died sooner than in other media. Detection of infecting power is comparatively easy, but accurate comparative measurement thereof is not yet possible.

A bibliography is given.

Negative heliotropism of the urediniospore germ tubes of Puccinia rhamni, F. D. FROMME (*Abs. in Phytopathology, 4* (*1914*), *No. 6, pp. 407, 408*).—The author reports that when germinating urediniospores of *P. rhamni* were exposed to a unilateral diffused illumination during four or five hours, more than 80 per cent of the germ tubes grew away from the direction of the light. These negative heliotropic reactions are thought possibly to play an important part in bringing about the stomatal entrance of the germ tube.

Flora of Vermont (*Vermont Sta. Bul. 187* (*1915*), *pp. 139–258*).—This consists of a list, prepared by a committee of the Vermont Botanical Club, of the ferns and seed plants found growing within the State without cultivation.

FIELD CROPS.

Field experiments, 1914 (*Dept. Agr. and Tech. Instr. Ireland Jour., 15* (*1915*), *No. 2, pp. 247–317*).—Results of variety tests with barley, potatoes, mangels, oats, turnips, and wheat are reported.

As a result of several years experiments in fertilizing meadow hay, it is noted that applications of 10 tons of barnyard manure per acre gave satisfactory results, but good returns were also obtained from the use of 100 lbs. of nitrate of soda, 200 lbs. superphosphate, and 200 lbs. kainit per acre. The superphosphate and kainit were applied together before the end of February and the nitrate at the end of March or early April. The application of kainit in the fall often gave better yields, but not sufficient to warrant the cost of the separate application. Basic slag is noted as giving better results in a wet season than in a dry. Liquid manure was found to give excellent results with all hay crops in both wet and dry seasons. The standard mixture of fertilizer above mentioned is also recommended for peat soils.

With potatoes, the best results were obtained by the use of 100 lbs. sulphate of ammonia, 400 lbs. superphosphate, and 100 lbs. muriate of potash in the row in connection with a moderate use of barnyard manure. It is noted that manurial experiments with potatoes on peat soils are in progress.

Experiments in the use of seaweed at the rate of 15 tons per acre as a fertilizer for potatoes showed 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."

The advantage of allowing potatoes to sprout before planting was shown in increased yields of approximately 2 tons per acre. Experiments to note the effect of change of seed potatoes are noted as in progress.

With mangels the most satisfactory results were obtained by the use of 400 lbs. superphosphate, 200 lbs. sulphate of ammonia, and 400 lbs. salt. In manurial tests with oats the application of sulphate of ammonia alone and superphosphate alone gave results which, while variable, proved on the whole to be profitable. The two applied together were more satisfactory. A complete fertilizer gave the best results.

The following conclusions are given as results of manurial tests with turnips: "Though good crops of turnips may be grown with farmyard manure alone, it is not economical to apply heavy dressings. A medium dressing of farmyard manure, say, from 10 to 15 tons per statute acre, supplemented by superphosphate or basic slag, is better than a heavy dressing of dung alone.

"Of the three kinds of artificial manures, nitrogenous, phosphatic, and potassic, phosphatic manures alone materially increased the yield. When a medium dressing of dung supplemented by superphosphate or basic slag is used, it is very doubtful whether the addition of either sulphate of ammonia or kainit, or both, will pay. But when no dung is used it is advisable to apply these manures along with superphosphate or basic slag. The use of a complete mixture has one decided advantage, inasmuch as a more even braird is obtained, the plants are stimulated in their early growth, and consequently suffer less injury from attacks of the turnip fly.

"Superphosphate and basic slag are practically of equal value as manures for turnips. The question as to which should be used to supplement dung must be decided by local circumstances, but where the land is deficient in lime or where the disease finger and toe is prevalent, basic slag should undoubtedly be applied. As much as 6 cwt. per statute acre of either manure may be used with satisfactory results. Especially is this the case when no farmyard manure is applied.

"Under ordinary conditions the following manurial dressings may be thoroughly relied upon to give satisfactory results: A medium dressing, from 10 to 15 tons, of farmyard manure supplemented with from 4 to 6 cwt. of superphosphate or basic slag, per statute acre; or the following dressing of artificials used without farmyard manure, 4 to 6 cwt. of superphosphate or basic slag, 1 cwt. sulphate of ammonia, 3 cwt. kainit, per statute acre. Basic slag must on no account be mixed with sulphate of ammonia."

[Field-crop studies] (*Wisconsin Sta. Bul. 250 (1915), pp. 17, 18, 19, 20, 23–28, figs. 4*).—This refers briefly to the work of E. B. Fred, which has shown an injurious effect of green manures upon the germination of cotton, flax, soy beans, hemp, mustard, and lupines, apparently caused by the type of organisms connected with such soil treatment (E. S. R., 28, p. 816). An increase of 20 per cent in the clover crop where sulphates were used is reported by W. E. Tottingham.

Breeding tests with peas, wheat, barley, oats, tobacco, corn, and soy beans are briefly reported.

[Breeding experiments with cereals], A. N. Hume (*South Dakota Sta. Rpt. 1913, pp. 24–31*).—This briefly gives results of selecting seed corn from plants bearing ears high above the ground and those bearing ears low, which show that there is some positive correlation between height of ear and yield. The higher growing ears indicate higher yielding strains of corn, but these are later in maturing (up to 16 days) than the low-eared corn. Breeding corn to change the protein and oil contents, which has been previously noted (E. S. R., 32, p. 733), is also summarized here.

The breeding of small grains for increased yields (E. S. R., 30, p. 738; 31, p. 435) is briefly summarized.

Vascular bundles and their significance in the lodging of cereals, K. Moldenhawer (*Ztschr. Landw. Versuchsw. Österr., 17 (1914), No. 12, pp. 886–891*).—The author here gives results of microscopical examinations of cross sections through the third internode of the plant above the root crown of 19 varieties of wheat. The number of vascular bundles in the parenchyma layer is coordinated with the bending stress for each plant.

It is noted that the number of vascular bundles seems to be a variety characteristic. Wheat varieties grown in a continental climate have a much less number of vascular bundles than those of a maritime climate. The stiffness of the culms of cereals seems to depend to a high degree upon the number of vascular bundles they possess.

The effect of different times of plowing small-grain stubble in eastern Colorado, O. J. Grace (*U. S. Dept. Agr. Bul. 253 (1915), pp. 15, fig. 1*).—This bulletin presents data obtained during six years at Akron, Colo., and the principles deduced therefrom are believed to be of general application in the Great Plains. These data relate to spring or fall plowing for spring wheat and are discussed in an effort to show correlations between precipitation and time of plowing.

After a close study of the moisture content of the soil, the amount and time of precipitation, and yields, the author concludes that "early fall precipitation is used by weeds if land is left uncultivated until spring. Stubble prevents much of the winter snow from being blown off. The increase in soil moisture from this source usually more than compensates for the loss by weed growth of the precipitation of August and September, when such precipitation is light. Late fall plowing does not prevent the loss of early fall precipitation through weed growth, but it does destroy stubble, which would aid in holding winter precipitation. If heavy rains occur in August or September, plowing should be done immediately after they cease. If this can not be done, or if heavy rains do not occur, the land should be left in stubble until the following spring."

Meadows and pastures, J. H. Voorhees (*New Jersey Stas. Circ. 43, pp. 3–7*).—This circular discusses soils, seed and seeding, liming, and manures and fertilizers for the establishment of meadows and pastures in New Jersey.

Growing hay in the South for market, C. V. Piper, H. B. McClure, and L. Carrier (*U. S. Dept. Agr., Farmers' Bul. 677 (1915), pp. 22, figs. 10*).—This bulletin points out the value of a hay crop for the Southern States, discusses difficulties in the way of producing market hay in the South, soils, curing the hay, and selling hay in local and city markets; describes special devices for curing hay, hay-handling devices, and hay presses; and comments upon the following crops as suitable for market hay in the cotton belt: Johnson grass, Bermuda grass, Lespedeza, or Japan clover, cowpeas, oats, Italian rye grass; the Arlington mixture of orchard grass, tall oat grass, and alsike; alfalfa, and Sudan grass.

Corn, milo, and Kafir in the southern Great Plains area: Relation of cultural methods to production, E. F. Chilcott, W. D. Griggs, and C. A. Burmeister (*U. S. Dept. Agr. Bul. 242 (1915), pp. 20*).—This bulletin embodies the results of a study ranging from three to seven years of methods of production of these crops at three field stations on the southern Great Plains, and includes meteorological data, a brief discussion of soil conditions, and data showing yields, value of the crop, and cost of production at the individual stations.

At Garden City, Kans., corn was not produced at a profit by any of the cultural methods tried, viz., fall plowed, spring plowed, subsoiled after corn, listed after corn, and summer tilled. At Dalhart, Tex., the profits ranged from 25 cts. by the spring plowing after small grains method to $4.80 per acre by listing after corn. Listing is the only method to show a profit, 67 cts. per acre, at the Amarillo, Tex., station.

With milo maize grown at Garden City the lowest yield of both grain and stover was on spring-plowed land that had been continuously cropped to this crop. The highest yield was from fall plowing after small grains. The former method resulted in a loss of 83 cts. per acre and the latter a profit of $2.07 per acre. At Dalhart, on a sandy loam soil, it gave profits ranging from $3.58 per acre by fall plowing after small grains to $14.21 by summer-tilled land. At Amarillo, on a heavy silty clay loam, it gave profits ranging from $1.46 per acre on summer-tilled land to $8.41 by fall plowing after small grains.

At Garden City Kafir corn after Kafir corn on spring-plowed land showed the lowest margin of profit, viz, 64 cts. per acre. The greatest net profit per acre, $3.78, was secured by growing Kafir corn after small grains on fall-plowed land. At Dalhart Kafir corn produced the largest net profit, $20.11, on land summer-tilled the preceding year. The profit of $2.90 by the method of fall plowing following small grains was the lowest. Kafir corn was produced at Amarillo at a loss of $2.54 per acre by the summer tillage method. The largest profit, $8.21, was by fall plowing after small grains.

The cost per acre of the different methods of soil preparation for milo maize and Kafir corn at all stations is estimated as fall plowing after continuous cropping $7.44, fall plowing after small grains $7.44, spring plowing after continuous cropping $7.06, listing after continuous cropping $5.93, and summer tillage $12.31. Data on the cost of producing corn have been previously reported (E. S. R., 33, p. 231).

It is noted that the greatest values in the Kafir corn crops were in the stover rather than the grain.

Forage crops, R. W. Allen (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1914, pp. 10, 11, fig. 1*).—This describes experiments the results of which have shown that Sudan grass, Dakota Amber sorghum, and feterita are desirable crops for that region. Dwarf Kafir corn and brown kaoliang were not so promising.

The effect on a crop of clover of liming the soil, F. W. Morse (*Massachusetts Sta. Bul. 161 (1915), pp. 119–124*).—These experiments to study the effect of lime were begun in 1909 with the application of 3,000 lbs. of slaked lime per acre on one-half of a series of plats that otherwise received various fertilizer materials, but carried for each plat 45 lbs. of nitrogen, 80 lbs. of phosphoric acid, and 125 lbs. of potash per acre. In 1913 an additional application of lime in the form of hydrate, 4,000 lbs. per acre, was given to the limed half of the series of plats. Notes on a red clover crop grown on this series of plats during 1914 show that "the clover on the limed areas receiving no nitrogen continued to lead all the other plats in size and vigor of growth, and began to bloom several days ahead of them. The whole area receiving nitrate of soda looked uniform to the eye, but a little behind the limed area without any nitrogen. The limed areas receiving sulphate of ammonia were like the areas receiving nitrate of soda. The unlimed areas without nitrogen produced a slow-growing crop which looked scanty in comparison with the growth on the limed portions of the same plats, but an examination of the ground showed the plants to be as numerous on one area as on the other. The clover on the unlimed areas receiving sulphate of ammonia looked noticeably inferior to all other plats without lime."

Samples of the tops and of the roots of the clover plants from the several plats were gathered in September, 1914, and determinations of ash, ferric oxid, calcium oxid, and nitrogen were made. The roots from both halves of the plat receiving nitrate of soda were large and thrifty and bore numerous nodules. The roots from the limed halves of the plats receiving sulphate of ammonia and no nitrogen were apparently similar in all respects to those from the plat receiving the nitrate of soda. The roots from the unlimed half of the plat receiving sulphate of ammonia were much smaller than those from the limed half, and nodules were few and very small. The roots from the unlimed half of the plat receiving no nitrogen were thriftier than those just described, but were not so thrifty in appearance as those on the limed half and bore smaller nodules.

The composition of the clover tops from the limed areas proved to be more uniform than the composition of samples from the unlimed. The mineral constituents were slightly higher in the clover from the unlimed areas, and this was most positively defined in the percentages of calcium oxid. The nitrogen was markedly lower in the unlimed group.

"The composition of the roots differed somewhat from that of the tops. The constituents determined, except iron oxid, were much lower in percentage than those in the tops. The percentages of nitrogen varied in the same manner as in the tops, while calcium oxid was higher in the roots from limed areas, and the iron oxid was higher in those from unlimed areas. Variations in the percentages of ash in the roots were probably due in part to the presence of clay, which could not be completely washed from the roots. . . .

"The percentages of ash, iron oxid, and calcium oxid throw no light on the specific effect of liming the soil. There appears to be neither too much iron nor too little calcium in the tissues of the plants from the unlimed areas, unless the small differences in the percentages from limed and unlimed roots are sufficient to warrant such a deduction. . . .

"The results of this work point to an effect of the lime on the soil constituents, by which the root environment is improved, rather than to an effect within the plant by the absorption of a larger amount of calcium salts."

Hard clover seed and its treatment in hulling, G. T. Harrington (*U. S. Dept. Agr., Farmers' Bul. 676 (1915), pp. 8*).—From studies of seeds of red clover, alsike clover, white clover, and sweet clover, grown on different soils, in different climatic conditions, covering a period of six years, and hulled by hand and by machines, after the crop had been subjected to various curing processes, the author concludes that "in nature nine-tenths or more of the well-matured seeds of red clover, alsike clover, white clover, and white sweet clover are hard.

"Hard clover seeds are sometimes of value, but are usually much inferior to good seeds which are not hard. The hardness of well-matured clover seed is not influenced materially by conditions of soil, by seasonal variations, by climatic conditions, or by the time at which the seed is harvested. The hardness of well-matured red clover seed is not related to its color or size.

"The rotting of clover in field or stack kills some of the seeds and may reduce the quality of the hulled crop, but it does not affect the proportion of hard seeds in the hulled crop after the dead seeds are removed. The rotting of the clover in field or stack or sweating it in the mow before hulling is not necessary. To secure the greatest yield and highest quality of seed the clover should be cured and stored with as little wetting as possible.

"The rubbing which clover seed receives in the hulling machine greatly reduces the proportion of hard seeds, but frequently breaks some of the seeds. The clover seed huller is, therefore, an effective scratching machine. The aim should be to have the huller so constructed and so operated as to reduce the proportion of hard seeds to the greatest possible extent and at the same time to break the smallest possible number of seeds."

Improvement of the flax crop by propagation from selected plants, H. HUNTER (*Dept. Agr. and Tech. Instr. Ireland Jour., 15 (1915), No. 2, pp. 237–246, pl. 1, fig. 1*).—From experiments conducted to study some factors to consider in the improvement of flax "it has been shown that flaxseed may be artificially dried within certain limits of temperature without impairing its germination.

"Flax has been shown to be a self-fertilizing plant, directly by artificial means and indirectly by the cultivation of the seed of single plants, which was found to exhibit all the characteristics of limited variability of self-fertilizing plants when treated in a similar manner. This leads to the conclusion that the basis of the selection of parent stocks should be single plants and not groups of plants.

"Seeds of a self-fertilizing plant, when sown under similar soil conditions will demonstrate whether the characters for which the parent plant was chosen are inherent or adduced by conditions peculiar to the conditions of environment under which it was grown. Thus the true value of any selected plant must always be determined finally by the character of its progeny.

"The flaxseed in general cultivation is a mixture of many types, varying in character and degree, which are readily capable of selection and propagation as pedigreed cultures."

Investigations on hops.—III, The pollination and fertilization processes in Humulus lupulus and H. japonicus, Ö. WINGE (*Compt. Rend. Lab. Carlsberg, 11 (1914), No. 1, pp. 46, pls. 2, figs. 22*).—This article continues the report of researches previously noted (E. S. R., 31, p. 526), and deals especially with the pollination processes. The results of the investigations may be summed up as follows:

"Zinger's description of the formation of the embryo sack and the growing together of the integuments in Humulus is correct, but the author is wrong in his statement that the ovule lacks a micropyle, the presence of which has already been determined by Lermer and Holzner.

"The microspores are developed and ripen in basipetal order in correspondence with the dehiscence of the pollen sacks by means of apical pores. It is not easy to get the pollen grains of *H. lupulus* to grow on an artificial substratum, but the pollen grains of *H. japonicus* grow willingly on a gelatin solution. The pollen grains of *H. lupulus* retain their power of growth for three days on being kept in a dry room of the laboratory. The tapetum in Humulus offers a good example of multinuclear cells and vegetative caryogamy, the original divalent nuclei dividing repeatedly, after which the products of division constantly fuse together. This gives rise to plurivalent, synkaryonlike nuclear complexes.

"Rosenberg and Bonnet's theory that the tapetum originates phylogenetically from the archespore and consists of sterile archespore cells can not be accepted, and for this reason it can not be admitted that atavistic tendencies give the explanation of the multinuclear condition of the tapetal cells. It is suggested that the peculiar nuclear condition of the tapetum has a physiological explanation, and the same applies to the endosperm's wealth of chromosomes. Both tissues are to a very great extent connected with the nutrition, which must be reflected in the abundance of chromatin.

"The growth of the pollen tube in Humulus does not suggest true aporogamy, as Zinger maintains. Zinger's description of the deep penetration of the pollen tube into the integuments is somewhat exaggerated, especially in the case of

H. japonicus. The more or less advanced age of the ovule at the moment of pollination affects the route by which the pollen tube penetrates to the nucellus, the ovule in younger flowers being less curved than in older, yet nevertheless ripe for fertilization. In younger flowers the pollen tube must pass a longer way through the integuments. In certain cases, in older flowers of *H. japonicus*, the pollen tube passes directly by the conducting tissue to the nucellus without touching the integuments.

"The number of chromosomes in the somatic cells is 20 and 16 in *H. lupulus* and *H. japonicus*, respectively; in the ×-generation respectively 10 and 8. In the tetrad formation two longitudinal divisions of the chomosomes are observed, but no transverse division.

"In abnormal, monoecious hops plants of *H. lupulus* it has been found that the reduction division proceeds in the pollen mother-cells; but in the observed cases the gonotokonts then became starved, the tapetum being already degenerated. In an abnormal, gynomorphous male plant of *H. lupulus* no gonotokonts developed at all, but the microsporangia were filled with sterile tissue.

"It proved possible to produce the hybrid *H. lupulus*×*H. japonicus*, but only as an imperfectly formed embryo. The pollen tube of *H. japonicus* grew down into the ovary of *H. lupulus* in the same way as the pollen tube of *H. lupulus* itself, and the bastard embryo and bastard endosperm or only one of them developed. Humulus did not develop seed without fertilization in the experiments which were made."

Spraying and dusting white potatoes, T. J. Headlee (*New Jersey Stas. Circ. 42, pp. 3–8*).—This circular gives results of testing the cost and efficiency of Bordeaux mixture as a spray or as a dust, in part previously noted (E. S. R., 32, p. 547.)

Data obtained from tests in various parts of the State show that the average cost of four treatments of home-mixed Bordeaux and arsenate of lead was $5.24 per acre, as compared with $8.46 as the average cost of the dust treatment. The former was more effective in increasing the yield. A comparison of the home-mixed and the commercial-mixed Bordeaux shows the former to be less expensive and more effective.

Potato spraying experiments at Rush in 1914, F. C. Stewart (*New York State Sta. Bul. 405 (1915), pp. 335–339*).—This bulletin gives results of a repetition of experiments made in 1913 (E. S. R., 31, p. 137). Owing to favorable weather in 1914 potato foliage was remarkably free from diseases and injuries. The average increase in yield as a result of spraying in unsprayed fields was 8 per cent.

Mulched potatoes for seed purposes in eastern Nebraska, R. F. Howard (*Nebraska Sta. Bul. 146, popular ed. (1915), pp. 3–6*).—A popular edition of the bulletin already noted (E. S. R., 32, p. 631).

Potato seed certification in Wisconsin, J. G. Milward (*Wisconsin Sta. Bul. 252 (1915), pp. 11, figs. 2*).—This discusses the community plan of potato growing, standards for certificates based on varietal purity and freedom from disease, and methods of inspection in the field and bin. The form of certificate and a list of growers of certified seed potatoes are also given.

Results of four years' experiments with sugar cane, A. H. Rosenfeld (*Rev. Indus. y Agr. Tucumán, 5 (1915), No. 8, pp. 323–361*).—This summarizes the results obtained with various fertilizing materials, applied in different amounts and in different combinations, as shown in the analyses of the cane juices.

Local fertilizer experiments with sweet potatoes, J. F. Duggar and J. T. Williamson (*Alabama Col. Sta. Bul. 184 (1915), pp. 19–34*).—This bulletin describes and gives results of fertilizer experiments made by farmers in several counties of the State during 1911, 1912, 1913, and 1914.

The data show that "of nine conclusive experiments made on various soils the largest increase in yield was afforded by phosphoric acid in five experiments, and by nitrogen in two experiments. In none was kainit more effective than acid phosphate. In five experiments cotton-seed meal was more effective than an equal weight of kainit, and in only one was kainit notably more effective than meal.

"Taken as a whole these experiments seem to indicate that the popular idea that potash is the most important constituent in a fertilizer for sweet potatoes is incorrect, at least as to practically all of the soils here represented. On the other hand, these tests show that phosphate and nitrogen were much more important than potash. These experiments also seem to discredit the notion that the use of a fertilizer containing nitrogen causes the sweet-potato plant to run to vines to an injurious extent. In our experience this danger does not occur where reasonable amounts of nitrogen are used in combination with acid phosphate.

"The following general fertilizer formulas are suggested where the conditions justify rather high fertilization: For sweet potatoes growing on fresh land, or on sandy land in rather high state of fertility, a fertilizer consisting of 200 lbs. cotton-seed meal per acre, 400 lbs. acid phosphate, and 200 lbs. of kainit. . . . For sandy land long in cultivation and not in a high state of fertility it would seem advisable to increase the proportion of nitrogen, using, for example, a formula somewhat like the following: Three hundred lbs. cotton-seed meal per acre, 400 lbs. acid phosphate, and 200 lbs. kainit."

Irrigation practice in rice growing, C. G. HASKELL (*U. S. Dept. Agr., Farmers' Bul. 673 (1915), pp. 12, fig. 1*).—This discusses methods and means of irrigation as developed in the rice fields of the United States, under the topics of making a water supply available, preparing for irrigation, and applying the water.

Growing hard spring wheat, C. R. BALL and J. A. CLARK (*U. S. Dept. Agr., Farmers' Bul. 678 (1915), pp. 16, figs. 4*).—This discusses the size, surface, soil, and climate of the Great Plains area, describes rotations for spring wheat, and gives directions for preparing the seed bed, sowing the seed, and cultivating and harvesting the crop.

Wheat silage, J. R. SHINN (*Washington Sta. Popular Bul. 88 (1915), pp. 4, fig. 1*).—This gives results of harvesting wheat or wheat and vetch as a silage crop for dairy purposes, obtained in cooperation with the Bureau of Plant Industry of this Department. The yields of silage material ranged from 6.316 to 42,688 lbs. per acre. Better milk yields are claimed by its use than by the use of corn silage.

Control of tumbling mustard, R. G. ADAMS and B. HUNTER (*Washington Sta. Popular Bul. 89 (1915), pp. 7, figs. 3*).—As methods of control of this weed, disking stubble in early fall, seeding winter wheat after and before rains, harrowing winter wheat in spring, growing spring wheat, pulling scattering mustard plants, and clipping the mustard plants are discussed, the work being in cooperation with the Bureau of Plant Industry of this Department. Attachments which may be put on the header of a combined harvester to enable the machine to cut badly infested grain are described.

HORTICULTURE.

Progress in plant breeding, N. E. HANSEN (*South Dakota Sta. Bul. 159 (1915), pp. 179–192, figs. 7*).—Descriptive notes are given on a number of varieties of fruit and on a new rose, all of which were introduced in 1912 and have been noted (E. S. R., 30, p. 640).

Several varieties of pears claimed to be blight-proof have been tested at the station but either the winter or blight quickly killed them. In view of these results work has been conducted to determine whether immunity to blight existed in other members of the pear family and, if so, whether it could be imparted to cultivated pears. Of the various kinds under trial are a form of the Chinese sand pear (*Pyrus sinensis*), grown from seed collected by the author in Siberia, and the birch-leaved pear (*P. betulifolia*), a native of northern China. These two pears have proved perfectly hardy and quite resistant to blight. They have been used freely in crossing with many of the best cultivated pears. A list is given of the resulting varieties which have been sent to several States for testing purposes with reference to blight resistance and general value.

The author also briefly describes a field method of hybridizing alfalfa.

Mushrooms, edible and poisonous.—Publications on culture of mushrooms, D. C. Babcock (*Ohio Sta. Circ. 153 (1915), pp. 89–92, figs. 3*).—In this circular the author gives a number of rules which should be adhered to in avoiding poisonous mushrooms, calls attention to a few of the more common edible fungi, and gives a list of publications on mushroom identification and culture.

[Horticultural investigations at the Umatilla experiment farm, Oregon, in 1914], R. W. Allen (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1914, pp. 12–18*).—Directions are given for the management of hairy vetch as an orchard green manure crop. It has been demonstrated both at the experiment farm and by a number of orchardists that the reseeding method is thoroughly practicable and much cheaper than the annual purchase of expensive seed.

For the purpose of determining the best size of trees to purchase and the height at which they should be cut to give the best results, a number of 1-year-old cherry and pear trees of three sizes were planted in 1912. The large trees were oversize, being 1 in. in diameter and 6 to 8 ft. tall. The medium-sized lot were 3.5 to 4.5 ft. tall, and the small ones 2 to 3 ft. tall. The large, small, and part of the medium-sized trees were cut off at the usual height of 18 in. when planted. One lot of medium-sized trees was cut at 6 in. above the union and another lot left unpruned. Growth data secured from this experiment during three subsequent seasons and also from general field planting show that as far as the stone fruits are concerned large trees are undesirable for planting on account of the heavy losses that result. It has also been definitely shown that for trees planted on coarse soils better results will be obtained by cutting the trees off close to the union in order to force the first year's growth into a small number of vigorous branches. Trees left standing at full height after planting rarely survive. The trees topped at 18 in. from the ground quickly put out a large number of small branches, advance slowly, and are difficult to train.

Experiments were conducted during the past three years to determine the effect of summer pruning upon the growth and training of fruit trees. The results of this work indicate in general that removing about half the branches from bushy, slow-growing trees and removing the terminal bud of all but 6 or 8 of the remaining branches has a tendency to increase the size of weak-growing and bushy trees much faster than by winter pruning alone. This practice is believed to be important for trees on coarse soils where slow growth and early fruiting frequently occur. Heading back rapidly growing trees in summer followed by a light winter pruning tends to develop the trees more rapidly than the usual method of pruning heavily in winter at the expense of large quantities of wood growth.

A brief statement of progress is given on cultural and variety tests of fruits and vegetables. The work of testing fruit varieties has been seriously handicapped by poor soil conditions and spring frosts. Two poplars (*Populus alba* and *P. balsamifera suaveolens*), as well as two elms (*Ulmus pumila* and *Ulmus* sp.), and an upright willow (*Salix* sp.), all introductions by the U. S. Department of Agriculture from Asia, have given considerable promise as trees for windbreaks. They all come into leaf very early in the spring and appear to be vigorous.

The influence of grass upon the growth of orchard trees, B. T. P. Barker (*Univ. Bristol Ann. Rpt. Agr. and Hort. Research Sta., 1913, pp. 94–96, pls. 3; Jour. Bath and West and South. Counties Soc., 5. ser., 8 (1913–14), pp. 139–141, pls. 3*).—In view of the results secured in the earlier experiments at Woburn (E. S. R., 15, p. 474) and elsewhere, showing the detrimental effect of grass on fruit trees, experiments were started in 1906 under the direction of the National Fruit and Cider Institute to determine whether clean cultivation for a few feet around each apple tree would suffice to lessen or prevent the injurious grass effect. In some cases the cultivated area extended for a radius of 3 ft., in others 4½ ft., and in others 6 ft. Some of the trees were grown in grass.

The results of these tests up to 1910, six years after planting the trees, show that the growth improved with the size of the cultivated area. From 1910 to 1911 there was practically no gain from cultivation. The trees were then given no further cultivation. Measurements made in 1913 showed a tendency in many cases for trees grassed over from the start of the experiment to gain slightly on those originally cultivated. The inference based on the behavior of six varieties is that trees do benefit from cultivation and begin to show the detrimental effect of grass as soon as the roots extend out into grassed areas. Trees that have been cultivated early in life may suffer more seriously from grass later on than trees grown in grass from the start.

Similar experiments conducted in various orchards in the west of England have shown the beneficial effects of cultivation. The differences between grassed and nongrassed trees in the present experiments were not so marked as those noted in the work at Woburn (E. S. R., 26, p. 639).

Pruning, F. S. Merrill (*Kansas Sta. Circ. 49 (1915), pp. 14, figs. 9*).—This circular contains practical suggestions for pruning orchard fruits, grapes, and bush fruits.

New developments in spray materials, W. M. Scott (*Amer. Agr., 95 (1915), No. 11, p. 5; New England Homestead, 70 (1915), No. 11, p. 3*).—In order to obtain a fair comparison between arsenate of lime and arsenate of lead several experiments were conducted for two years in which the former was diluted to contain the same amount of arsenic as the diluted arsenate of lead. No differences could be observed during the summer between the two insecticides, either in their effect upon the fruit and foliage or in the control of the codling moth and other insects, no injury being produced and the codling moth being controlled equally well in both cases.

It is stated that in a test by F. Johnson, formerly of the Bureau of Entomology of this Department, upon Baldwin apple trees at Westfield, N. Y., a barium-sulphur preparation, to which arsenate of lime was added, gave as satisfactory results as did the homemade lime-sulphur and arsenate of lead applied to adjacent trees, the orchard being entirely free from scab and codling moth. It is pointed out that calcium arsenate is considerably cheaper than lead arsenate and that it mixes with lime-sulphur without causing any chemical reaction. By the substitution of barium for lime as a carrier for sulphur the decomposition which takes place upon drying can be eliminated. Thus barium-sulphur furnishes a dry material which can be redissolved for spraying purposes without losing its original composition. Experiments conducted during the past year have shown it to possess insecticidal and fungicidal properties equal to lime-sulphur.

New developments in spraying materials, W. M. Scott (*Rpt. Md. State Hort. Soc., 17 (1914), pp. 96–104*).—In this paper the author reviews recent progress in the perfection of insecticides and fungicides, and gives an account of some demonstration experiments conducted to determine the value of barium-sulphur and arsenate of lime as substitutes for lime-sulphur and arsenate of lead.

The author concludes that the efficiency of these new spray materials has been sufficiently demonstrated to commend them to fruit growers for trial. The principal advantage of barium-sulphur over lime-sulphur is that the polysulphids of barium can be produced in the form of soluble crystals while those of calcium can not. The chief advantage of arsenate of lime over arsenate of lead is the cheaper cost of the former material.

Farm apple storage, M. B. Cummings and P. M. Lombard (*Vermont Sta. Bul. 186 (1915), pp. 99–136, pls. 4, figs. 6*).—In this bulletin the authors give a short account of apple storage practice in Vermont and briefly review previous investigations dealing with the cold storage of apples. A detailed account is then given of apple storage experiments conducted during four storage seasons in a basement room resembling in many respects a farmhouse cellar. The bulletin concludes with a study of structural characters of the apple in relation to storage.

The storage experiments included several commercial varieties of apples and two distinct lines of treatment were followed. In one case the apples were dipped in Bordeaux, copper sulphate solution, lime water, or paraffin; in the other case the apples were packed in dry cork dust, dry and damp coniferous and hardwood sawdust, dry and damp leaves, dry and damp sand, chopped hay, paper wrappers, or in sawdust after being dipped in Bordeaux. The experiments were controlled with reference to ventilation and temperature and in all cases untreated parallel check lots were stored. The data secured each season are presented in tabular form and discussed.

Of the protective dips used Bordeaux was most effective in retarding decay and also in preserving the flavor. Copper sulphate gave good results in preserving flavor, but was of no value as protection against shrinkage and decay in storage. Lime water, which was used only with respect to flavor, was practically of no value. Paraffin was effective in retaining flavor and crispness, but at the same time it induced early internal decay.

All of the mechanical media used in preserving apples reduced the temperature of the fruit, but only mill sawdust and cork dust possessed value in preventing decay. Sawdust from resinous woods imparts an undesirable flavor to apples, but hardwood sawdust does not injure the flavor.

Apples kept best by first immersing them in Bordeaux and then packing them in hardwood sawdust. By this method of treatment 15 per cent of a lot of Baldwin apples stored November 11 were still in good condition on August 5, 267 days after storing, as compared with 15 per cent of the control apples in good condition on May 22, 192 days after storing, and of those dipped in Bordeaux alone and packed in sawdust alone on July 17, 248 days after storing. The flavor of apples merely dipped in Bordeaux was somewhat better than those dipped in Bordeaux and packed in sawdust. Flavor tests with the Northern Spy and Rhode Island Greening apples gave similar results for the apples dipped in Bordeaux alone. Similar results were secured with Northern Spy and Rhode Island Greening relative to the keeping tests of the above media, except that the period of storage for Northern Spy ended on July 6 and for Rhode Island Greening on July 17.

A study of the structure of the flesh and skin of several varieties of apples as compared with their keeping qualities shows that the best keeping varieties have a firm flesh, compact tissue, and a thick and highly impervious skin. The suberization and cutinization of the cuticle is a protective contrivance which is of value in prolonging the life of apples. The change in chemical and mechanical structure of the cuticular layer and the epidermis in general seems to be quite common in the late keeping varieties, like Roxbury Russet and Ben Davis. The Baldwin, a midwinter variety, has a rather porous flesh, with large intercellular spaces and a moderately thick skin. Oldenburg, a fall apple, has a relatively thin skin with thin walled cells underneath.

Report of cranberry substation for 1914, H. J. Franklin (*Massachusetts Sta. Bul. 160* (*1915*), *pp. 91–117*).—This bulletin contains a full report on the work at the cranberry substation in Wareham for the year 1914 (E. S. R., 31, p. 740).

The usual weather observations were made during the year and some evidence was secured which indicates that an increased water content of the soil tends to raise the minimum air temperature above it on cold nights. Experiments in frost protection were continued. In September a test was made of cloth such as is used in shading tobacco as a means of protecting bogs from frost. A strip of cloth was supported by wires held 3 ft. above the ground by stakes, about 9 sq. rods of rather dry grassy lowland being covered. The cloth was spread out for the tests after sundown on cold nights, the covered area being shut in on all sides. The cloth was removed soon after sunrise and the soil exposed to the heat of the day. Thermometer readings were made 5 in. from the ground under the cover and on adjoining exposed land. The results showed that the cloth gave an advantage of about 4.5° F. With the outside temperature at 26.5° there was no frost under the cover. It is believed that this advantage would be sufficient to warrant the protection in this manner of bogs yielding good returns. The first cost of protecting bogs with cloth is estimated as less than $200 an acre, and the loss from depreciation no greater than the cost of the upkeep and operation of a pumping plant.

Work on the cranberry fertilizer plats was continued, no distinct advantage in quantity, color, and size of fruit being shown by the fertilized areas as compared with the check plats. The storage tests again showed a decrease in the keeping quality of the fruit from nitrate of soda plats. It is believed that the loss from these plats may be due to a greater shrinking of the somewhat more succulent fruit rather than to increased rotting. In 1914 two varieties were fertilized during the blooming period with a mixture of 150 lbs. per acre of nitrate of soda, 400 lbs. of acid phosphate, and 200 lbs. of high-grade sulphate of potash. Data secured in yield and size of fruit indicate that the application of fertilizer during the blooming period tends to cause a greater number of blossoms to set and mature fruit. The same result was observed in the application of nitrogenous fertilizers during the blooming period in 1913.

The bee pollination experiments were discontinued. Some preliminary observations of studies of the seasonal development of the root growth of cranberries and of Mycorrhiza fungi on cranberry roots are noted. Observations made at the harvesting period indicate that the average loss of berries with careful scooping is about 10 per cent as compared with an extreme loss of 25 per cent from hurried scooping. It is believed that under normal price conditions it will pay to scoop heavy or medium crops slowly and carefully. Observations on the temperature of June reflowage water with reference to bud injury have shown that water at 86° causes practically no damage to the buds. It is believed that higher temperatures will seldom be experienced in flooding.

The season's work with plant diseases and insects is noted on pages 350 and 352, respectively, and a study on water movement in peat on page 322.

State bog report, H. J. Franklin (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc., 27 (1914), pp. 5–27*).—A summarized account of the above noted work at the cranberry substation.

[Cranberry investigations] (*Wisconsin Sta. Bul. 250 (1915), pp. 28, 29*).—A brief statement of progress in the station's cranberry work (E. S. R., 31, p. 835).

The results of the clean culture method of cranberry bog culture—that is, sanding and draining—continue to demonstrate the efficacy of this mode of cultivation in comparison with the older methods of bog management. Most of the new bogs in the State are being installed on the clean culture basis. The attempt of growers to reclaim old bogs by sanding on top after partial attempts at weeding and without adequate drainage minimizes materially the advantage of the clean culture process, since the retained moisture facilitates luxuriant moss growth.

An inspection of most of the Wisconsin bogs by C. L. Shear resulted in the conclusion that the so-called blight, which apparently prevents the development of much of the fruit after blossoming (E. S. R., 31, p. 840), is really due to lack of vitality of the vines caused by improper cultural conditions, more especially insufficient drainage.

The avocado in California.—I, Culture, production, and marketing, I. J. Condit (*California Sta. Bul. 254 (1915), pp. 381–394, figs. 9*).—In this paper the author discusses the avocado with reference to its general distribution, economic importance, climatic requirements, propagation and culture, production and marketing, insects and diseases, and varieties.

Botanical characters of the leaves of the date palm used in distinguishing cultivated varieties, S. C. Mason (*U. S. Dept. Agr. Bul. 223 (1915), pp. 28, pls. 5, figs. 15*).—The results are given of a study of the foliage characters of the date palm, the object of the study being to develop a classification of characters adapted to determining varieties. The system of classification devised is here explained, together with the method of recording characters. Descriptions are also given of four varieties of the Deglet Noor date showing the application of this system of leaf study.

Mangoes in Florida, P. H. Rolfs (*Florida Sta. Bul. 127 (1915), pp. 105–138, figs. 19*).—A practical treatise on mango culture. Consideration is given to the history and range of mango culture in Florida, time of ripening and blooming, methods of propagation, effects of stock on scion, culture, fertilization, marketing, mango groups and varieties, and culinary recipes. A short bibliography of literature on mango production is appended.

FORESTRY.

Forest planting in Vermont as an investment, A. F. Hawes (*Vermont Sta. Bul. 188 (1915), pp. 261–294, pls. 4*).—A cultural treatise including a discussion of the possibilities of forest planting in Vermont as an investment. The subject matter is discussed under the following general headings: Suggestions for the prospective forest planter, land which should be reforested in Vermont, safety of an investment in forest planting, kind of trees to plant, methods of planting, convenient planting crew, time of planting, spacing, esthetic planting, cost of planting, care of forest plantation, taxation on forest plantations, returns from plantations, profit from forest planting, value of land that can be planted profitably, cost of raising pine lumber, and school-endowment forests.

The text is given of the Vermont act of 1912 relating to the taxation of young timber, as well as the act of 1912 providing for school-endowment forests. Data on the height and diameter growth of white pine, Norway pine, balsam fir, and white ash are appended.

The cypress and juniper trees of the Rocky Mountain region, G. B. Sudworth (*U. S. Dept. Agr. Bul. 207 (1915), pp. 36, pls. 37*).—This bulletin describes the distinguishing characters, geographic distribution, and forest habits of all the known species of cypress (Cupressus) and junipers (Juniperus) growing within the Rocky Mountain region of the United States, including also Canadian territory lying directly north of the Rockies and Mexican territory adjacent to the Southwest. The descriptive text is accompanied by illustrations representing foliage, fruits, seeds, and other important parts of the trees in their natural size as well as maps showing the geographical distribution of the different species.

Caoutchouc, A. J. Ultée (*Caoutchouc. Haarlem: H. D. Tjeenk Willink & Son, 1913, pp. VIII+93, figs. 38*).—A treatise on the culture, diseases and pests, tapping, and preparation of rubber with special reference to *Hevea brasiliensis* and *Ficus elastica*. Notes are given relative to vulcanization, regeneration, and rubber surrogates, together with statistics of rubber production and consumption in different countries.

Cinchona culture, A. Groothoff (*De Kinacultuur. Haarlem: H. D. Tjeenk Willink & Son, 1912, pp. 111, figs. 30*).—A treatise on cinchona with reference to the history of the industry, the introduction of the cinchona tree into Asia, its botany and culture, the exploitation and preparation of the bark, uses and commerce, and geographical distribution of the industry.

Union of an oak and a birch, W. T. Davis (*Proc. Staten Isl. Assoc. Arts and Sci., 5 (1913–14), No. 1–2, p. 10, pl. 1*).—An illustration with descriptive notes is given of a white oak (*Quercus alba*) and black birch (*Betula lenta*) that have grown together in such a manner that if the trunk were all that could be seen they would ordinarily be taken for one individual.

Union of an oak and a beech, A. Hollick (*Proc. Staten Isl. Assoc. Arts and Sci., 5 (1913–14), No. 1–2, pp. 11, 12, pl. 1*).—An illustration with short descriptive notes is given of a white oak (*Quercus alba*) and a beech (*Fagus americana*) which have grown together at the trunk similar to the above-noted trees.

Notes on the germination of some tree and shrub seeds, W. Kinzel (*Naturw. Ztschr. Forst u. Landw., 13 (1915), No. 4–5, pp. 129–159*).—During the course of the author's investigations during the past 10 years relative to the effect of frost, light, and other influences on the germination of seed of various kinds (E. S. R., 26, p. 821; 29, p. 421), germination tests were made of the seed of a number of trees and shrubs of diverse species. The present article comprises observations on the germination history of these trees and shrubs, with special reference to the development, ripening, and resistance faculty of the seed of indigenous and cultivated forms of linden.

The application of town sewage and house garbage as a forest manure, Schwappach (*Ztschr. Forst u. Jagdw., 47 (1915), No. 4, pp. 249–256*).—Experiments conducted in the neighborhood of Berlin in the use of sewage waters diluted by rain water and of house garbage indicate that an important increase in size may be obtained in various hardwoods by irrigations with sewage water, but that such irrigation should be confined to the first few years in the life of pine and spruce trees and is apt to cause damage to all evergreen trees after a few years' time. The trouble appears to be due rather to a change in the level of the ground water than to any specific injury from the sewage water. The use of garbage wherever feasible appears to be desirable, since it increases the moisture content of the soil and furnishes available plant food for the trees.

Annual progress report on forest administration in the Western, Eastern, and Kumaun Circles of the United Provinces for the forest year 1913–14, H. G. BILLSON, J. C. TULLOCH, and F. CANNING (*Ann. Rpt. Forest Admin. West., East., and Kumaun Circles* [*India*], *1913–14, pp. 5+57+XC+8*).—This is the usual report on the administration, management, silvicultural operations, and exploitation of the state forests in the Western, Eastern, and Kumaun Circles of the United Provinces, including a financial statement for the forest year 1913–14.

All imporant data relative to the forest areas, forest surveys, working plans, forest protection, and miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Progress report of forest administration in the Punjab for the year 1913–14, R. MCINTOSH (*Rpt. Forest Admin. Punjab, 1913–14, pp. 7+II+20+CIX*).—A report similar to the above on the administration of the state forests in the Punjab, including also a quinquennial review.

The production of lumber in 1913 (*U. S. Dept. Agr. Bul. 232* (*1915*), *pp. 32, figs. 2*).—A statistical report on the production of lumber in the United States in 1913, prepared by the Forest Service in cooperation with the Bureau of Crop Estimates.

Detailed data are given showing the production of the important kinds of lumber by States and the number of active mills in each State, together with data showing the total production of minor species of lumber and the principal Sates reporting same. Comparative summaries of production by States and species are given for 1913, 1912, and 1911.

In 1913 a total production of 38,387,009,000 ft. b.m. was reported, as compared with 39,158,414,000 ft. in 1912. Soft woods contributed 30,302,549,000 ft. b.m. in 1913, as compared with 30,526,416,000 ft. in 1912.

DISEASES OF PLANTS.

[Investigations in plant diseases] (*Wisconsin Sta. Bul. 250* (*1915*), *pp. 33–39, figs. 4*).—A summary report is given of work carried on by the department of plant pathology during the year, the investigations consisting of a plant disease survey, and experiments with rot-proof cabbage, onion smut, and pea blight.

In connection with the plant disease survey a new disease of cucumber, known as "white pickle," has been discovered. It affects both vine and fruit, causing serious losses. The cause is as yet undetermined.

In continuation of the experiments in the production of cabbage immune to the disease known as yellows, one strain has been developed and seed placed in the hands of selected growers. A stand of from 95 to 99 per cent of the rot-proof type was obtained, as compared to 15 to 20 per cent of a crop where imported Danish and Puget Sound seed was used. Efforts are being made to produce a seed of this resistant strain on a commercial scale in the Puget Sound region.

A continued investigation on the prevention of onion smut by the use of formaldehyde solution has shown that the treatment greatly reduces the amount of disease at a cost of about $4 per acre for the fungicide and its application.

The pea-blight investigation during the year has been extended to study the influence of drainage. Where land that had been previously cropped with peas was thoroughly drained but little blight was observed, while on the undrained portions of the same plat a total loss was experienced. Preliminary investigations have been begun on the development of a resistant strain of plants. A survey made of the pea industry indicates that a lack of rotation is one of the chief contributory factors in the production of pea blight.

Lightning injury to potato and cotton plants, L. R. JONES and W. W. GILBERT (*Phytopathology, 5 (1915), No. 2, pp. 94–102, pls. 2; abs. in Phytopathology, 4 (1914), No. 6, p. 406*).—The results of an inquiry into the injury caused by lightning are given, the authors stating that such injury is not uncommon to certain crops, particularly cotton, potatoes, beets, tobacco, and ginseng.

Relation between Puccinia graminis and plants highly resistant to its attack, E. C. STAKMAN (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 193–200, pl. 1*).—In amplification of an account previously noted (E. S. R., 33, p. 245), the author gives some results of histological studies of the hyphal invasion of several plants by *P. graminis*.

It is stated that when plants practically immune to *P. graminis* are inoculated the fungus gains entrance in a perfectly normal manner. After entrance it rapidly kills a limited number of the plant cells in its immediate vicinity and seems then unable to develop further.

The relations between plant and parasite in partially resistant and in almost totally immune plants are different in degree only, hypersensitiveness appearing to be a phenomenon fairly common among both somewhat resistant and almost totally resistant plants.

A bibliography is given.

A preliminary report on the relation of grass rusts to the cereal rust problem, E. C. STAKMAN (*Abs. in Phytopathology, 4 (1914), No. 6, p. 411*).—In continuation of previous studies on rust specialization (E. S. R., 31, p. 146) the author reports experiments in which uredospores developed on grasses in the field were used to inoculate wheat, oats, barley, and rye. It was found that *Puccinia graminis* from *Agropyron repens*, *A. tenerum*, *A. caninum*, *A. smithii*, and *Hordeum jubatum* transferred quite readily to barley and rye, only occasionally to wheat, and practically not at all to oats. The rust transfers readily from *Dactylis glomerata* and *Poa nemoralis* to oats, but not to other cereals.

Attempts were made to transfer rusts occurring on *Agrostis alba*, *A. stolonifer*, *Anthoxanthum odoratum*, *Calamagrostis canadensis*, *Poa pratensis*, and *P. compressa* to wheat, oats, barley, and rye, but, with the exception of a few small spores and a very few pustules, the results were entirely negative.

The ascigerous stage of Helminthosporium teres, A. G. JOHNSON (*Abs. in Phytopathology, 4 (1914), No. 6, p. 408*).—In the course of studies on the Helminthosporium diseases of barley the author found an ascigerous stage which is considered to be a species of Pleospora.

Some facts of the life history of Ustilago zeæ, F. J. PIEMEISEL (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 411, 412*).—The author reports inoculation work with sporidia of *U. zeæ* which indicates that infection may take place readily without any injury of the tissues, and that the infection is purely local. On very young corn plants successful infection often takes place, but not much of the host tissue is involved. No effect of freezing temperature on the vitality of spores was observed. Spores placed in a silo in the fall failed to germinate within two months from the time they were placed in the silage, but whether they germinated in the silo or whether the various organic acids which are developed during fermentation of the silage destroyed their powers of germination has not been definitely determined. It is considered, however, that the acids probably are the chief agency in destroying the powers of germination.

Third progress report on Fusarium-resistant cabbage, L. R. Jones (*Abs. in Phytopathology, 4 (1914), No. 6, p. 404*).—The author reports trials conducted in experimental fields as well as in cooperative tests with farmers of strains of cabbage which were previously reported (E. S. R., 31, p. 446) as resistant to the cabbage yellows fungus.

Compared with the commercial strains, practically all plants lived and headed, giving a very large increase in production. It is considered justifiable to conclude that the disease-resisting quality which has shown itself in three successive generations is a fixed transmissible character.

The relation of temperature to the infection of cabbage by Fusarium conglutinans, J. C. Gilman (*Abs. in Phytopathology, 4 (1914), No. 6, p. 404*).—In connection with investigations on Fusarium disease of cabbage by Jones (E. S. R., 31, p. 446), the author found that the disease was induced by a soil temperature of from 17 to 22° C. or above, while no disease was found in flats and pots with soil from the same field but kept at 14 to 17°. These experiments indicate that the organism is dependent on a rather high soil temperature to produce infection.

Cotyledon infection of cabbage seedlings by the bacterial black rot, C. Drechsler (*Abs. in Phytopathology, 4 (1914), No. 6, p. 401*).—The author reports that cabbage seedlings grown in soil that had been previously inoculated with *Pseudomonas campestris* were frequently found attacked by black rot. Specialized water pores are not found on cabbage seedlings, and until they are developed on the secondary leaves the cotyledons may function in guttation and bacteria enter through the stomata. The points of original infection are limited to the area active in guttation. The disease was also induced by inoculating droplets extruded by the cotyledons.

A disease of red clover and alsike clover caused by a new species of Colletotrichum, P. J. O'Gara (*Abs. in Phytopathology, 4 (1914), No. 6, p. 410*).—The author describes a widely spread disease in the State of Utah on red and alsike clovers. The plants are attacked most frequently at or near the crown, but the fungus may also attack the stems just beneath a cluster of blossoms, as well as the petioles and stipules. A technical description of the fungus, which is a species of Colletotrichum, has been noted (E. S. R., 32, p. 842).

A disease of the underground stems of Irish potato caused by a new species of Colletotrichum, P. J. O'Gara (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 410, 411*).—According to the author, a disease of potatoes which may become of economic importance was observed in the Salt Lake Valley, Utah. While examining some badly diseased fields many plants were found to have dark brown or black cankers or lesions on the underground stems, the stems often being completely girdled. The organism causing the trouble has been isolated and a technical description of it is given elsewhere (E. S. R., 32, p. 842).

"Spindling sprout" of potatoes, F. H. Hall (*New York State Sta. Bul. 399, popular ed. (1915), pp. 4, fig. 1*).—This is a popular edition of Bulletin 399 previously noted (E. S. R., 33, p. 52).

A contribution to the life history of Spongospora subterranea, L. O. Kunkel (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 265–278, pls. 5*).—In a preliminary report the author describes a type of infection supposed not to have been noted heretofore.

Infection of growing potatoes by *S. subterranea* is accomplished not by separate amœbæ, as previously supposed, but through the action of an invading plasmodium infecting a large number of cells at each point of entrance. This raises numerous questions regarding various related organisms.

It is noted that the cells in each little area of infected tissue are stimulated to abnormal growth and division. In stored tubers spores germinate in the base of the old sori and produce amœbæ, which come together to form plasmodia that cause secondary infections. These plasmodia feed on surrounding tissue, causing a dry rot, which is probably a mild form of the canker stage.

The spores germinate in culture media, each producing a single uninucleate amœba, and this body encysts, entering a resting stage, when conditions become unfavorable. Apparently saprophytic plasmodia are produced on culture media.

A bibliography is given.

Soil stain and pox, two little known diseases of the sweet potato, J. J. TAUBENHAUS (*Abs. in Phytopathology, 4 (1914), No. 6, p. 405*).—Soil stain or scurf, which was first described by Halsted (E. S. R., 2, p. 416), was attributed to *Monilochætes infuscans*, but the author has carried on some investigations which indicate that the genus Monilochætes is probably not well founded. Affected potatoes are considerably reduced in value, the disease being confined to the underground parts and carried with the seed. It is said that it may be easily controlled by soaking the seed (roots) for 10 minutes in a solution of corrosive sublimate. It may also be eliminated by growing plants from vine cuttings.

The second disease reported upon was also described by Halsted (E. S. R., 2, p. 416) and attributed by him to *Acrocystis batatæ*. During two years' work of the author's on this disease this fungus has not been found associated with it. A Fusarium, an Actinomyces, and a Rhizoctonia were isolated, and it was found that an excess of lime favored the disease, while an acid fertilizer such as acid phosphate reduced it.

Some important leaf diseases of nursery stock, V. B. STEWART (*New York Cornell Sta. Bul. 358 (1915), pp. 167–226, figs. 29*).—This is a condensed report of investigations since 1909 on nursery leaf diseases and means of protection therefrom. These include apple scab (*Venturia inæqualis*), pear scab (*V. pyrina*), apple powdery mildew (*Podosphæra oxyacanthæ* or *P. leucotricha*), yellow leaf disease of cherry and plum, ascribed by Higgins (E. S. R., 29, p. 349; 30, p. 750) to *Coccomyces* spp. (polymorphic forms of Cylindrosporium), powdery mildew of cherry (*P. oxyacanthæ*), anthracnose of currants and gooseberries (*Pseudopeziza ribis*, parasitic stage *Glœosporium ribis*), Septoria leaf spot of the same plants (*S. ribis*), gooseberry mildew (*Sphærotheca mors-uvæ*), leaf blotch of horse chestnut (*Læstadia æsculi*, conidial and parasitic form *Phyllosticta paviæ*), peach leaf curl (*Exoascus deformans*), leaf blight of pear and quince (*Fabræa maculata* [*Stigmatea mespili*], parasitic stage *Entomosporium maculatum*), Septoria leaf spot of pear (*Mycosphærella sentina*, conidial stage *S. piricola*), black spot of roses (*Diplocarpon rosæ*, conidial stage *Actinonema rosæ*), and mildew of rose and peach (*Sphærotheca pannosa*, conidial form *Oidium leucoconium*).

A promising new fungicide, W. M. SCOTT (*Abs. in Phytopathology, 4 (1914), No. 6, p. 412*).—The author briefly reports upon some experiments on the use of barium polysulphid in crystal form for the control of apple scab. Spraying experiments were conducted, the fungicide being used at the rate of from 3 to 6 lbs. to each 50 gal. of water in comparison with lime-sulphur solution. No outbreak of apple scab occurred on any of the checks, so that the value of the fungicide could not be determined for the control of the disease.

In peach-spraying experiments the barium sulphur used at the rate of 3 lbs. to 50 gal. of water controlled peach scab almost completely.

The author concludes that this material has decided fungicidal properties and is worthy of further investigation.

Apple cankers and their control, L. R. HESLER (*New York Cornell Sta. Circ. 28 (1915), pp. 17–28, figs. 16*).—Brief popular descriptions are given of the various forms of canker of apple trees found in New York State with suggestions for their control as far as definite means are known. In addition to frost cankers and sunscald, the forms of canker and their causal agents taken up are apple tree canker (*Physalospora cydoniæ*), fire blight canker (*Bacillus amylovorus*), European apple tree canker (*Nectria ditissima*), Illinois blister canker (*Nummularia discreta*), bitter rot canker (*Glomerella cingulata*), and a superficial bark canker caused by *Myxosporium corticolum.*

Field studies of apple rust, N. J. Giddings and A. Berg (*Abs. in Phytopathology, 4 (1914), No. 6, p. 401*).—In continuation of previous studies (E. S. R., 28, p. 748), the authors give the results of experiments undertaken for the control of the apple rust.

The results indicate that it is impracticable to control this disease in commercial orchards by use of liquid sprays, as spray material applied a week previous to infection did not appreciably reduce the amount of disease. Of the fungicides tested, commercial lime sulphur gave the best results, with Bordeaux mixture second and atomic sulphur third.

Orchards were found infected to a considerable extent three-fourths of a mile from any cedar trees, and the effects of a severe rust infection, it is claimed, may be noted on trees for at least two years following it. There is believed to be some evidence that heavy infection of a cedar tree is followed either the first or second season afterwards by a loss of vitality and inhibition of growth, which renders that tree practically immune for one or two seasons.

Apple rots, C. Brooks, D. F. Fisher, and J. S. Cooley (*Abs. in Phytopathology, 4 (1914), No. 6, p. 403*).—The authors report having isolated from market and storage apples the following fungi which are capable of producing a rot of the same: *Sphæropsis malorum, Glomerella cingulata, Monilia* sp., *Botrytis cinerea, Phomopsis mali, Penicillium expansum, P. commune, P. pinophilum, Mucor stolonifer, Cephalothecium roseum, Aspergillus niger, Trichoderma* sp., *Pestalozzia gucpini, P. brevipes, Verticillium* sp., *Ramularia macrospora, Fusarium radicicola, F. putrefaciens,* and several species or strains of Alternaria.

Of the above species, *P. expansum* is the most common on the storage fruit. Sphæropsis and the Alternarias cause most of the blossom rot in eastern States, and the Alternarias and the Fusariums the core rots in the Northwest. The Alternarias are also of common occurrence following Jonathan spot and scald.

York spot and York skin-crack, H. S. Reed (*Abs. in Phytopathology, 4 (1914), No. 6, p. 405*).—The author reports some new, or at least undescribed, troubles observed in Virginia in 1914 on the York Imperial apple.

The spot appears somewhat different from the Jonathan spot and is characterized by much larger sunken areas on the fruit, which bear some resemblance to moderate hail injury. The tissue beneath the spots is dry and corky. Where the trouble is severe the superficial tissues are water-soaked.

York skin-crack was first noticed by the author in 1911, but did not become serious until 1914. The skin of the fruit is at first pitted and then cracks open, giving entrance to various decay fungi. There is a rather constant association of a species of Alternaria with this trouble, and this fungus has been isolated and is now under further study.

Orchard experiment with Jonathan spot rot in 1914, G. W. Martin (*Abs. in Phytopathology, 4 (1914), No. 6, p. 406*).—In continuation of a previous report (E. S. R., 29, p. 847) the author bagged apples, as in the previous investigation, and compared the protected with the unbagged apples. The results obtained are in harmony with those of 1913, which indicate that Jonathan spot rot is caused by a species of Alternaria and that infection occurred later than June 9.

Jonathan spot, bitter pit, and stigmonose, C. Brooks and D. F. Fisher (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 402, 403*).—Experiments of the authors have shown that both Jonathan spot and bitter pit are usually worse on large apples than on small ones, and that bitter pit is increased by continued heavy irrigation, by continued light irrigation, or by sudden checks in the water supply to heavily watered trees. If a sudden drought comes at midseason the effects may become more extreme than in typical bitter pit, the fruit developing large dead areas beneath the skin, with a very high coloration on the surface, while the fruit is still green. In such cases drops of sticky exudation often appear on the affected areas and the fruit ripens prematurely.

Stigmonose is a term used to refer to the response to insect attack, and in the apple one form seems to be closely associated with the occurrence of the rosy aphis. It differs from bitter pit in that it develops earlier in the season, occurs on the fruit in the middle of the tree rather than on the exposed limbs, is often followed by cracking of the fruit and premature ripening, is often accompanied by a gnarled appearance of the apple, the spots are not typically at the end of vasculars, and the brown tissue beneath has more definite margins and is firm rather than spongy.

Stigmonose: A disease of fruits, M. B. WAITE (*Abs. in Phytopathology, 4 (1914), No. 6, p. 402*).—The author reports having observed in and under the skin of Japanese plums, pears, and apples a disease which he designates as stigmonose.

On pears stigmonose forms a hard, sunken, slightly atrophied, greenish spot, and in late pears it may become brownish. In apples a similar sunken, greenish spot is produced, the spot later becoming corky and dry, resembling bitter pit. In plums the spots remain firm and hard, although possibly streaked with brown after the fruit ripens.

Plant bugs and aphids are considered as having an important part in the formation of these injuries, and the stigmonose effect has been observed on the apple around curculio feeding punctures and scars made by the ovipositor.

Common diseases of apples, pears, and quinces, M. T. COOK (*New Jersey Stas. Circ. 44, pp. 20, figs. 18*).—This is a descriptive list of common diseases of pomaceous fruits, with treatments. A discussion is also given of water core, winter injury, and spray injury, also of spraying, with reference to the organism to be controlled, the material to be used, and tne time of application. A spray calendar is appended.

Common diseases of the peach, plum, and cherry, M. T. COOK (*New Jersey Stas. Circ. 45, pp. 16, figs. 10*).—Besides a discussion of the most common diseases of drupaceous fruits in this State, and treatments so far as known, a description is given of injuries due to cold, sprays, and constriction by label wires, said to cause symptoms like those of yellows. Spray calendars adapted to the peach, plum, and cherry are also given.

A preliminary report on twig and leaf infection of the peach by means of inoculations with Cladosporium carpophilum, G. W. KEITT (*Abs. in Phytopathology, 4 (1914), No. 6, pp. 408, 409*).—The author reports successful infection experiments with *C. carpophilum* taken from leaves and twigs, more than 50 lesions being counted on twigs and more than 100 on leaves. On the control plants only one primary twig infection developed and no primary leaf infection was found.

Fungus-host relationship in black knot, E. M. GILBERT (*Abs. in Phytopathology, 4 (1914), No. 6, p. 402*).—A microscopical study of the formation of black knot gall shows that a considerable portion of the hypertrophy is in regions not directly in contact with the fungus. The continued invasions of the fungus hyphæ cause a separation of cells into larger and small masses, and during this process some of the cells gradually fill with a granular substance which becomes resinous in nature and is exuded from the mature knot. Other cells disintegrate, the cell walls break down, cytoplasm disappears, and at this time it is not uncommon to find the host nuclei lying free between the hyphæ of the fungus.

The perfect stage of the fungus of raspberry anthracnose, W. H. Burkholder (*Abs. in Phytopathology, 4 (1914), No. 6, p. 407*).—During 1914 the author made an examination of the affected stems which showed minute pustules on the diseased area. From these were developed cultures the same as those from conidia of the anthracnose fungus (*Glœosporium venetum*). The morphology of the fungus on raspberries seems to be identical with that found by Woronichin upon Pyrus, which is attributed to *Plectodiscella piri*.

[Fungus diseases of cranberries], H. J. Franklin (*Massachusetts Sta. Bul. 160 (1915), pp. 94–100*).—A report is given of investigations carried on in cooperation with C. L. Shear, of the Bureau of Plant Industry of this Department, the general plan being the same as that previously described (E. S. R., 31, p. 740).

Experiments for the control of diseases by spraying with Bordeaux mixture have been continued, but no evidence was obtained to indicate that spraying is beneficial, and under some conditions it was apparently injurious to the crop. Indifferent results were obtained in an attempt to determine whether the keeping qualities of the fruit in a sprayed plat were better than those where the plants were not sprayed. The use of copper sulphate placed in flowage water was again tested without definite results. The berries from the treated sections, however, showed a smaller percentage of loss in storage than the untreated ones.

The effect of spraying on root development of cranberry plants was studied, and the results obtained seemed to suggest that the plants are injured by retarding the development of new rootlets. In order to determine definitely the effect of Bordeaux mixture a series of plats were sprayed in various ways, excessive quantities of the fungicide being employed. It seems that spraying for the control of fungus diseases in the Cape Cod bogs is impracticable unless some noninjurious substitute for Bordeaux mixture can be found.

Notes are given on the disease commonly called ringworm, which, instead of being the result of insect work, seems to be due to the attack of fungi. The author also reports the occurrence of the Wisconsin false blossom disease (E. S. R., 31, p. 841) in bogs in Massachusetts. In every instance the presence of the disease was traced to vines that had come from Wisconsin.

Rhizoctonia in America, G. L. Peltier (*Abs. in Phytopathology, 4 (1914), No. 6, p. 406*).—While making a study of the stem rot of carnation, due to Rhizoctonia, the author collected about 50 forms of the fungus.

After three seasons' work with these cultures he finds that while some exhibit slight morphological differences, in cross-inoculation experiments they all behave alike. All but two of the forms, he claims, can be included under *R. solani*. The author states that true *R. violacea* of Europe has not been reported in this country. There seems to be no question that *Hypochnus solani* of Europe is the same as *Corticium vagum solani*.

An anthracnose of Asclepias speciosa caused by a new species of Colletotrichum, P. J. O'Gara (*Abs. in Phytopathology, 4 (1914), No. 6, p. 410*) —A brief account is given of a disease of stems and foliage of the common milkweed in the Salt Lake Valley. A technical description of the fungus has been given elsewhere (E. S. R., 32, p. 842).

Some effects on chestnut trees of the injection of chemicals, Caroline Rumbold (*Abs. in Phytopathology, 4 (1914), No. 6, p. 412*).—The author injected a number of stains into living chestnut trees to determine their diffusion throughout the tree. When injected into the trunks the solutions were found to have passed up and down in restricted areas. Branches and roots on the injected side would be stained, while the uninjected side was not. The stains were also found to differ in their method of passage through the tissue. Methyl green passed through the tracheæ in the last year's ring of wood. Congo red and trypan blue spread over larger areas. Colloidal stains spread further through the trees than crystalloidal ones. The chemicals, whether metals, acids, alkalis, or benzenes, appear to have profoundly affected cells lying beyond the paths of the injected solutions, causing pathological growth.

Leaves on the injected tree showed blotches which were found to be characteristic of the chemical used. In the case of lithium-injected trees, the presence of the metal was found in bark, leaves, and fruit.

Notes on Cronartium comptoniæ and C. ribicola, P. Spaulding (*Abs. in Phytopathology, 4 (1914), No. 6, p. 409*).—In continuation of a previous account of observations on one of these fungi (E. S. R., 30, p. 653), the author reports that *Pinus rigida* is very susceptible to attacks of *C. comptoniæ*, and that both *P. ponderosa* and *P. contorta* were so badly affected that the entire stock of both species in a nursery was destroyed. The fungus has been successfully transferred from *P. contorta* to *Comptonia asplenifolia*, but not from *P. laricio*, another new host.

In addition the author reports *C. ribicola* on the American variety Downing of cultivated gooseberries.

Observations on the pathology of the jack pine, J. R. Weir (*U. S. Dept. Agr. Bul. 212 (1915), pp. 10, pl. 1, figs. 4*).—This is a study of fungi affecting *Pinus divaricata*, chiefly in Michigan, Minnesota, and adjacent Canada.

Peridermium cerebrum (*Cronartium quercus*) causes the most important injury to jack pine of all ages, attacking almost all portions of the trunk and usually either killing or dwarfing the plant attacked.

Wood-destroying fungi of the living tree are not regarded as very important, though a few are mentioned, as *Trametes pini* and *Polyporus schweinitzii*, which attack weakened trees. A number of saprophytic fungi mentioned attack dead wood of this species, which rapidly deteriorates in consequence.

A new leaf and twig disease of Picea engelmanni, J. R. Weir (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 251–254, pl. 1*).—In a preliminary statement the author reports having examined what was thought from the gross appearance of the mycelial mat to be *Herpotrichia nigra*, a fungus common on *P. engelmanni* on Marble Mountain, Idaho. It proved, however, to be a new species which is described as *H. quinqueseptata* n. sp. These two species of Herpotrichia, with *Neopeckia coulteri*, cause considerable damage to forests at altitudes of not less than 5,000 ft. The dense mat of mycelium has been found to influence the temperature of the enveloped leaves in the same manner as when any dark covering is placed on an air thermometer bulb. The fungus acting as a pronounced epiphyte may thus be enabled to incubate its own mycelia within the tissues of the host, thus hastening its parasitic activities, and these may be further hastened by accompanying injurious physiological changes. The spread of the mycelium over young growth, from spring to early fall, is fairly rapid.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

[Report on insect pests] (*Wisconsin Sta. Bul. 250 (1915), pp. 29–33, fig. 1*).—Brief notes are presented on cranberry insect work by O. G. Malde, and on studies by J. G. Sanders on the control of the onion maggot (see p. 357); the tobacco split worm, better known as the potato tuber worm, which was found during the year to occur in the State; May beetles (*Lachnosterna* spp.);

the cottony maple scale, which became so numerous as to be destructive to many soft maple shade trees in a number of cities and farming communities; etc. It is stated that upon a farm where the poisoned bait spray for the onion maggot was tested, a perfect stand of onions was secured, while an untreated check plat 40 ft. distant and separated by two rows of trees and currant bushes was destroyed by the onion maggot to the extent of 75 per cent. A chart illustrating the development and vulnerable points of attack of the May beetle is included.

Potato insects, R. L. WEBSTER (*Iowa Sta. Bul. 155 (1915), pp. 359–420, figs. 43*).—Brief accounts with records of observations are given of the important insect enemies of potatoes in Iowa. The pests considered are the Colorado potato beetle, the potato flea-beetle (*Epitrix cucumeris*), the striped blister beetle, the gray blister beetle, the black blister beetle, the tobacco worm, the tomato worm, the cabbage looper, the variegated cutworm, the cotton cutworm (*Prodenia ornithogalli*), the apple leafhopper, the potato aphid (*Macrosiphum solanifolii*), the dusky leaf bug (*Adelphocoris rapidus*), the tarnished plant bug, the potato stalk borer, and white grubs.

A bibliography of literature relating to the subject is included.

[Work with cranberry insects in 1914], H. J. FRANKLIN (*Massachusetts Sta. Bul. 160 (1915), pp. 103–117; Ann. Rpt. Cape Cod Cranberry Growers' Assoc., 27 (1914), pp. 12–27*).—In reporting upon the occurrence during the year of insect enemies of cranberries, in continuation of work previously noted (E. S. R., 31, pp. 453, 752), it is stated that the forest tent caterpillar was very abundant everywhere in the cranberry section during May and June, but that it was never found feeding on cranberry vines. While the army worm was abundant and did quite a little damage on bogs here and there the cases of great injury appear to have been few. The gipsy moth is becoming more of a menace each year. The cranberry weevil (*Anthonomus suturalis*) which did much damage on some bogs at Plymouth in 1913 also caused a loss in the same locality in 1914. The application of arsenicals when the vines were in bud some time before any blossoms have opened appears to have reduced the injury caused. The spanworm (*Epelis truncataria faxonii*), which seriously damaged a bog at Wareham, was found to be parasitized by an ichneumonid, to be described by the author as *Campoplex variabilis* n. sp., to the extent of 25 to 30 per cent. The larvæ are said to have survived a winter submergence of five months in the bog. The cranberry tip worm (*Cecidomyia oxycoccana*) and the cranberry fruit worm were given special attention during the year and are here considered at some length. Notes are also given on the flowed bog fireworm or blackhead cranberry worm (*Rhopobota vacciniana*).

It was determined that the cranberry tip worm is responsible for the poor budding that follows the serious dying back of the cranberry tips, which had been supposed to be due to injury to the root system caused possibly by mismanagement in the use of water during the growing season. It was found that the maggots of the most injurious brood leave the tips and go down to the sand under the vine to form their cocoons. Flowed bogs which had been resanded the fall before or in the spring before the first of May were, as a rule, much less seriously injured than those not thus resanded.

In regard to the cranberry fruit worm it is stated that late holding of winter flowage appears to be the only method of satisfactorily combating it. Submergence tests show that the fruit worm, in its cocoon, is quite resistant to drowning. The cocoons of this insect are not impervious to water, but the pupæ do not appear to be readily killed by contact insecticides, such as scalecide and blackleaf 40, which were tested during the year. While nearly a dozen parasites of this worm have been reared, mention of several of which were made in the previous report, only three are abundant enough to be of much importance. It was found during 1914 that the braconid parasite *Phanerotoma tibialis* discussed in the previous report apparently larviposits in the fruit worm eggs. The ichneumonid parasite, previously mentioned, has been determined by Cushman as *Pristomeridia agilis.* The common chalcidid parasite *Trichogramma minuta*, known to parasitize the eggs of not less than 46 other species of insects, is said to be the most important parasite of the fruit worm, 56 per cent of the eggs having been attacked by it on dry bogs in the vicinity of the station bog. The parasitic and predaceous enemies of the fruit worm are said to have destroyed not less than 90 per cent of the infestation on dry bogs and fully 66 per cent on flowed bogs in the vicinity of the station.

The control of citrus insects, H. J. QUAYLE (*California Sta. Circ. 129* (*1915*), *pp. 35, figs. 18*).—A summarized account of the various means for controlling citrus pests.

Control of dried-fruit insects in California, W. B. BARKER (*U. S. Dept. Agr. Bul. 235* (*1915*), *pp. 15, pls. 7, figs. 4*).—This report is based upon work conducted in central California in large part since 1911, at which time it was taken up by the author. The author's summary of the work and conclusions drawn are as follows:

"A considerable financial loss due to the infestation of dried fruit by insects is experienced by packers, wholesale men, and retail dealers. There are several species of insects which attack dried fruits on the Pacific coast, but of these the most common and destructive are the Indian-meal moth and the dried-fruit beetle.

"Infestation takes place in the packing house, in the warehouse, and in the grocery store. The insects find their way to the fruit through small cracks in the boxes and between the folds of the paper. All insect life is destroyed in fruits that are put through the boiling dip, and the processing of other fruits can be accomplished by the addition of the belt heater to sterilize all fruit so treated.

"The use of an insect-free packing room and sterilized cartons or containers which are sealed before being placed in the warehouses or cars will protect the fruit from infestation unless the package is broken. There are several cartons and methods of sealing that can be applied to dried fruit, but their cost will determine their practicability. The secret of preparing an insect-free package of dried fruit is to sterilize it at a temperature of 180° F. and protect it from future infestation by the use of the insect-free packing room and sealing in sterile cartons or packages.

"The sealed carton not only protects the fruit from infestation, but it prevents it from drying out and preserves it for long periods in the moist and attractive condition in which it was packed. Moist fruit can be successfully packed in sealed cartons, provided attention is paid to the moisture content. The fruit must be carefully drained and must not be packed too hot. Machines have been invented which will successfully wrap and seal small packages of dried fruit at a moderate cost per thousand. It is probable that the time is coming when it will be as necessary to put up dried fruit in sealed packages as it is to pack cereals in that form to-day."

Some external parasites of poultry with special reference to Mallophaga, with directions for their control, G. W. HERRICK (*New York Cornell Sta. Bul. 359* (*1915*), *pp. 233–268, figs. 22*).—This bulletin deals in large part with the Mallophaga, or bird lice (pp. 233–251), their injury to fowls, life history, etc. A host list is given of the species reported as found on fowls and brief popular accounts with illustrations and notes on the occurrence of the more important. Other parasites of fowls briefly considered are the poultry mite (*Dermanyssus gallinæ*), the common hen flea (*Ceratophyllus gallinæ*), the southern hen flea (*Echidnophaga gallinaceus* seu *Xestopsylla gallinacea*), the harvest mite (*Trombidium* sp.), and a tick that infests turkeys, namely, *Hæmaphysalis chordeilis*, which has been found to occur in Warren County, N. Y. The bulletin concludes with a brief account of methods of controlling the parasites of domestic fowls.

A new wheat thrips, E. O. G. KELLY (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 219–224, pl. 1*).—It is stated that a new thrips, described by Hood in 1914 from material collected by the author in 1908 as *Prosopothrips cognatus* (E. S. R., 30, p. 658), frequently becomes injurious to wheat (*Triticum* spp.) in localized areas, but has not as yet been discovered to injure other grain crops. This species of thrips is known to occur in all parts of Kansas, even to the western border; in Oklahoma; at two places in western Missouri; and in one locality in extreme southern Nebraska. Careful search has failed to detect it in northern Texas, eastern New Mexico, western Nebraska, and in Kentucky, Tennessee, and Georgia.

The eggs, which are deposited in the tissue of the young leaves of wheat or grass, hatch in from 6 to 10 days. The larvæ become full grown in from 10 to 12 days and crawl down the plants into the soil where they pupate and transform to adults. The pupal period occupies from 10 to 13 days while the newly issued female requires but from 2 to 3 days to prepare for egg laying. A few adults are said to have lived for a period of 8 months in the laboratory. There are from 4 to 5 generations of this species each year which overlap one another so that adults and larvæ are present at all times, even in late winter.

Wheat plants furnish its principal food from the time the volunteer plants sprout in August until the crop is harvested the following June. During the interval between wheat harvest and the sprouting of volunteer wheat the thrips feed and reproduce on *Agropyron smithii*, *Elymus canadense*, *E. virginicus*, *Syntherisma sanguinalis*, *Panicum crus-galli*, and *Hordeum jubatum*, upon which they may also be found at all seasons. The injury by this thrips is confined to the leaves of young plants, unfolding heads and newly formed grains of wheat, and the young unfolding leaves of some grasses. "The leaves when attacked by a dozen or more individuals at one time become badly mutilated in a few hours and, owing to the influence of sunshine and wind, soon acquire a 'rusty' appearance. Since the injured leaves nearly always cover the next unfolding leaf, the injury often becomes disastrous to the plant by preventing the new shoot from developing. The heads are first attacked when in blossom, the pollen being eaten greedily. The tender stamens and pistils are lacerated badly and dry up very quickly, so that the embryo seeds are killed in a kind of injury seldom observed and one wherein the damage can hardly be estimated, although evidently it is considerable. As soon as the grains begin to form, the thrips attack the husk, and later, gaining access to the husk, they lacerate the tender integument of the newly forming grain. Grains attacked at this stage are practically destroyed, and even after the milk has become a dough the injury causes the grains to shrivel."

It is stated that at the present time no thoroughly practical remedy can be offered for the control of this pest, although large numbers may be destroyed by burning off all grasses.

Control of the citrus thrips in California and Arizona, J. R. HORTON (*U. S. Dept. Agr., Farmers' Bul. 674 (1915), pp. 15, figs. 7*).—A popular summary of means of control of the citrus thrips, accounts of which by Jones and Horton have been previously noted (E. S. R., 25, p. 657).

A new species of North American Tingitidæ, O. HEIDEMANN (*Proc. Ent. Soc. Wash., 16 (1914), No. 3, pp. 136, 137, fig. 1*).—A new species which seems to have a wide range of distribution, from the Atlantic coast to the Southwestern States, having been collected from *Solanum carolinense* and *S. elæagnifolium* at Kirkwood, Mo.; in Lavaca County and at Columbus, Tex., on coffee weed and Solanum; at El Reno Okla.; and at Norfolk, Va., is described as *Gargaphia solani*.

The eggplant lace-bug, D. E. FINK (*U. S. Dept. Agr. Bul. 239 (1915), pp. 7, pls. 6*).—This work is in cooperation with the Virginia Truck Station.

Injury by lace-bugs, which first attracted the author's attention in the vicinity of Norfolk, Va., during the spring and summer of 1913, has been found to be due to a new species that has been described by Heidemann as *Gargaphia solani* (see above). During the spring and summer of 1914 investigations proved it to be widely distributed in Tidewater Virginia wherever eggplant was grown on a commercial scale, and also at Occoquan, Va., in the District of Columbia, and in Maryland.

The work of this pest somewhat resembles that of aphidids. All stages may be found on the underside of the leaves, and in the nymphal stages particularly they always feed in original colonies as hatched. "The first stage of injury appears in the form of circular discolored areas of about the size of a silver quarter. Such a leaf when examined will show a mass of eggs, and usually the female also will be observed either in close proximity feeding or in the act of ovipositing. Upon emergence of the nymphs from the eggs the discoloration of the leaves increases in area until finally the entire leaf is involved, turning yellow and dry. The nymphs migrate from one leaf to another, injuring every leaf attacked, until they transform, after which, as adults, they disperse to other plants. Not every plant in a field will be injured, but once a plant becomes infested every leaf may be so injured as to result in the loss of the plant." While the injury by the lace-bug to eggplant is usually attributed to plant lice, it is entirely well-defined and individual in character and can be readily recognized.

Five nymphal stages have been observed, technical descriptions of which are presented. Adults and eggs were found by the author as early as May 20, the egg-laying period in the field lasting from 4 to 5 days. The author records 116, 117, and 188 eggs, respectively, as deposited by three females kept in confinement. An incubation period of from 5 to 8 days was observed during the last of May, June, and early July. The period required for development of the nymph under normal conditions is said to be about 10 days. Allowing 6 days for the egg stage and several days for time before and after copulation by adults, the life cycle is approximately 20 days. In the vicinity of Norfolk this lace-bug was found breeding as late as November, giving a breeding season of nearly 6 months. Thus there is a possibility of from 7 to 8 generations a season. Apparently 6 generations are spent on eggplant and the remainder on horse nettle.

Several insect predators are recorded as having been observed feeding on the nymphs and adults. Quite satisfactory results were obtained in spraying experiments in the use of fish-oil soap and with a standard blackleaf tobacco extract containing 40 per cent active nicotin sulphate. The percentage of nymphs killed was but slightly affected by the increase in the amount of nicotin sulphate from 1:1,066 up to 1:640; the latter had no effect whatever on the adults. With each increase in the amount of fish-oil soap up to 6 lbs. to 50 gal. of water there was a corresponding increase in the percentage of nymphs killed, and at the latter strength some of the adults were affected. At a strength of 8 lbs. of fish-oil soap to 50 gal. of water all the nymphs and 95 per cent of the adults were killed.

Leafhoppers of Maine, H. Osborn (*Maine Sta. Bul. 238 (1915), pp. 81–160, figs. 25*).—This report deals mainly with the leafhoppers proper or Jassoidea which includes the families Tettigoniellidæ, Jassidæ, Bythoscopidæ, and Typhlocybidæ. It is pointed out that the principal economic importance of leafhoppers is due to their attacks upon oats, timothy, wheat, and other cereal and forage crops, fruits of various kinds, and forest and shade trees. The author here deals with 153 forms, representing 34 genera, of which 12 species are described as new to science. Brief descriptions are given of the species with records of their occurrence in the State.

The species found by the author as being most in evidence in meadows and grasslands in Maine are *Cicadula 6-notata*, *Deltocephalus inimicus*, *D. configuratus*, *Acocephalus striatus*, *Dræculacephala mollipes*, *D. angulifera*, and *D. noveboracensis*. The species affecting fruit and garden crops are more commonly noticed, particular mention being made of the damage caused by the grape leafhopper (*Typhlocyba comes*) and by the apple leafhopper which affects not only apples but quite commonly such crops as potatoes, beans, and other garden crops.

Methods of control are briefly considered under the headings of crop rotation, clean culture, mowing, burning, spraying, and the use of the hopperdozer. Keys to the families of Jassoidea and to the genera of these families are included.

The sharp-headed grain leafhopper, E. H. Gibson (*U. S. Dept. Agr. Bul. 254 (1915), pp. 16, fig. 1*).—The data here presented are based upon an entire season's work in the Salt River Valley, Arizona, during 1914, together with occasional observations elsewhere. The most extended account of this species previously published is that by Osborn in a bulletin previously noted (E. S. R., 27, p. 858). The present paper, which supplements that account, includes quotations therefrom.

The greatest damage caused by this leafhopper is to young and tender grain crops by the nymphs and adults during the fall and early spring months. The greatest injury to corn and other crops is done during the summer months, while that to alfalfa will probably always be very slight on account of its rapid growth. Ordinarily the feeding of the nymphs is more injurious to a plant than that of the adults, because they are present in greater numbers. Injury is also produced by the adult female by puncturing and constructing pockets in the leaves and stems for oviposition.

This jassid has an extremely wide distribution, ranging from the Atlantic to the Pacific and from the strictly boreal portions of Canada south into Mexico. The author has taken the nymphs and adults in large numbers from wheat, barley, oats, alfalfa, bur clover (*Medicago denticulata*), sour clover (*Melilotus indica*), Johnson grass (*Sorghum halepense*), wall barley (*Hordeum murinum*), and many other native grasses of the South and Southwest.

Five nymphal instars have been observed, descriptions of which are presented. The incubation period of the egg in southern Arizona was found to vary from 3 to 35 days, with an average of 12 days. Observations at Tempe, Ariz., show the length of the nymphal stage to vary from 20 to 51 days. While Osborn has stated that hibernation seems to occur in all stages from egg to adult, although the great majority must pass the winter in the egg stage, the author has as yet failed to find other than the adult stage to do so. He concludes that it is safe to assume that the species winters over principally in the adult stage throughout the Southern States, and that in all probability the same holds true throughout the country.

Egg parasites are said to be the most effective enemies, two new species of which were reared by the author during the summer of 1914, one described by Crawford as *Gonatocerus gibsoni* (see above) and the other to be described by Girault as *Abbella auriscutellum*. *G. gibsoni* is said to have not only held the pest in check but to have practically eradicated it in the Salt River Valley during the summer of 1914, from 75 to 95 per cent of parasitism having been observed between May 15 and June 15. Two egg parasites were reared in considerable numbers by Ainslie in Florida during the spring of 1914, one of which has been determined as *Brachistella acuminata*.

As regards remedial measures it is stated that in localities with conditions similar to those in Salt River Valley, Arizona, much can be accomplished through the keeping down of wild grasses, principally Johnson grass, along irrigation ditch banks, fence rows, and along roadsides during the summer months. As soon as possible after the grain is harvested the ground should be broken up and planted. Where the species infests pastures or grass lands close pasturing or cutting while it is in the egg stage is advised. It is thought that in the Northern States the burning of grasses in which the species may be hibernating will destroy many of the adults.

Influence of soil moisture upon the rate of increase in sugar-beet root louse colonies, J. R. Parker (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 3, pp. 241–250*).—During the course of studies of the sugar-beet root louse (*Pemphigus betæ*) at the Montana Station, an account of the life history of which species has been previously noted (E. S. R., 31, p. 250), it was found that soil moisture is a very important factor in the control of the rate of increase in root-louse colonies. In the present paper the author reports upon general field observations, insectary experiments, and field irrigation tests of the effect of soil moisture. In irrigation experiments at Huntley, Bozeman, and Edgar, it was found that sugar beets grown under rather moist conditions were the least infested with root lice and yielded the highest in both sugar content and in tonnage. By irrigating early before the fields become dry the chances of root louse infestation are reduced and the best conditions for plant growth are secured.

The Hessian fly, T. J. Headlee (*New Jersey Stas. Circ. 46, pp. 3–8*).—A brief popular account of this pest and means of control, including a table for determining the date of safe sowing at different altitudes and latitudes in the State.

Fly baits, J. E. Buck (*Alabama Col. Sta. Circ. 32 (1915), pp. 34–39, fig. 1*).—This is a brief report of work at the station barns during the summer and fall of 1914, during the course of which more than 50 tests were made with a view to determining the relative attractiveness to flies of various baits used in wire traps. The baits were exposed from 2 to 5 hours in a test and from 2 to 18 hours in a series.

In all tests the baits were exposed 138 hours, catching a total of 104,041 flies. Formulas are given of twelve of the most important baits in the order of their attractiveness, all of which are said to have been thoroughly tested in comparison with each other and with still others, and can be relied upon for good results. The one first mentioned is that of light bread, buttermilk (to which 7 per cent of 40 per cent commercial formaldehyde has been added), and a little sugar or sirup.

Control of the onion fly, J. G. Sanders (*Country Gent., 80 (1915), No. 12, pp. 572, 573, figs. 5*).—Following studies of the life history of the onion maggot (*Pegomya cepetorum*) at the University of Wisconsin by C. R. Cleveland and H. H. Severin, showing a period of from 10 to 14 days between the emergence of the adult fly and the beginning of oviposition, control experiments were conducted to determine whether the adults could be poisoned during the interim, as previously noted (E. S. R., 31, p. 849).

It has been found that sodium arsenate at the rate of ⅛ oz. to a gallon of boiling water to which 1 pint of New Orleans molasses is later added furnishes a spray that is cheap, attractive to the pests, and effective. "In actual practice it has been found that a field may be treated in checkerboard fashion or in alternate strips, leaving an untreated strip of a width similar to the treated areas, since the flies are strongly attracted to the poison bait spray when freshly applied. The frequency of treatment is most important. During fair weather the application of this poison bait once a week regularly is sufficient, but in rainy weather it is desirable to apply it at least twice a week, especially if a shower follows the application. It is urged that the poison bait spray be also applied to weeds or other vegetation adjoining the onion fields to poison any individual flies that may be resting at these locations." It is stated that a number of onion growers in Wisconsin tried out this poison bait spray during the summer of 1914 under actual field conditions and harvested almost perfect stands, and the best crop grown in fifteen or more years.

Insecticides for the control of the Colorado potato beetle (Leptinotarsa decemlineata), L. B. SMITH (*Virginia Truck Sta. Bul. 14* (*1915*), *pp. 315–333*, *figs. 5*).—This is a general summary of the results of field work on the control of the Colorado potato beetle conducted in Tidewater Virginia, during the season of 1914. The results indicate that for the farmer who grows 5 acres or more of potatoes Bordeaux mixture (4:6:50), together with arsenate of lead paste from 4 to 6 lbs., and 1 lb. of Paris green to 50 gal. of mixture has not yet been surpassed as a spray for potatoes by any of the proprietary insecticides now in use either from the standpoint of efficiency or economy. It is thought that the most economical and efficient results in spraying under Tidewater conditions may be obtained through the application of Paris green and lime dust when the first green shoots are showing, followed as soon as the plants are from 4 to 8 in. high by some liquid spray, preferably that above mentioned. This should be applied at least every 10 days and the application repeated preferably once a week until the crop is ready for harvest. A description of a Bordeaux mixing plant is included.

The southern corn leaf-beetle, E. O. G. KELLY (*U. S. Dept. Agr. Bul. 221* (*1915*), *pp. 11*, *pls. 2*, *figs. 6*).—During the last few years the southern corn leaf-beetle (*Myochrous denticollis*) has become a pest of considerable importance. It first came to the author's attention in the bottom lands of the Ohio River in southern Illinois in 1905, and has since been observed by him in Kansas, northern Texas, and eastern Arkansas. These observations and others by Webster in Louisiana and Ohio [a] seem to indicate that it occurs in destructive abundance on lands that have previously been devoted to pasture or on lands which have been allowed to lapse into a semiwild condition, not having been cultivated for several years. The species is widely distributed over the southern half of the United States, extending from the extreme southeastern part of Arizona to southern Texas, becoming more numerous directly north of Brownsville, thence northward to southern Iowa, and eastward to northern Illinois and central Ohio and to Washington, D. C., the most southeastern point recorded being in northern Florida.

While numbers of larvæ have from time to time been found in the soil, always in close proximity to corn roots which were more or less eaten, in no

[a] Jour. N. Y. Ent. Soc., 9 (1901), No. 3, pp. 127–132.

instance have they actually been observed feeding on corn roots, although special attention has been given to their feeding habits.

In the laboratory the eggs hatch in from 6 to 10 days, but the larvæ have not as yet been reared to maturity, notwithstanding repeated attempts to do so. In numerous searches made in cornfields, wheat fields, grass, and fields grown up with weeds, the larvæ have not as yet been found feeding on plants other than corn. The first larvæ found in the field were observed at Wellington, Kans., July 20, 1910, in small, round earthen cells from 4 to 6 in. deep, with a small burrow leading toward the corn roots which had been more or less eaten. Very few larvæ or pupæ have been found in sandy or light soils, and correspondingly few injured corn roots have been observed.

Laboratory records made at Brownsville, Tex., by Vickery indicate that the larval period extends from about April 1 to June 15, while the author's observations at Plano, Tex., show the larval period to range from April 15 to July 1, and at Wellington, Kans., from May 1 to July 15. "In the bottom lands of the Arkansas River, near Paris, Ark., the larvæ had pupated and practically all the adults had issued by July 22, 1914, indicating that they began pupating as early as July 1. In the vicinity of Wellington, Kans., the larvæ began to pupate about the middle of July, pupæ being found as early as July 20 and as late as August 14. The period for maturing the pupa seems to be about 15 days, although no exact data have been obtained. The first pupæ to be found were in earthen cells in the soil near corn plants at depths of from 4 to 6 in."

Because of the fact that the adults have the habit of dropping from their food plants to the ground and hiding when disturbed, they are very rarely seen. The beetles seem to prefer feeding early in the morning, late in the evening, or at night, or on cloudy days. The adults issue from pupal cells about the middle of July in central Arkansas and the first of August in southern Kansas, emergence extending over a period of about one month. They do considerable feeding on the kernels of unripe ears of corn and buds of cocklebur before entering hibernation, which begins early in the fall. Corn is the only cultivated crop that has been found to be attacked in sufficient numbers to cause serious damage, but the beetles have been observed to attack the young leaves and growing shoots of cocklebur, smartweed, Japan clover, and crab grass. They have also been observed to feed upon sorghum, *Alopecurus geniculatus*, cotton, and alfalfa, but on the latter plant only in rearing cages in the laboratory.

In regard to remedial measures it is stated that a great number of beetles have been collected at lights, indicating that a powerful light trap located in the vicinity of the infested field might materially reduce them, especially in the early fall when they are flying in search of hibernating quarters. It is suggested that the cleaning up of all rubbish in the cornfield early in the fall, especially in fields of very late corn, will prove an effective remedy in the protection of succeeding crops. No remedy has been found that can be recommended in combating them after they once enter the cornfield. If a crop is so badly damaged as to be worthless it can be replanted with safety from damage by this insect about one month after the regular planting time, since within a few days after the leaf-beetles have killed out the first planting they will leave the field. It is thought that something might be gained by delaying corn planting in localities where beetles have been injurious the previous year. Experimental work by Gibson in the vicinity of Charleston, Mo., during late April and early May indicates that the beetles can be readily destroyed by a poison bran bait, consisting of 25 lbs. of wheat bran, 1 lb. of Paris green, 1 gal. of low-grade molasses, and the juice of 3 oranges, with enough water to bring the mixture to a stiff dough.

A list of 8 references is included.

Contributions toward a classification and biology of the North American Cerambycidæ.—Larvæ of the Prioninæ, F. C. Craighead (*U. S. Dept. Agr. Rpt. 107* (*1915*), *pp. 24, pls. 8*).—The present paper is based upon rearings for identification of some 200 species additional to some 50 on which the report by Webb (E. S. R., 27, p. 756) was based. Emphasis is made of the need of great care in rearing these larvæ, it being stated that a single piece of infested wood may contain from five to a dozen different species of Cerambycidæ.

The larvæ of this family of beetles are primarily and probably without exception phytophagous, boring in the ligneous tissue of, for the most part, the aborescent flora, though a few species are confined to herbaceous plants, in this case being usually pith or root feeders. Some are confined to one species of tree, as is usually the case with those attacking living tissue, others to a single genus, and again there are species which will have a wide variety of host plants among either the conifers or the hardwoods, but the larvæ of the same species will rarely attack both indiscriminately.

Keys to the larvæ of the subfamilies of Cerambycidæ and to the genera of the Prioninæ, and general anatomical characteristics and descriptions of larvæ of Prioninæ are given.

The roundheaded apple-tree borer, F. E. Brooks (*U. S. Dept. Agr., Farmers' Bul. 675* (*1915*), *pp. 20, figs. 19*).—A popular summary of this pest, its life history and habits, natural enemies, and methods of control.

Some sugar-cane root-boring weevils of the West Indies, W. D. Pierce (*U. S. Dept. Agr., Jour. Agr. Research, 4* (*1915*), *No. 3, pp. 255–263, pls. 4*).—The present paper, which deals with the weevils of the genus Diaprepes that attack sugar cane in the West Indies, has been prepared with a view to straightening out the difficult nomenclature, to point out the dangerous nature of the injury by the species treated, and so to describe the various forms that quarantine agents may readily detect them. The author calls attention to the fact that, due to their variable color, shape, and markings, it is extremely difficult to determine their specific limitations. Two species, namely, *Diaprepes spengleri* and its six varieties (*marginatus, comma, spengleri, abbreviatus, denudatus*, and *festivus*), and *D. famelicus* are recognized and here considered, one of which varieties (*D. spengleri denudatus*) from Guadeloupe is described for the first time.

Descriptions of new Hymenoptera, IX, J. C. Crawford (*Proc. U. S. Nat. Mus., 48* (*1915*), *pp. 577–586, figs. 11*).—Among the new species here described, of economic importance, are the following: *Hexaplasta marlatti* reared at Warrenton, Va., from cow dung with Hæmatobia; *H. fungicola* reared from dipterous larvæ in mushrooms at Washington, D. C.; *H. websteri* reared from *Euxesta nitidiventris* at Wellington, Kans.; *Figites popenoei* reared from *Boletus bicolor* at Washington, D. C.; *Zelotypa fungicola* reared from dipterous larvæ in *B. felleus* at Clarendon, Va.; *Geniocerus chrysopæ* reared from cocoons of Chrysopa at Batesburg, S. C.; *G. juniperi* and *G. marcovitchi* reared from berries of *Juniperus virginiana* at Ithaca, N. Y.; and *Gonatocerus gibsoni* reared from the eggs of *Drœculacephala mollipes* at Tempe, Ariz.

FOODS—HUMAN NUTRITION.

[Food and drug topics], E. F. Ladd and Alma K. Johnson (*North Dakota Sta. Spec. Bul., 3* (*1915*), *No. 17, pp. 289–304*).—This bulletin, which gives information regarding some proprietary medicines, including a so-called hog-cholera remedy noted on page 389, contains a report, by R. O. Baird, of the chemical analysis of 29 samples of molasses.

A report, by T. Sanderson, on a comparison of the values of four types of hard red spring wheat, namely, Marquis, Velvet Chaff, Bluestem, and Fife, in cooperation with the Office of Grain Standardization of the U. S. Department of Agriculture, completes the bulletin. From the results of milling and baking tests carried out with these varieties and previous work (E. S. R., 30, p. 666), the following conclusions, among others, are drawn:

"From the data at hand Marquis has done better this year than last, compared with the other types, and is clearly in the lead, Bluestem second, Fife third, Velvet Chaff fourth, when considered from value of products.

"We are not in a position to advocate the growing of any one of these types of wheat over the other, because of the wide variation of soil and climatic conditions which we believe the farmer to be familiar with in his own locality, and should be governed by, in the selection of the type of wheat to grow.

"In view of the discrimination against the Velvet Chaff, we feel constrained to advise the farmers to discontinue its production as far as possible, substituting any one of the other three that has been doing well in their locality."

The digestibility of the proteins of cereals, legumes, and potato flour, O. Rammstedt (*Pharm. Zentralhalle, 56 (1915), Nos. 1, pp. 1–7; 2, pp. 14–17; 3, pp. 22–25*).—In this digest of data the author brings together information regarding the relative nutritive value of corn, wheat, potatoes, and legumes prepared and cooked in different ways. The use of corn, peas, lentils, and beans is recommended as a substitute for meat and wheat flour in times of food stringency.

The influence of the environment on the milling and baking qualities of wheat in India.—III, The experiments of 1911–12, A. Howard, H. M. Leake, and Gabrielle L. C. Howard (*Mem. Dept. Agr. India, Bot. Ser., 6 (1914), No. 8, pp. 233–266, pls. 2*).—The work here reported is a continuation of that previously noted (E. S. R., 29, p. 263). The experiments were carried out to determine whether a good grade of wheat produced in only a limited area could be successfully cultivated in other sections of India under a different environment. A standard variety of wheat was grown at a number of different stations and samples compared as regards consistency, absolute weight, nitrogen content, and milling and baking qualities. The results of these tests indicated that the environmental conditions of different sections of India were not sufficiently unfavorable to influence seriously the strength and milling qualities of good wheat.

Banana meal a substitute for flour, J. C. Monaghan (*U. S. Dept. Com., Com. Rpts., No. 129 (1915), p. 1019*).—This article notes the combination of banana meal with wheat flour for bread making in Jamaica.

Digestive disturbances following the use of war bread, and their treatment, C. von Noorden (*Berlin. Klin. Wchnschr., 52 (1915), No. 14, pp. 349, 350*).—Clinical observations are reported which tend to show that the excessive use of rye-potato bread produced disturbances in the digestive tract, especially fermentation, dyspepsia, hyperacidity of the stomach, and excessive gas formation.

Bread seasoning, A. Maurizio (*Naturw. Wchnschr., 30 (1915), No. 15, pp. 225–228*).—A summary and digest of data in which is described the custom of seasoning bread as practiced at different times in this and in other countries. It is pointed out that the use of most spices and flavors is governed either by necessity or by long-continued usage.

Proso and kaoliang as table foods (*South Dakota Sta. Bul. 158 (1915), pp. 147–176, figs. 2*).—General information is given by N. E. Hansen regarding the history, cultivation, and milling of different varieties of these grains, including analyses. The publication also contains the results of an investigation of their use as food by Nola K. Fromme. It is stated that while proso is practically unused in America as a food, in Russia and India it has been so used for some time. The grain may be used whole, ground into a meal, or finely ground into flour. A number of recipes and suggestions for its use in cooking are given. Information is also given regarding the use of kaoliang as food, it being compared with grain sorghums. A number of recipes are given, in some of which kaoliang is used in the same way as corn meal or Kafir corn flour.

The nutritive value of the avocado, M. E. JAFFA (*California Sta. Bul. 254* (*1915*), *pp. 395–402, figs. 2*).—This paper reports the results of the chemical analysis of 28 varieties of the avocado. The approximate composition of the edible portion, constituting 65.7 per cent of the fruit, is as follows: Water, 69.16 per cent; protein, 2.08 per cent; fat 20.1 per cent; carbohydrate, 7.39 per cent; and ash, 1.26 per cent. The average energy value found was 984 calories per pound, or more than twice the maximum noted for any other fruit. The amounts of protein and ash found were greater and the amount of carbohydrate about one-half that found in most fresh fruit. The value of the avocado as food is chiefly due to its high fat content, which is greater than that of the average olive. It is assumed that the avocado is quite thoroughly digestible.

Unfermented grape juice, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 307* (*1915*), *pp. 19*).—This bulletin contains data regarding the inspection of 111 samples of unfermented grape juice collected in various parts of Canada. The legal requirements for grape juice are also given.

The preservation of meat, H. COPAUX and A. KLING (*Génie Civil, 66* (*1915*), *Nos. 14, pp. 209–214, figs. 14; 15, pp. 227–230, figs. 3*).—In this article, which describes somewhat in detail the process of the manufacture of canned meats for an army camp, the Appert and Billancourt processes are considered. Special attention is given to the methods of preparing meat and the mechanical processes involved in packing it for shipment.

Bacterial content of desiccated egg, L. S. ROSS (*Proc. Iowa Acad. Sci., 21* (*1914*), *pp. 33–49*).—The results are reported of a bacteriological examination of 66 samples of liquid egg yolk and 76 samples of liquid egg white, as well as 248 samples of desiccated eggs which had been stored for varying lengths of time at different temperatures. The author concludes as follows:

"The desiccated egg loses a large percentage of the bacteria originally present if stored for even a relatively short period. Also the experiment indicates a more rapid diminution if storage is at a higher temperature than at a lower. And it seems possible that a poor product, even one prepared from 'spots' and worse, might satisfy the ordinary bacterial test of colony counting and gas determination after a period of a few months' storage."

Cooking fats in South America (*U. S. Dept. Com., Spec. Cons. Rpts., No. 67* (*1915*), *pp. 15*).—This publication contains information regarding the use of various cooking fats in the different countries of South America. Data are given regarding the quantity and value of such fats imported by the different countries in the years 1912 and 1913 and six months of 1914.

The use of hardened fats for food purposes, H. THOMS and F. MÜLLER (*Arch. Hyg., 84* (*1915*), *No. 1, pp. 54–77*).—The authors report a number of chemical and physiological tests of peanut, sesame, and cotton-seed oil.

In long-continued animal feeding experiments and in tests of one week's duration with men, the availability of the hardened vegetable oils was compared with that of some of the more common animal fats and also with the same vegetable oils in the fluid condition. As a result of this work it is recommended that a fat should not be hardened to give a melting point of over 37° (body temperature). It was found that, in practically every case, if the digestibility of fats melting higher than this was not noticeably different from that of lower melting fats, a tallowy taste and intestinal and other passing disturbances, such as are usually noticed with beef and mutton tallow, were experienced. Should the melting point be higher than 37°, it is suggested that a suitable mixture may be prepared by the addition of a lower melting fat.

Use of hydrogenized fish oil in the manufacture of oleomargarin, J. KLIMONT and K. MAYER (*Ztschr. Angew. Chem., 27 (1914), No. 96–97, Aufsatzteil, pp. 645–648; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 3, p. 148*).—As objections to the use of this product it is noted that on account of improper control of the production of crude oil, its disagreeable odor may appear if the hydrogenized oil is kept for some time. The hydrogenized oil may also contain small quantities of nickel and has a higher melting point than any of the fats commonly used for food.

A description is given of a method for detecting the presence of hardened fish oil in oleomargarin.

Nineteenth report on food products and seventh report on drug products, 1914, J. P. STREET (*Connecticut State Sta. Rpt. 1914, pt. 5, pp. 227–356*).—The first part of this report contains the detailed results of the examination of a number of samples of food products, showing the net weight, cost, and calculated energy value per 100 gm. in addition to the chemical composition of the food products.

Eighty-eight samples of biscuits and crackers were examined, including graham, oatmeal, ginger, cheese, and whole-wheat crackers and others of miscellaneous character. Regarding these products the author states that "many of these are more strictly confections than foods, and this must be kept in mind in connection with their high cost. From the food standpoint many of them the consumer would not be justified in purchasing; on the other hand, judged as confections, their daintiness, tastiness, general attractiveness, and cleanliness might justify such high prices as from 60 cts. to $1.50 per pound. Furthermore, it is only just to say that in many cases the biscuits may be bought in bulk as well as in small packages, thus permitting a considerable saving in cost, with a possible loss as to freshness and cleanliness."

Examinations were also made of 12 samples of bran biscuits and laxative preparations, and 2 samples of condensed soups. In continuation of earlier work (E. S. R., 29, p. 660), 72 samples of diabetic foods were analyzed. Tabular data regarding these are also contained in the report.

The second part of this report contains the results of the examination of several samples of drug products, including toilet preparations and proprietary medicines. Detailed information is given regarding each of 130 samples of proprietary medicines analyzed. The author states that of these "35 might be passed as possessing some merit, but even these are expensive; they are generally toilet preparations and in certain cases possibly the convenience of their use might justify their purchase even at the high prices."

A general review of the effect of food inspection in Connecticut since 1895 is appended.

Twenty-first annual report of the Dairy and Food Commissioner of the State of Michigan (*Ann. Rpt. Dairy and Food Comr. Mich., 21 (1914), pp. 458+[3], pls. 2, figs. 20*).—The inspection and educational work carried on under the state food and drugs laws during the year ended June 30, 1914, is reviewed.

The report of the state analyst, F. L. Shannon, gives detailed information regarding the analysis of 1,719 samples of food products, of which 717 were found to be adulterated or misbranded. The report of the drug analyst, A. R. Todd, gives the results of the examination of 571 samples, of which 214 were condemned as not conforming to the requirements of existing standards. Inspections were made of 17,318 grocery stores, hotels, restaurants, bakeries, dairies, creameries, cheese factories, and other establishments where food was handled or manufactured.

The educational work consisted in speaking before various organizations, in disseminating popular information through pamphlets or bulletins, a number of which are reprinted in the report, and in the preparation of pure-food exhibits.

In this publication is also included the first annual report of the work done by the state sealer of weights and measures. This includes specifications for various food containers, as well as for weights and measures.

A review of the prosecutions and decisions relative to the inspection and adulteration of foods completes the report.

The Food and Drugs Act (*U. S. Dept. Agr., Office Solicitor Circ. 82 (1915), pp. 5*).—According to the decision of the U. S. Circuit Court of Appeals for the First Circuit, here reported, confectionery containing talc is held to be adulterated within the meaning of the Food and Drugs Act, although the amount of talc contained is a mere trace.

Food—what it is and does, EDITH GREER (*Boston: Ginn & Co., 1915, pp. VII+251, pls. 8, figs. 92*).—This book is intended as a school text-book and summarizes the characteristics of animal and vegetable foods, their methods of production, place in the diet, and the hygiene of their use. It includes charts, tables of composition, statistics of production, and many illustrations, some of the latter chiefly decorative in value.

Physics of the household, C. J. LYNDE (*New York: The Macmillan Company, 1914, pp. XI+313 figs. 217*).—This publication differs from most elementary text-books in that illustrative examples are taken largely from the household and for this reason should be of interest to teachers of physics in schools offering courses in home economics. The principles of physics involved in many common household processes are fully explained. Chapters are devoted to heat in the home, including a study of different kinds of heating and cooking appliances, heat measurement, etc. Other chapters devoted to the use of electricity in the home discuss heating, cooking, and lighting and other electrical appliances.

[Popular nutrition bulletins] (*Bul. Univ. Tex., 1914, Nos. 333, pp. 20; 342, pp. 20; 344, pp. 12; 345, pp. 12; 347, pp. 19; 350, pp. 13; 366, pp. 20*).—This series contains a number of popular bulletins, among which are the following, which would be of interest to housekeepers or to those engaged in extension work in home economics: The Principles of Menu Making, by Anna E. Richardson; Food for Growing Children, Cooking Tough Meats, and The Uses of Foods and the Proper Balancing of the Diet, by Jessie P. Rich; Meat, Its Value as Food, and Its Proper Preparation, prepared by the Division of Home Welfare; and The Irish Potato, and Nuts and Their Uses as Food, by Jessie P. Rich.

The public feeding of elementary school children, PHYLLIS D. WINDER (*New York: Longmans, Green, & Co., 1913, pp. VII+84*).—This report, which is one of the series entitled Birmingham Studies in Social Economics and Adjacent Fields, edited by W. J. Ashley, reviews and criticizes the methods and results of school feeding in Birmingham, England. The aspects of the subject here considered are some of the causes of malnutrition, the methods employed for selecting the children as compared with those generally used, the time and nature of the meal, the service and its supervision, the family circumstances of the children, and the effect of the meals on the child and on the family. Among the factors given as the cause of malnutrition are poverty, unsuitable and ill-cooked foods, insufficient sleep, poor ventilation, and general insanitary surroundings.

Experience showed that it was desirable to supply in the meals those food constituents in which the customary home diet was deficient, viz, protein and fat.

Where breakfast was the meal served, porridge was found to be one of the best foods, it being served with treacle or sugar and milk, and followed by bread and "dripping." Where dinner was provided a number of menus were used, consisting of fish, meat pies, vegetable dishes, stews, roast meats, stewed fruits, milk suet puddings, and the usual soup.

In the appendix are given some typical menus and several examples of family conditions existing in the cases of the children fed. A preface by N. Chamberlain and a bibliography are included in the publication.

A standard dietary for an orphanage, Adelle S. Jaffa (*[Sacramento, Cal.]: State Printing Office, 1914, pp. 28*).—This publication gives standard dietaries for children from 8 to 12 years old, for alternate weeks in the month, as well as a few extra menus for variety.

Feeding men in camps, W. Fisher (*[Memphis, Tenn.: R. H. & G. A. McWilliams, 1915], pp. 20*).—This pamphlet, issued by a contracting firm for the use of its superintendents, contains specific information for the feeding of laborers in camps. The different foods and amounts of foods to be purchased are listed, and data regarding frequency of service and the size of the portion allotted to each man are given. The appendix contains standard bills of fare for logging camps and the standard garrison ration of the United States Army.

A modern small-sized construction camp with some costs on feeding men, E. W. Robinson (*Engin. and Contract., 43 (1915), No. 14, pp. 318–320, fig. 1*).—This article gives detailed information concerning the plan of the camp, construction of the necessary buildings, and the methods employed in maintaining the camp. Figures are reproduced which show the cost of foods and other supplies used, as well as the expenditure for camp equipment.

Campaign rations for the army, J. Basset (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 12, pp. 375–378*).—Four new rations are described and recipes given for their preparation. Beef or pork forms the basis of these rations, dried fats and dried vegetables being added in sufficient quantity to secure a balance.

Beri-beri, E. B. Vedder (*New York: William Wood & Co., 1913, pp. VIII+427, pls. 6, figs. 51*).—In this comprehensive treatise of beri-beri its history, distribution, prevalence, pathology, symptomology, and etiology are considered. Under the last-named subject the author takes up at considerable length the questions as to whether it is a specific disease, an intoxication, an infection, or is due to the deficiency of the diet in certain essential principles. One chapter deals with rice and its preparation for the table. Experimental polyneuritis and beri-beri in animals are discussed and considered in their relation to the etiology of the disease in man. Chapters are also devoted to infantile beri-beri, ship beri-beri, and epidemic dropsy.

The publication contains a 54-page bibliography. In the appendix are given in more detail some of the data cited in the book.

Studies on beri-beri.—VIII, The relationship of beri-beri to glands of internal secretion, C. Funk and M. Douglas (*Jour. Physiol., 47 (1914), No. 6, pp. 475–478*).—The results are reported of an extended study of the pathological changes observed in the glands of internal secretions of pigeons suffering from experimental beri-beri resulting from an excessive diet of polished rice.

The harmlessness of vinegar eels in the human and animal organism, H. WÜSTENFELD (*Deut. Essigindus., 19 (1915), No. 11, pp. 53, 54*).—According to the experiments here reported a large number of vinegar eels were ingested without producing intestinal physiological disturbances.

The metabolism of white races living in the Tropics.—I, Protein metabolism, W. J. YOUNG (*Ann. Trop. Med. and Par., 9 (1915), No. 1, pp. 91–108*).—To determine whether tissue metabolism takes place to a greater extent in a tropical country than in a temperate climate a number of measurements were made of excretory nitrogen and sulfur catabolized by white men living in Queensland, Australia. No considerable variation is reported from the averages obtained in temperate climates, except that the excretion of neutral sulphur was consistently high.

Gastro-intestinal studies.—VII, The utilization of ingested protein as influenced by undermastication (bolting) and overmastication (Fletcherizing), L. F. FOSTER and P. B. HAWK (*Jour. Amer. Chem. Soc., 37 (1915), No. 5, pp. 1347–1361*).—In this investigation was studied the effect of different degrees of mastication upon the utilization of a typical protein. The subjects of experiment (two young men) were fed a uniform diet, the principal ingredients of which were beef, graham crackers, and milk. The beef, which furnished the major portion of the protein, was cooked in the form of 15-mm. cubes.

The experiment was divided into four 7-day periods, as follows: Preliminary normal, during which the food was masticated normally; bolting, in which the meat was swallowed with no attempt at mastication; Fletcherizing, when the food was chewed until carried down the esophagus by the "swallowing impulse"; and, final normal, in which ordinary mastication was practiced. A nitrogen-free diet was fed through a 4-day period at the close of the experiment proper. The results may be briefly summarized as follows:

"The output of fecal nitrogen was highest during the food bolting; that during Fletcherism was lowest. Protein utilization was most complete as the result of Fletcherism, and least complete when bolting was practiced. The discrepancies, however, averaged only 1.6 per cent. Utilization during Fletcherism averaged 0.17 per cent higher than during normal mastication.

"During food bolting macroscopic meat residues appeared in every stool. In a single stool the amount was 16.5 gm.

"The fineness of the protein may determine the amount of its hydrolytic cleavage. This fact was shown by the higher nitrogen content of the urine in the Fletcherizing period and the lowered output during bolting."

The authors mention that "the fact that pepsin may be absorbed in the stomach by particles of undigested food and carried into the small intestines to aid further in protein hydrolysis may have an important bearing on the question of the digestion of bolted meat."

The conclusion is drawn that "the results of this investigation fail to demonstrate the advantages of Fletcherism or the harmfulness of food bolting. . . . Fletcherism of starchy foods should be encouraged to insure the salivary digestion of a large quantity of material."

The circulation of the blood in man at high altitudes.—II, The rate of blood flow and the influence of oxygen on the pulse rate and blood flow, E. C. SCHNEIDER and D. L. SISCO (*Amer. Jour. Physiol., 34 (1914), No. 1, pp. 29–47*).—From observations of pulse rate and blood pressures of six subjects at high altitudes the following conclusions are drawn, in part: The pulse rate does not accelerate immediately on arrival at an altitude of 14,109 ft., but requires several days to reach its maximum. In the majority of healthy men the arterial pressures are unchanged. In five out of six subjects on Pikes Peak the venous pressure was lowered from 25 to 87 per cent. In consequence of these changes conditions of the vascular system favor an increased rate of blood flow on Pikes Peak.

Some metabolic influences of bathing in the Great Salt Lake, HELEN I. and H. A. MATTILL (*Amer. Jour. Physiol., 36 (1915), No. 4, pp. 488–500, fig. 1*).—Observations upon two subjects indicated that bathing exerts a stimulating effect on metabolism. The excretion of chlorids and total nitrogen was materially increased during the bathing periods.

Healthy atmosphere, L. HILL (*Nature [London], 95 (1915), No. 2373 pp. 205–207, figs. 3*).—In this article, which emphasizes the importance of the rate of cooling the body to comfort and health, two pieces of apparatus are described. These consist of a wet and dry katathermometer by means of which can be measured the rate of heat loss by radiation, convection, and evaporation, as well as the vapor pressure of the atmosphere, and a caleometer, which automatically indicates the amount of heat energy required to maintain a coil of wire at body temperature and thus shows the cooling effect of air currents.

ANIMAL PRODUCTION.

Influence on growth of rations restricted to the corn or wheat grain, E. B. HART and E. V. MCCOLLUM (*Jour. Biol. Chem., 19 (1914), No. 3, pp. 373–395, pl. 1, figs. 11*).—A continuation of work previously noted (E. S. R., 26, p. 467; 33, p. 69).

In these studies the authors found that "when swine are restricted to corn meal and gluten feed little or no growth can be secured, but with an addition of salts, making the entire ash content of the ration very similar in quality to that of milk, growth approximating that of a normal curve was secured to at least 275 lbs. These results are not in harmony with the theory that the failure of swine to grow on corn alone is due entirely to the incomplete nature of its protein content. Restriction to mixed grains and distilled water did not allow normal growth with swine. This emphasizes again the very great importance of either the mineral side of a ration, or as yet unknown factors operative in the normal environment of this species, namely, soil rooting, natural water, etc.

"When the wheat kernel supplied all the nutrients, growth was again limited with both swine and rats. However, when the salt content was modified to resemble milk some growth could be secured, but ultimately this ceased, followed by partial paralysis, particularly in swine, and a general decline. Correcting the mineral content of the wheat kernel alone induces a certain amount of growth, but the benefit is only temporary. When the wheat kernel was fortified with salts and butter fat, the growth curve was very much improved in both species, although a normal curve was not secured. The animals, however, remained vigorous and strong for a very much longer period, although partial decline in some individuals, mainly characterized by stiffness, ultimately set in. However, when the wheat kernel, salt, and butter fat ration was supplemented with casein to the extent of 2.5 per cent of the ration, a normal curve of growth was secured for swine. Similar results were secured with rats. Rations may contain as much as 80 to 90 per cent of wheat without bad effects when supplemented with milk or egg yolk. Normal reproduction as well as normal growth have been secured with such rations."

Value of proteins from different sources (*Wisconsin Sta. Bul. 250 (1915), pp. 49–52, figs. 2*).—The data reported are included in the article noted above.

Effect of rations from single plant sources (*Wisconsin Sta. Bul. 250 (1915), pp. 48, 49*).—The studies to determine the physiological effect of rations from single plant sources are briefly noted, those with calves and swine being abstracted above.

In a study with poultry extending over three years, pens of 12 pullets each, as near the same age as possible and of the same breeding, were fed rations restricted to corn, wheat, oats, or barley for 10 months. No appreciable difference was observed during the first 90 days, but when the feeding was continued longer physiological disturbances began to appear on the wheat-fed lots, and at the end of the trial only four, three, and six pullets, respectively, were alive out of the original 12 in each of the three pens. No fowls were lost in the corn lot, and the oats and barley rations ranked midway between the corn and wheat. There appeared to be no consistent difference in the number of eggs produced by the different lots, nor in the percentage or vigor of chicks hatched from the various lots.

Acidosis in omnivora and herbivora and its relation to protein storage, H. Steenbock, V. E. Nelson, and E. B. Hart (*Jour. Biol. Chem., 19 (1914), No. 3, pp. 399–419*).—The experiments reported in this paper deal with the rise and fall of urinary ammonia production when swine, as representatives of omnivora, are confined to grains alone or grains supplemented with basic materials. Other experiments deal with the influence of acid rations on ammonia production in herbivora (calves).

It was found that "acid rations fed to swine (omnivora) or calves (herbivora) occasion a rise in urinary ammonia with a compensative fall in output of urea. Presumably on a normal level of protein intake a part of the ammonia, produced either in the intestine or liver, combines with acids and is excreted as the salts of these acids. This power to help maintain neutrality by the production or use of ammonia is apparently very general in all mammals. Ammonia production, under conditions of exogenous protein metabolism, does not occasion an increased nitrogen excretion or an interference with protein storage.

"In herbivora (calves) approximate endogenous nitrogen metabolism, accompanied by mineral acid ingestion, likewise occasions a rise in urinary ammonia, but does not, on the level of acid used, cause a rise in protein catabolism, as has been observed with dogs and swine. This may be due in this experiment to a greater dilution of the ammonium salts incident to a large consumption of water by this class of animals.

"Data are also given on calcium and phosphorus metabolism during both neutral and acid periods of low nitrogen intake, as well as on a period of high nitrogen intake. Very probably the skeleton was not drawn upon for calcium during the period of lowest acid ingestion. Only on a high acid ingestion did it appear probable that decalcification of the bones began and then only a withdrawal of calcium carbonate.

"From the records submitted on growth and reproduction it is believed that natural acid rations, if otherwise satisfactory, are as effective for growth or reproduction as those of basic character. However, until it has been shown conclusively that less vigorous individuals will tolerate acid rations with perfect impunity, we are not warranted in making too sweeping conclusions."

Relation of different fats to animal growth (*Wisconsin Sta. Bul. 250 (1915), pp. 47, 48*).—In continuation of work previously noted (E. S. R., 31, p. 864) it has been found that milk fat can be converted into soaps without destroying its peculiar constituent, and that when olive oil is shaken with a solution of these soaps the vital principle is transferred to the olive oil and it will then induce growth in the same manner as butter fat alone. See also a previous note by McCollum and Davis (E. S. R., 32, p. 360).

Effect of poison on germ cells (*Wisconsin Sta. Bul. 250 (1915), pp. 44–46, fig. 1*).—In continuation of work by L. J. Cole previously noted (E. S. R., 31, p. 876) it is concluded that lead poisoning so acts on the germ cells of the sire as to produce an appreciable decrease both in size and vitality of offspring. In experiments with chicks the results, as indicated by the infertility of eggs and the death of embryos or young chicks soon after hatching, showed that the influence of lead poisoning in the case of the male distinctly affected the vitality of the offspring.

Physiology of reproduction (*Wisconsin Sta. Bul. 250* (*1915*), *p. 46*).—In trials with guinea pigs by L. J. Cole and H. Ibsen it has been shown that the size of offspring is controlled to some extent by the length of the gestation period, the young being smaller with a short period. The size of the mother, kind and amount of her food, and her ability to utilize it for the development of the fetuses are even more important in determining the size of offspring. Small and young mothers tend to produce small offspring, especially when the litter is large. With small litters the weight of the mother increases up to parturition. With large litters, however, her weight remains stationary or even drops during the last days of pregnancy, evidently due to the fact that all the nutrients in the food are required for merely maintaining the weight of the mother and fetuses. Numerous weighings have disproved the assumption that female young gain steadily from the day of birth while males lose in weight. There is no correlation with sex in this respect, both sexes tending to lose in weight during the first few days. Neither is there any constant relation between the size of individuals and the order of their birth in the litter.

Sex studies.—VII, On the assumption of male secondary characters by a cow with cystic degeneration of the ovaries, R. Pearl and F. M. Surface (*Maine Sta. Bul. 237* (*1915*), *pp. 65–80*, *pls. 3*).—This paper describes the reproductive history of a cow, which presents the following points of interest.

"The cow was initially a perfect female, bearing calves and making a very high milk record. Later she failed to come in heat, and gradually, but in the end to a very marked degree, took on male secondary sex characteristics, both in behavior and structure. The gonads of this animal, examined subsequent to the change in secondary characters, were exactly like those of a normal cow, save in the one respect that the follicles were not breaking and discharging ova, but were forming follicular cysts, or becoming atretic, and because of this no corpora lutea were formed. The interstitial secreting mechanism of these ovaries was absolutely normal, both in respect of number of cells and the cytological characteristics of the individual cells.

"The evidence from this case strongly suggests that one function of the corpus luteum, through its internal secretion, is to maintain in full development the female secondary sex characters. Repeated injections of a suspension of the dessicated substance of the anterior lobe of the pituitary body failed to bring about any change in the sex behavior of this cow after it had assumed a male character."

Sex ratios in pigeons, together with observations on the laying, incubation, and hatching of the eggs, L. J. Cole and W. F. Kirkpatrick (*Rhode Island Sta. Bul. 162* (*1915*), *pp. 463–512*, *figs. 5*).—A continuation of the work noted above.

It was found that "the normal ratio of the sexes of pigeons hatched is 105 males to 100 females. The death rate of squabs is especially high for the first two or three days after hatching, and at about 10 to 15 days of age. When the two squabs are of distinctly different size before the banding age (10 to 15 days), the larger squab is more often a male than a female. The death rate for the two sexes, in bisexual broods, is essentially equal. There is no marked tendency for one sex to be weaker than the other in bisexual broods, and there is only a slight indication that more males than females from such broods survive to adult life—placed at six months.

"A consideration of the ratio of males to females in each of the age groups does not indicate a high relative mortality of females in the ages preceding the adult state. There is a high mortality of both sexes during the first two or three years of their adult life, and this is especially high in the females between the ages of one and two years. The higher mortality of females at early adult ages, together with the higher proportion of males hatched (105:100), may be in large part responsible for the prevailing notion of a considerable excess of male pigeons in adult populations and seems to furnish real substantiation for this notion. The fact that males are generally more easily recognized than females probably adds to this impression.

"The number of unisexual broods, in which the squabs are either both male or both female, somewhat exceeds in our records the bisexual broods (one squab of each sex), but the odds against the numbers obtained representing a potential equality are very slight. These facts are directly contradictory to the statements that the two eggs usually produce a male and a female squab. Considering only the unisexual broods, the number of 'both males' to 'both females' is practically equal.

"A comparison of the numbers of each sex hatched from first eggs and from second eggs, respectively, shows no tendency for the former to produce exclusively males and the latter females, but as a matter of fact more males than females are hatched from both.

"The mean time of laying of the first egg is about 5 p. m., and of the second egg about 1 o'clock in the afternoon of the second day following. The mean interval between the laying of the two eggs is practically 44 hours. The mean time between the laying of the first and second eggs decreases progressively in the months from February to July, inclusive. There is a very sensible positive correlation between the time of laying of the first and of the second egg. The equation of the regression curve is given, which enables one to calculate the most probable time of laying of the second egg when the time the first was laid is known.

"The mean time of hatching of the first egg is 16.5 days after the laying of the second. The mean time of hatching of the second egg is 17 days after it is laid. On the average, therefore, the time from laying to hatching of the first egg is nearly a day and a half longer than it is for the second egg. This is probably to be accounted for by the fact that the first egg receives very little incubation until the second is laid. There is a high correlation between the times of hatching of the two eggs of a clutch.

"So far as the data presented go, they appear to indicate that sex in pigeons is determined according to the laws of chance.

"In case the eggs do not hatch they are seldom abandoned at the end of the normal period of incubation, but the birds continue to sit on them for a time longer. The length of time they will continue to incubate the eggs varies, but averages practically six days after the normal period, making the mean total time of incubation when the eggs do not hatch 23 days after the laying of the second egg. This continuance of incubation beyond the normal time under such circumstances constitutes a 'factor of safety' in the incubating instinct. A pair of mourning doves continued to sit on substituted eggs for four days after their own had hatched in an incubator, thus disproving Raspial's assertion that wild birds have an 'exact notion of the time required for the eggs to hatch.'"

References are appended.

Studies on inheritance in pigeons.—II, A microscopical and chemical study of the feather pigments, O. Lloyd-Jones (*Jour. Expt. Zool., 18 (1915), No. 3, pp. 453–509, figs. 63*).—This is a continuation of work previously reported (E. S. R., 31, p. 572), and the results are summarized as follows:

"The six fundamental self colors of tumbler pigeons have been accounted for by the interaction of four genetic factors: *R*, red; *B*, black; *I*, intensity; *S*, spreading. Evidence as to the nature of the factor *B* has been secured from its effect on the feather pigment with respect to (a) color, (b) manner of formation and distribution, (c) physical form, and (d) chemical properties. All of these seem to indicate a different mechanism from that which produces red pigment, rather than simply a later stage of the same process. If uninfluenced by other factors, the final result of the pigmentation process in a bird carrying *B*, is the clumping of the pigment into the middle of the barbule cells. The factor *S* when present stops this clumping process and results in a 'spread' condition of the pigment. *S* may properly be considered as an inhibitive or 'stopping factor.'

"As regards the increment of pigment substance, factor *I* probably has a constant effect when acting on dilute birds of different constitutions, namely, to increase by about three times the amount of pigment produced. As regards its influence on granule shape, on the other hand, it reacts in a different manner with each combination of factors. The facts concerning the granule shape in blacks suggest the possible existence of a factor not yet determined which is specifically concerned with granule shape.

"Genetic research which is confined only to obvious characters is often superficial, and in such cases microscopic research is necessary to distinguish the independently heritable characters involved."

A bibliography is included.

Inspection of feeding stuffs, A. W. Clark (*New York State Sta. Bul. 404 (1915), pp. 221–334*).—Analyses are given of the following feeding stuffs: Cotton-seed meal, linseed meal, malt sprouts, distillers' dried grains, brewers' dried grains, corn gluten feed, corn gluten meal, hominy feed, molasses feeds, tankage, meat meal, meat scrap, blood flour, beef scrap, fish scrap, alfalfa meal, wheat bran, wheat middlings, ground buckwheat screenings, corn meal, barley middlings, corn bran, wheat screenings, ground corn screenings, flax screenings, pea meal, dried beet pulp, shredded wheat waste, and various mixed and proprietary feeds.

Analyses of feeding stuffs, P. H. Wessels et al. (*Rhode Island Sta. Insp. Bul., 1915, May, pp. 16*).—Analyses are reported of beef scrap, fish scrap, meat and bone scrap, cotton-seed meal, linseed meal, gluten meal, gluten feed, malt sprouts, distillers' grains, malt screenings, wheat shorts, middlings, bran, hominy feed, alfalfa meal, and various mixed and proprietary feeds.

How to comply with the law regulating the sale of concentrated feed stuffs in Texas, [and] other information, B. Youngblood (*Texas Sta. Circ. 6, n. ser. (1915), pp. 14*).—This circular gives the text of the law regulating the sale of feeding stuffs in the State of Texas, and gives directions for complying with this law.

Cattle feeding.—X, Winter steer feeding, 1913–14, J. H. Skinner and F. G. King (*Indiana Sta. Bul. 178 (1914), pp. 343–384*).—This is a continuation of work previously noted (E. S. R., 30, p. 767). The object was to determine the comparative value of leguminous hay alone and in combination with corn silage as roughage for full-fed cattle; to compare oat straw and leguminous hay as dry roughage for full-fed cattle receiving all the corn silage they will eat; to compare different quantities of cotton-seed meal in rations containing corn silage for fattening cattle; to compare ground soy beans and cotton-seed meal as sources of protein for supplementing rations for fattening cattle; and to test the comparative value of clover hay and alfalfa hay as roughage for fattening cattle.

Seven lots of ten choice high-grade Shorthorn steers each, weighing approximately 1,000 lbs. per head, were fed from November 20, 1913, to May 14, 1914, with the results shown in the table following. Each lot contained ten 105-lb. hogs which were fed corn in addition to the droppings from the cattle, and lots 1, 2, and 6 were fed a small quantity of shorts and tankage.

Summary of steer-feeding experiments.

Lot.	Daily feed consumed per steer.						
	Shelled corn.	Cotton-seed meal.	Clover hay.	Alfalfa hay.	Corn silage.	Oat straw.	Ground soy beans.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	13.27				20.21	1.57	2.91
2	18.21	2.95	9.47				
3	17.01	2.95		11.38			
4	13.56	2.97	2.83		24.25		
5	12.02	4.72			25.43	1.07	
6	14.09	3.07			26.19	1.16	
7	13.48	2.95		3.65	23.33		

Lot.	Dry matter consumed per pound of gain.	Average daily gain.	Cost per pound of gain.	Profit per steer, not including pork.		Profit per steer, including pork.
				First 90 days.	Last 85 days.	
	Lbs.	*Lbs.*	*Cts.*			
1	10.37	2.16	10.94	$4.79	−$2.38	$11.22
2	10.66	2.44	12.21	1.71	− 5.88	6.73
3	11.04	2.32	13.87	− 2.93	− 8.55	− 1.01
4	10.24	2.47	10.74	6.38	− 2.97	10.95
5	10.15	2.42	10.90	3.51	− .62	10.38
6	9.86	2.54	10.24	3.34	2.15	14.40
7	10.64	2.37	11.57	2.65	− 6.54	5.56

The addition of corn silage to rations of grain and leguminous hay slightly increased the rate of gain made by the cattle, but had little effect on the finish of the cattle. The substitution of oat straw for leguminous hay had little effect other than a reduction in the cost of gain. Larger profits were secured from a ration containing oat straw and a well-balanced ration containing corn silage than when leguminous hay was fed instead of oat straw.

Cattle fed ground soy beans in addition to corn, oat straw, and corn silage maintained very eager appetites for three months but thereafter had very poor appetites, while cattle fed cotton-seed meal maintained eager appetites for six months. Ground soy beans had a laxative effect on the cattle. Cattle fed ground soy beans as supplement did not gain as rapidly during the last three months as others fed cotton-seed meal. The cattle fed ground soy beans were valued 10 cts. per hundred lbs. less than those fed cotton-seed meal.

Cattle fed shelled corn, cotton-seed meal, and clover hay consumed a larger quantity of grain and a smaller amount of hay than those fed shelled corn, cotton-seed meal, and alfalfa hay. Cattle fed hay in connection with corn silage and grain consumed a larger quantity of alfalfa than of clover hay. Cattle fed clover hay as the only roughage or in combination with corn silage made fully as rapid gains as those fed alfalfa hay, and the gains were made more economically either from the standpoint of feed consumed or financial cost.

Corn silage and alfalfa hay for beef production, R. K. Bliss and C. B. Lee (*Nebraska Sta. Bul. 151 (1915), pp. 43, figs. 16*).—Six lots of seven or eight 2-year-old steers each were fed 157 days, as follows: Lot 1, ground corn, cotton-seed cake, and prairie hay; lot 2, ground corn, corn silage, and cotton-seed cake; lot 3, ground corn, corn silage, and prairie hay; lot 4, ground corn, a heavy feed of corn silage, and alfalfa hay; lot 5, ground corn, a medium feed of corn silage, and alfalfa hay; and lot 6, corn and alfalfa hay. These steers made average daily gains per steer of 1.93, 2.01, 1.75, 2.24, 2.04, and 2.29 lbs., costing 9.51, 9.29, 9.08, 7.79, 8.31, and 7.22 cts. per pound of gain. The net profit per steer was $9.42, $7.31, $8.93, $14.50, $13.47, and $20.59 for the respective lots. The average shrinkage in marketing was estimated to be 27, 44, 17, 30, 30, and 8 lbs. per steer, and the dressing percentages 61.65, 61.28, 60.52, 60.94, 61.52, and 60.71 for the respective lots.

In a second experiment eight lots of from six to eight 2-year-old steers each were fed 154 days, as follows: Lot 1, ground corn and alfalfa hay; lot 2, ground corn, alfalfa hay, and wheat straw; lot 3, ground corn, alfalfa hay, and a light feed of silage; lot 4, ground corn, a medium feed of silage, and alfalfa hay; lot 5, ground corn, a heavy feed of silage, and alfalfa hay; lot 6, ground corn, alfalfa hay, and a heavy feed of silage at the beginning, which gradually decreased to a light feed at the close of the feeding period; lot 7, ground corn, alfalfa hay, a medium feed of silage, and cotton-seed cake; lot 8, ground corn, a heavy feed of silage, cotton-seed cake, and alfalfa hay during the first five weeks. These steers made average daily gains per steer of 2.1, 1.86, 2.1, 2.1, 2.1, 2.07, 2.05, and 2.07 lbs., costing 10.82, 12.23, 11.31, 11.77, 11.74, 11.49, 12.04, and 12.76 cts. per pound of gain. The net profit per steer was —15 cts., —$4.22, 42 cts., —$4.11, —$2.35, —$3.42, —$5.89, and —$6.30 for the respective lots.

The results of the two experiments are summarized as follows: "A ration of corn and alfalfa hay produced the cheapest gains of any ration used. Furthermore, the steers fed corn and alfalfa hay made as rapid gains as did the steers on any other ration. Had the alfalfa hay used in the first experiment cost $20 per ton, the average profit on the three lots receiving alfalfa would have been 15 per cent greater than the profit on the best one of the three lots not receiving alfalfa. Cold pressed cotton-seed cake did not give as good results, as regards either rate of gain or economy of gain, as did alfalfa hay in a ration for fattening steers. The addition of cold pressed cotton-seed cake to a ration of corn, silage, and alfalfa increased the cost of gain and lowered the profits on the steers. The steers receiving silage without exception shed their coats early in the spring and at all times presented a sleek and sappy appearance. Contrary to preceding experiments, a heavy feed of silage with alfalfa hay and corn gave as rapid gains as did either a medium or a light feed of silage with alfalfa hay and corn. The amount of silage which can best be fed to fattening steers apparently must be regarded as unsettled. The steers fed silage in connection with corn and alfalfa suffered a very slight shrinkage when shipped to market. Different amounts of silage seemingly had no effect upon the number of pounds shrinkage. Where prairie hay was used in place of alfalfa, small and expensive gains resulted.

"The individuality of a steer is a very important factor in the rate of gain. The average difference in gains made between the highest and lowest producing steer in each of the 14 different lots was 120 lbs. In practically all cases there was a greater variation in the daily gains made by steers in the same lot than there was in the average daily gains of the different lots. Usually a considerable difference can be noted between poor and good feeder cattle, but sometimes even a careful study of steers does not reveal their feeding possibilities. An advance of 8 cts. per bushel in the price of corn increased the cost of gains $1 per 100 lbs. In the second experiment, where a ration of corn and alfalfa hay was fed, an increase of 1 ct. per bushel in the price of corn had the same effect in increasing the cost of gains as did an increase of $1 per ton in the price of alfalfa hay."

Raising calves on skim milk, O. E. REED (*Kansas Sta. Circ. 48 (1915), pp. 11, figs. 4*).—A general discussion of methods of feeding calves on skim milk, including data previously noted (E. S. R., 16, p. 1111).

Sheep feeding.—IV, Fattening western lambs, 1913–14, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 179 (1914), pp. 385–404*).—Continuing previous work (E. S. R., 30, p. 769), nine lots of 25 choice Idaho lambs, weighing approximately 60 lbs. per head, were fed from November 14, 1913, to February 22, 1914, with the results shown in the following table:

Summary of lamb feeding experiments.

Lot.	Ration.	Average daily feed consumed per lamb.					Average daily gain.	Cost per pound of gain.	Profit per lamb.
		Grain.	Corn silage.	Clover hay.	Alfalfa hay.	Oat straw.			
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cts.*	*Cts.*
1	Shelled corn, cotton-seed meal, corn silage	1.07	1.80	0.04			0.240	6.74	29
2	Shelled corn, oats, clover, silage	1.24	1.21	1.06			.334	6.99	31
3	Shelled corn, clover	1.22		1.76			.344	7.10	18
4	Shelled corn, alfalfa	1.15			1.72		.313	8.59	−28
5	Shelled corn, cotton-seed meal, silage, oat straw	1.09	1.60			0.45	.241	7.01	9
6	Shelled corn, silage, clover, (open shed)	1.18	1.21	1.04			.333	6.61	40
7	Shelled corn, cotton-seed meal, silage, clover	1.24	1.22	1.15			.374	6.50	53
8	.....do	1.25	1.22	1.14			.365	6.81	48
9	Shelled corn, silage, clover (barn-fed)	1.19	1.22	1.05			.315	7.05	35
	Average	1.18	1.05	.81	.19	.05	.318	7.03	26

The addition of corn silage to a ration of shelled corn and clover hay reduced the hay consumption and slightly reduced the quantity of grain eaten and the rate of gain made by the lambs. It also reduced the cost of gain 0.49 cts. per pound, slightly increased the selling value of the lambs, and increased the profit 22 cts. per lamb.

Lambs fed corn silage as the only roughage or corn silage and oat straw as roughage had irregular appetites and required great care to prevent their going "off feed." The addition of oat straw to a ration of shelled corn, cotton-seed meal, and corn silage had no beneficial effect on the ration. The addition of clover hay to a ration of shelled corn, cotton-seed meal, and corn silage produced excellent appetites in the lambs, and greatly increased the quantity of feed eaten and gains made by the lambs.

The addition of cotton-seed meal to a ration of shelled corn, clover hay, and corn silage increased the appetites of the lambs for both grain and hay and increased the rate of gain. A grain mixture of seven parts corn and one part cotton-seed meal proved slightly more effective for producing rapid gains and on less feed than a grain mixture of four parts corn and one part cotton-seed meal.

Specific effects of rations on the development of swine, E. B. FORBES, F. M. BEEGLE, C. M. FRITZ, L. E. MORGAN, and S. N. RHUE (*Ohio Sta. Bul. 283 (1915), pp. 111–152, figs. 12*).—This is a continuation of work previously noted (E. S. R., 22, p. 771), and of a preliminary metabolism study (E. S. R., 31, p. 268).

Seven lots of five pigs each were used in a feeding and carcass-analysis experiment in a study of the specific effects of rations on the composition of the growth produced. The rations were corn alone, and corn supplemented by soy beans, wheat middlings, linseed-oil meal, tankage, and skim milk. These rations were fed in quantities such as contained the same amount of digestible nutriment per unit of live weight of the pigs. The supplemented rations contained the same proportions of protein to nonnitrogenous starch equivalent. The experiment was in large measure a comparison of the capacities of pigs to grow on equivalent amounts of protein from different sources.

The capacity of digestible milk protein to cause proteid increase was shown to be greater than that of digestible protein from the vegetable foods used and from tankage. None of the supplements, used in proportions such that the nutritive ratios of the rations are as 1 : 6.5, apparently furnished mineral matter of the amounts and kinds requisite to maximum growth of bones. The rations of corn alone and of corn and soy beans produced the least bone, and that of corn supplemented by tankage and by skim milk the most bone.

The lot which received corn and linseed oil meal produced the largest percentage of flesh and leaf fat (together) and the smallest percentage of bone, as related to the gross-dressed carcass, of any lot in the series. The lots which received tankage and skim milk had the largest proportions of bone to gross-dressed carcass, except for the lots which received corn alone, and corn and soy beans, in which latter cases the higher proportion of bone to gross-dressed carcass was due not to superior development of bone, but to inferior nourishment of other tissues. The proportions of calcium, magnesium, and phosphorus in the bones tended strongly to remain constant, but may be modified to a certain extent by the limitations of the food. The amounts of these elements in the bone, however, are susceptible of much greater modification through the composition of the food. The ash per gram of the bones and the breaking strength of the bones were shown to vary together in the following order of decreasing magnitude: Corn and skim milk; corn and tankage; corn and linseed oil meal; corn alone; corn and wheat middlings; and corn and soy beans. The calcium and phosphorus content of the skeleton was lower than in the check lot (killed at the beginning of the experiment) in all lots except those which received tankage and milk. The magnesium content of the skeletons of the pigs which received wheat middlings (a food very rich in magnesium) was higher than in the check lot.

The ration of corn alone produced less moisture, protein, and ash, and more fat in the flesh than did any of the supplemented rations, while the ration of corn and skim milk produced the maximum of moisture and protein and the minimum of fat in the flesh. There was marked variation in the content of the flesh and blood in the mineral constituents, apparently as determined by the food. Excluding the check lot, the sodium in the flesh varied between 0.0635 and 0.1036 per cent, potassium between 0.1888 and 0.2419 per cent, calcium between 0.0217 and 0.0319 per cent, magnesium between 0.0146 and 0.0188 per cent, sulphur between 0.1289 and 0.1799 per cent, chlorin between 0.0353 and 0.0679 per cent, and phosphorus between 0.1227 and 0.1506 per cent. There was also much variation in inorganic phosphorus and in lecithin, especially the latter (0.0147 to 0.0273 per cent).

One-half of each carcass was cured. The foods were found to have produced marked differences in the firmness of the hams and bacon, and certain effects on their behavior in cooking; also slight effects on the acceptability of the cooked meat. One-half of each carcass was analyzed and a complete chemical accounting made. The data show that there is a specific effect of the ration on the proportions of the main tissue components.

The proportion of protein to ether extract in the flesh ranked as follows in the respective lots: Corn lot 1:6.66, corn and soy beans 1:5.65, corn and linseed meal 1:6.3, corn and middlings 1:5.87, corn and tankage 1:6.34, corn and skim milk 1:5.03, check lot 1:4.52. The proportion of protein to ash in the bones in the respective lots ranked as follows: Corn 1:1.13, corn and soy beans 1:0.957, corn and linseed meal 1:1.139, corn and middlings 1:0.928, corn and tankage 1:1.171, corn and skim milk 1:1.171, check lot 1:1.076. The proportion of protein to ether extract and to ash in the gross-dressed carcass, as a whole, ranked as follows in the respective lots: Corn lot 1:5.12:0.178, corn and soy beans 1:4.45:0.17, corn and linseed meal 1:4.91:0.169, corn and middlings 1:4.43:0.159, corn and tankage 1:4.88:0.197, corn and skim milk 1:3.93:0.179, check lot 1:3.36:0.199.

Complete histological blood analyses were made for each pig. Certain individual differences were related to the state of nutrition of the animals within an experimental lot, while other observations were considered to be specific or characteristic for the lot and ration. The following conditions seemed to be more certainly characteristic than others: In the corn lot the low hemoglobin content, the maximum percentage of polymorphs and minimum percentage of lymphocytes; in the tankage lot the uniformly high hemoglobin content; in the milk lot the large number of white corpuscles; and in the linseed meal and milk lots the low percentage of polymorphs and high percentage of lymphocytes.

Catalase estimations were made on the more important organs and tissues, and certain differences noted. The very high catalase content of the blood and the low content of the flesh suggest that the catalase content of the latter is likely to be influenced by the blood which it normally contains. That the flesh of the milk lot should have no catalase suggests that all of the catalase of the flesh is due to blood contained therein, and possibly that the skim milk has such an effect on the musculature of the blood vessels as results in more complete bleeding out than occurs under the influence of other foods. In the brain the catalase varied comparatively little, but was lowest in the skim milk lot. In the blood it was lower in the lots containing the largest proportions of corn than in others, and practically as large in the skim milk lot as in any other. The low catalase values for brain and muscle in this lot are ascribed not to a general condition in these animals but to special conditions within the particular tissues. The catalase of the liver of the linseed meal and tankage lots appeared to be significantly low, while in the kidneys there were probably no significant differences. The catalase in the spleens varied rather widely, from 8.06 cc. of oxygen liberated per gram of substance in the tankage lot to 15.07 cc. in the corn lot.

It is said that the results of these studies reflect the great poverty of cereals in lime, as an element of the food of animals, it being clearly proved that normal growth of the skeleton can not be sustained by the grains. This fact calls especial attention to the leguminous roughages, which, because of their high protein and unparalleled lime content, are deemed the ideal natural supplementary foods for use with the grains.

Pork production, W. P. Snyder (*Nebraska Sta. Bul. 147 (1915), pp. 56, figs. 6; popular ed., pp. 5–31, figs. 5*).—This bulletin summarizes and continues work conducted at the North Platte substation and previously noted (E. S. R., 27, p. 470).

Two lots of 10 yearling or older brood sows each were wintered on corn and alfalfa during four successive winters. One lot was fed shelled corn in a trough or on clean ground and a good quality of alfalfa hay in a rack; the other lot was fed a ration of ground corn mixed with an equal weight of chopped alfalfa and moistened with water. During the fourth winter corn was replaced by wheat. The average daily gains per head were 0.76 and 0.79 lb., the amount of grain consumed per pound of gain 6.8 and 5.3 lbs., the amount of alfalfa consumed per pound of gain 1 and 5.39 lbs., the cost of feed per pound of gain 6.5 and 7.54 cts., the cost of feed for wintering the sow $5.29 and $6.92.

Spring gilts were summer pastured on alfalfa and wintered on a mixture of alfalfa and grain 1:2 or 1:3 during five winters, receiving on the average 2.48 lbs. of feed per 100 lbs. live weight per day. They made an average daily gain during the winter of 0.91 lb. per gilt, requiring on the average 4.77 lbs. of grain and 1.81 lbs. of alfalfa per pound of gain, and costing 5.3 cts. That no trouble occurred at the time of farrowing and that fairly large, healthy litters were farrowed is deemed an indication that the ration has some merit. It is thought that a smaller percentage of alfalfa probably would have given cheaper as well as faster gains but would have kept the gilts too fleshy unless the amount fed had been kept considerably below a full feed.

Old and young sows fed during four winters on corn and alfalfa farrowed an average of 11.1 and 8.2 pigs per sow, respectively, the pigs weighing 2.4 and 2.31 lbs. each at birth, and raised 6.55 and 6.2 pigs per sow. The pigs gained at the rate of 0.53 and 0.5 lb. each daily and reached the 50-lb. weight when 89 and 99 days old. The average cost of all the feed used by the sows and their litters was $17.41 and $16.41. Crediting the sow with her gain in weight, the average cost of the feed used in producing a 50-lb. pig from old sows is estimated at $2.11 and that with young sows at $1.68.

It was found that the cost of producing a spring pig to the weight of 50 lbs. was $2.05 and that of the fall pig $2.03. A spring pig from a young sow cost $1.81 as compared with $2.05 for a spring pig from an old sow. The young sows raised nearly as many pigs and grew them to the 50-lb. weight nearly as quickly as the old sows.

In trials to determine the cost of growing pigs on alfalfa pasture and grain, 202 pigs were kept on alfalfa pasture and fed 2.75 lbs. corn per 100 lbs. live weight per day. The pigs made an average daily gain of 0.72 lb. per pig, consuming 3.55 lbs. of corn per pound of gain, which, together with the alfalfa consumed, cost 3.54 cts. per pound of gain. In a second experiment, six lots of 25 pigs each, fed on alfalfa pasture and corn, or corn and shorts (2.12 lbs. of grain per 100 lbs. live weight per day), made an average daily gain of 0.51 lb. per pig, consuming 3.13 lbs. of grain per pound of gain, which, together with the alfalfa fed, cost 3.57 cts. per pound of gain. The lots fed corn alone when grazing on alfalfa pasture made practically as rapid and as cheap gains as the lots fed corn and shorts.

Six lots of from 19 to 25 pigs each fed 83 days on alfalfa pasture and soaked or dry shelled corn (2.39 lbs. per 100 lbs. live weight per day) made an average daily gain of 0.66 lb. per pig, consuming 2.86 lbs. of grain per pound of gain, which, together with the alfalfa consumed, cost 3.05 cts. per pound of gain. The dry corn and soaked corn gave the same rate of gain with nearly the same amount of corn consumption, indicating that it was not profitable to soak corn for these pigs.

A lot of 25 gilts during five consecutive summers on alfalfa pasture and fed 2.5 lbs. of grain (corn or corn and wheat) daily per 100 lbs. live weight consumed an average of 3.39 lbs. of grain per pound of gain, made at the average rate of 0.92 lb. daily per head and costing 3.35 cts.

Summarizing the records of the various lots fed grain while grazing on alfalfa pasture, it is found that with the pigs on a 2, 2½, and 3 per cent grain ration the relative daily gains of the three groups were almost the same as the relative amounts of grain fed to the three groups. The ratio of the cost of grain and pasture for 100 lbs. of gain was 81, 84, and 100, respectively, with corn at 47 cts. per bushel. As the price of corn is increased the difference in the cost of gains becomes greater and is more in favor of the lighter rations. The ratio of the daily profit per pig with corn at 47 cts. per bushel and hogs $5.90 per 100 lbs. is 76, 85, and 100, and with corn at 70 cts. per bushel and hogs $7.50 per 100 lbs., 91, 100, and 100. The higher prices favor the lighter ration of 2 per cent, but do not bring as much profit from this ration as from the heavier rations. It is thought that rations lighter than 2½ or 2 per cent are not as profitable as these rations even with the price of corn high, as the light rations do not permit of sufficient growth to keep the hogs in a healthy and thrifty condition.

In a comparison of various ways of feeding corn and protein supplements to corn in fattening hogs, 10 lots of 10 130-lb. pigs each were fed 106 days, as follows: Lot 1, shelled corn; lot 2, ear corn and alfalfa hay in a rack; lot 3, shelled corn and alfalfa hay in a rack; lot 4, ground corn and alfalfa hay in a rack; lot 5, ground corn and alfalfa meal 9:1; lot 6, ground corn and shorts 9:1; lot 7, ground corn and oil meal 9:1; lot 8, ground corn and tankage 19:1; lot 9, ground corn and oil meal 9:1, and alfalfa hay in a rack; and lot 10, ground corn and tankage 19:1, and alfalfa hay in a rack. These pigs made average daily gains of 0.78, 0.79, 0.78, 0.9, 1, 1.05, 1.24, 1.25, 1.25, and 1.26 lbs. per pig, consuming 6.1, 5.86, 6.03, 5.97, 5.36, 5.11, 4.67, 4.69, 4.87, and 4.84 lbs. of feed per pound of gain, costing 5.13, 4.8, 4.93, 4.93, 4.45, 4.47, 4.23, 4.21, 4.29, and 4.14 cts. per pound of gain, and realizing a profit of 64 cts., 92 cts., 80 cts., 93 cts., $1.53, $1.59, $2.20, $2.25, $2.13, and $2.35 per hog for the respective lots.

In a second experiment 11 lots of 9 or 10 100-lb. pigs each were fed 109 days rations corresponding to the above except that lot 1 received ground corn and lot 11 ground corn and cotton-seed cake 9:1. These pigs made average daily gains of 1.22, 1.52, 1.52, 1.33, 1.24, 1.34, 1.41, 1.46, 1.41, 1.47, and 1.48 lbs. per pig, consuming 4.94, 4.24, 4.46, 4.82, 4.97, 4.61, 4.45, 4.41, 4.55, 4.47, and 4.54 lbs of feed per pound of gain, costing 4.15, 3.5, 3.63, 3.93, 4.13, 4.04, 4.03, 3.96, 4.08, 4, and 4 cts. per pound of gain, and realizing a profit of $2.34, $3.99, $3.78, $2.86, $2.41, $2.72, $2.88, $3.08, $2.81, $3.04, and $3.07 per pig for the respective lots.

One group of seven lots of 10 108-lb. pigs was fed 98 days, as follows: Lot 1 shelled corn dry, lot 2 whole wheat dry, lot 3 whole wheat soaked, lot 4 ground wheat moistened, lot 5 ground wheat soaked, lot 6 whole rye soaked, and lot 7 ground rye moistened. This group received alfalfa hay in racks in addition. A second group of six lots were fed the same rations as lots 1 to 6, inclusive, of the first group, but without alfalfa hay. The pigs of the corresponding lots of these two groups made average daily gains of 1.11, 1.02, 1.05, 1.36, 1.41, and 0.88 lbs. per pig, consuming 4.79, 5.19, 5.14, 4.33, 4.18, and 5.58 lbs. of feed per pound of gain, costing (with corn at 47 cts. per bushel, wheat at 70 cts. per bushel, and hogs at 5.9 cts. per pound) 3.97, 5.99, 5.92, 5, 4.84, and 5.51 cts. per pound of gain, and realizing a profit of $2.11, a loss, a loss, $1.21, $1.46, and 34 cts. per pig for the respective lots. The single test with ground rye indicated that 1 bu. of ground rye produced the same gain as 1.15 bu. of whole rye, and gave a very much faster gain.

Two lots of 32 115-lb. pigs each were grazed for 70 days on alfalfa pasture, lot 1 being fed 3.34 lbs. of ground corn daily per 100 lbs. live weight, and lot 2, 3.3 lbs. of a mixture of corn and shorts 2:1, during which time they made an average daily gain of 1.09 and 1.04 lbs. per pig, consuming 4.62 and 4.81 lbs. of feed per pound of gain, costing 3.88 and 4.62 cts. per pound of gain, and realizing a profit of $1.54 and 94 cts. per pig for the respective lots. During the next 49 days the pigs were kept in dry lots and fed the grain rations with alfalfa hay in racks, and made an average daily gain of 0.86 and 0.92 lb. per pig, consuming 6.16 and 6.21 lbs. of feed per pound of gain, costing 5.13 and 5.89 cts. per pound of gain, and realizing a profit of 32 and 0.4 cts. per pig for the respective lots.

Two lots of 10 50-lb. pigs each were fed 51 days as follows: Lot 1 corn and shorts 3:1 and cut alfalfa, and lot 2 corn and shorts 3:1, cut alfalfa and alfalfa tea. The alfalfa tea was used in making a slop feed. These lots made relative gains of 94 and 100, respectively. Two other lots of 13 69-lb. pigs each were similarily fed, lot 2 receiving alfalfa tea grounds instead of the tea, the relative gains being 84 and 100, respectively. The tea from 100 lbs. of stewed alfalfa thus saved 47 lbs. of corn, and the tea grounds from 100 lbs. of stewed alfalfa saved 67 lbs. of corn.

In a second experiment in which a lot of 14 56-lb. pigs was fed 84 days ground corn and chopped alfalfa hay 9:1, and a second lot received the same ration mixed and moistened with alfalfa tea, together with the tea grounds, a slight advantage in favor of the alfalfa tea was obtained, but not enough to warrant the farmer in going to much, if any, expense to stew alfalfa for hogs.

The following table gives a summary of averages of various tests:

Summary of averages and comparison of rations.

Kind of ration.	Number of tests conducted.	Number of pigs tested.	Daily gain per pig.	Feed per pound of gain.	Cost per pound of gain.	Profit per pig.
			Lbs.	*Lbs.*	*Cts.*	
Corn	10	168	0.94	4.36	3.66	$1.70
Corn, shorts	10	168	.94	4.33	4.07	1.34
Corn	8	132	1.19	4.78	4.04	1.78
Corn, barley	8	132	1.10	5.32	4.48	1.26
Corn	3	84	1.33	4.77	3.95	1.95
Corn, emmer	3	84	1.14	5.29	4.48	1.38
Corn	4	64	1.30	5.01	4.01	2.33
Corn, wheat	4	64	1.22	4.70	4.53	1.71
Corn	7	162	1.17	5.11	4.26	1.83
Corn, tankage	7	162	1.45	4.59	4.08	2.45

Profitable hog feeding, W. Hislop (*Washington Sta. Popular Bul. 87* (*1915*), *pp. 8*).—A discussion of the value of tankage, skim milk, buttermilk and whey, soy bean meal, linseed oil meal, wheat middlings, wheat bran, alfalfa and clover hay, and cotton-seed meal as supplements to farm-grown grains for hog feeding.

Alfalfa pasturing experiment, R. W. Allen (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1914, pp. 8, 9, fig. 1*).—Four 84-lb. pigs, pastured 135 days from March 28 to August 11, 1913, on two plats of ⅛ acre each of 4-year-old alfalfa and fed 1½ lbs. of rolled barley per 100 lbs. live weight per day, gained an average of 106 lbs. per pig. Four 89-lb. pigs, pastured 55 days from August 11 to October 6 on the same plats of alfalfa and fed 1½ lbs. of rolled barley per 100 lbs. live weight per day, gained an average of 32 lbs. per pig. The ¼ acre of alfalfa supplemented by 1,883 lbs of grain produced a total of 573 lbs. of pork, and a net return of $47.48 per acre. Feeding the alfalfa in this manner saved the expense of harvesting the hay and retained the manure produced by the pigs.

Rape pasture for pigs in cornfield.—Kaoliang for pigs, J. W. Wilson (*South Dakota Sta. Bul. 157 (1914), pp. 131–143, figs. 5*).—The object of the first experiment was to determine the relative feeding value of several varieties of corn for hogging off purposes. Six lots of six 90- to 100-lb. pigs each were fed for six weeks as follows: Lot 1 Minnesota No. 13 corn, lot 2 Minnesota No. 13 corn and rape, lot 3 Wisconsin White Dent corn, lot 4 Wisconsin White Dent and rape, lot 5 Yellow Triumph flint corn, lot 6 Yellow Triumph flint corn and rape. The average daily gains per head were 1.04, 1.11, 1.08, 1.36, 1.05, and 1.38 lbs. for the respective lots.

The results indicated that flint corn is about equal to dent corn for pigs. There was a marked difference in the growth of rape in the different kinds of corn. The best growth was in the lot planted to Wisconsin White Dent corn, the next best in Yellow Triumph flint, and the poorest in Minnesota No. 13. The 18 pigs in the three lots receiving corn without rape made an average daily gain per head of 1.06 lbs., as compared with 1.28 lbs. for the 18 pigs receiving rape pasture in addition. The results obtained from the lot planted to rape and Minnesota No. 13 corn were poor, owing to the rank growth of the corn and the consequent stunted growth of the rape. It is concluded that the low-growing varieties of dent corn are to be preferred to the tall-growing varieties to secure a suitable growth of rape.

Four lots of four 150- to 250-lb. hogs each were fed for 55 days as follows: Lot 1 kaoliang meal and alfalfa hay, lot 2 kaoliang meal, lot 3 corn meal and alfalfa hay, and lot 4 corn meal. The average daily gains per head were 0.98, 0.87, 1.32, and 1.19 lbs., the consumption 5.81, 6.61, 4.63, and 5.22 lbs. per pound of gain, and the cost 6.56, 6.61, 5.19, and 5.22 cts. per pound of gain for the respective lots. Kaoliang grain is not deemed as good as corn for fattening pigs, but considering its drought-resisting qualities it is a better feed to grow in some sections than corn.

A metabolism crate for swine, E. B. Forbes (*Ohio Sta. Circ. 152 (1915), pp. 75–85, figs. 11*).—This circular gives plans and descriptions of a metabolism crate devised by the author and used in experimental work at the Ohio Station.

Rations for growing and fattening roasters and capons, W. J. Buss (*Ohio Sta. Bul. 284 (1915), pp. 153–172, figs. 2*).—Five lots of 39 10-week-old chicks, 94 cockerels and 101 pullets, were selected June 18. All but 8 of the cockerels were caponized July 31. The pullets were removed soon after they began to lay, and the 8 cockerels December 3. The remaining birds were fed until January 27. The rations for the 32 weeks were as follows: Lot 1, corn and a mash of ground corn and beef scrap 2:1; lot 2, corn and a mash of ground corn and beef scrap 2:1 during the first week, the amount of corn being increased one part each week so that the mash for the thirty-second week was ground corn and beef scrap 32:2; lot 3, corn, wheat, and oats 11:15:4, and a mash of ground corn, bran, and beef scrap 2:2:1; lot 4, corn and a mash of ground corn and tankage 7:3; lot 5, corn and a mash of ground corn and oil meal 3:4, fed for 12 weeks, and replaced by a mash of ground corn and beef scrap 2:1 thereafter.

The birds made an average weekly gain of 0.202, 0.2, 0.206, 0.185, and 0.181 lb. per bird, consuming per pound of gain 7.32, 7.71, 8.45, 7.67, and 7.52 lbs. of feed per bird, and costing 9.09, 8.67, 11.66, 9.1, and 9.25 cts. per pound of gain for the respective lots. The capons made more rapid gains than did the pullets. For the entire time that they were in the experiment only 32 per cent of the capons gained less than 0.2 lb. per week, while 81 per cent of the pullets gained less than this amount. During the first half of the experiment 27 per cent of the capons and 63 per cent of the pullets made average weekly gains of less than 0.2 lb. The average total gain for the pullets was 4.609 lbs. per head, for the capons 6.878 lbs., and for the cockerels 6.125 lbs. The eight cockerels in this experiment, however, had been selected for their large size and thrifty appearance, but it appears that with birds of equal thrift the advantage, so far as rate of gain is concerned, might be slightly in favor of the cockerels over capons.

Oil meal did not prove to be a satisfactory supplement for corn. Lot 5, given a ration of corn and oil meal for 12 weeks, gained less than one-fifth as much as lot 1.

In a second experiment similar to the first, except that the birds were all capons, were fed 19 weeks, and lot 5 was fed the same as lot 1 but was confined to the house, the birds made average weekly gains of 0.244, 0.237, 0.236, 0.242, and 0.201 lb. per bird, consuming per pound of gain 8.11, 8.61, 9.23, 8.16, and 9.5 lbs. of feed and costing 10.11, 10.27, 13.19, 9.79, and 11.88 cts. per pound of gain for the respective lots. The average shrinkage in killing was 0.508, 0.546, 0.561, 0.521, and 0.477 lb. per bird, and the percentage loss based on weight before killing was 6.58, 6.98, 7.49, 6.77, and 6.55 per cent for the respective lots.

The heaviest capons sold at the highest price per pound and the lightest at the lowest price. This shows the advisability of growing the capons to as large a size as possible, at a reasonable feed cost per pound of gain, before they are marketed. In lot 5 the capons confined to small pens from the beginning of the experiment, while consuming only 2 per cent less feed per bird, gained almost 17 per cent less per bird than did capons allowed range for the first 12 weeks of the experiment. The cost of feed per unit of gain was 17.5 per cent higher with the capons in confinement than with those on range.

An average of the two experiments on a percentage basis, using lot 1 as a standard for comparison and omitting lot 5, is, for rate of gain, 100, 98.2, 99.5, and 94.5; for average feed consumed per bird, 100, 104.8, 115.4, and 98.1; for feed consumed per pound of gain, 100, 105.1, 114.5, and 103.2; and for cost of feed consumed per pound of gain, 100, 97, 128.7, 98.8. Lot 2, receiving a ration which contained a constantly decreasing amount of protein, made a lower rate of gain at a higher feed consumption per pound of gain in both experiments than did lot 1, fed a ration which carried the same proportion of protein throughout the experiments. Lot 3 consumed the most feed per bird and per pound of gain. The cost of feed per pound of gain was 30.5 per cent higher with lot 3 than with lots 1, 2, and 4.

Essentials for growth of chicks, HELEN D. WHITAKER (*Washington Sta. Popular Bul. 91 (1915), pp. 4*).—A general discussion of the feeding and care of chicks, including data as to weights of Leghorns, Rhode Island Reds, and Plymouth Rocks from hatching to five weeks of age.

Wild fowl and poultry propagation (*Wisconsin Sta. Bul. 250 (1915), pp. 42–44, figs. 2*).—Successful trials by J. G. Halpin in propagating quail and wild mallard ducks are reported. It is said that the mallard is easy to domesticate, shows special ability to shift for itself at even an early age, and makes rapid growth.

DAIRY FARMING—DAIRYING.

[Milk production] (*Wisconsin Sta. Bul. 250 (1915), pp. 46, 47*).—In a comparison by G. C. Humphrey and A. C. Oosterhuis of home-grown grains and purchased protein-rich concentrates, one lot of eight cows was fed a home-grown concentrate mixture of oats and corn 6:4; another lot, dried distillers' grains, wheat bran, oats, and cotton-seed meal 3:3:3:1; and a third lot, dried distillers' grains, wheat bran, oats, corn, and oil meal 7:7:3:2:1. In addition, the lots received all the alfalfa, mixed clover and timothy, and corn silage they would consume, together with 6.7 lbs. sugar beets per head daily. The purchased ration, having a nutritive ratio of 1:5.4, cost on the average 3.2 per cent more than the home-grown ration, which had a nutritive ratio of 1:7.9. However, the value of the milk fat and skim milk from the purchased ration was 9.4 per cent greater than from the home-grown, so that the purchase of these feeds returned a profit and in addition brought increased fertility to the farm.

The value of nitrogen of alfalfa hay for milk production (*Wisconsin Sta. Bul. 250 (1915), pp. 52, 53*).—A brief report of work previously noted (E. S. R., 32, p. 74).

Dairy problems (*Wisconsin Sta. Bul. 250 (1915), pp. 40–42*).—It is reported that pasteurized milk cheese, previously described (E. S. R., 31, p. 874), is being made with success under factory conditions. The manufacture of buttermilk cheese is also meeting with success.

In bottle washing trials the loss of milk bottles due to breakage and chipping in cleaning was found by A. C. Baer to be 2.73 per cent by the older methods and 0.75 per cent by the new mechanical treatment in cases. In pasteurizing bottled milk it was found that with the temperature of the water in the vat at from 140 to 150° F. and held for 20 minutes, unsatisfactory bacterial counts were obtained. When, however, the temperature and time of holding of the milk was controlled by a thermometer inverted in a bottle, very satisfactory bacterial reductions were obtained, even when holding only 20 minutes. Temperatures of from 155 to 165° (water vat) gave better results bacterially, but the separation of the cream line was much affected at these temperatures, and a cooked flavor noted. It was found that unless precautions were taken there was danger of water entering the bottles when they were cooled after pasteurization, due to the formation of a partial vacuum in the bottle as the milk contracted on cooling. Tests made on unselected bottles showed that leakage occurred with a very large percentage (44 per cent). The leakage will depend upon the tightness of the cap and the condition of the top of the bottle.

In experiments with three types of ice-cream machines it was found that a large overrun is most easily obtained with the continuous ice-cream freezer, and more rapidly with the horizontal than vertical batch brine freezer. The vertical machine produced the smoothest ice cream and proved most satisfactory for making sherbets and ices.

Pasteurizing milk in bottles and bottling hot milk pasteurized in bulk, S. H. AYERS and W. T. JOHNSON, JR. (*U. S. Dept. Agr. Bul. 240 (1915), pp. 27, figs. 10*).—This material has been previously reported from another source (E. S. R., 31, p. 275).

Leucocytes in milk (*Wisconsin Sta. Bul. 250 (1915), pp. 39, 40*).—Emphasis has been placed on the occurrence of certain streptococci in milk because of the supposed relation of this type of organism to septic sore throat. Eighty-eight animals were examined from four herds and streptococci found by J. M. Sherman in about 40 per cent of the milk samples, although these herds were known from clinical history and appearance to be perfectly healthy. It is therefore concluded that if milk is to be condemned because these chain-cocci are found therein, the product of many healthy animals will have to be eliminated. It is deemed necessary that differential methods should be devised to enable harmful types of such organisms to be separated from the harmless types so frequently found in clean milk from healthy cows.

Do low scores always mean poor milk? F. H. HALL (*New York State Sta. Bul. 398, popular ed. (1915), pp. 11, figs. 2*).—A popular edition of the bulletin previously reported (E. S. R., 33, p. 78).

How to produce cream that makes good butter, O. F. HUNZIKER and G. L. OGLE (*Indiana Sta. Circ. 51 (1915), pp. 8, figs. 7*).—A general discussion of the importance and methods of producing good cream for butter manufacture.

Variations in the tests for fat in cream and skim milk, E. S. GUTHRIE and G. C. SUPPLEE (*New York Cornell Sta. Bul. 360 (1915), pp. 271–289, figs. 9*).—Experiments were conducted to determine the factors affecting the percentage of fat in cream from a centrifugal separator. The milk used was standardized, usually to 4 per cent of fat, and about 40 qt. was used in each determination. All the factors were studied with one machine, and some of them with other styles of machines, five types being employed.

It was found that "the percentage of fat in cream and in skim milk from separators 1 and 2 was affected by low temperatures to a greater extent than was that from the other three types of separators. The tests of the cream from separators 1 and 5 were distinctly variable when there was a difference of ten revolutions of the crank per minute. The other separators were not so affected. The variation of ten turns of the crank did not materially affect the percentage of fat in the skim milk. There is a slight increase in the test of the cream when the inflow of milk is small. The percentage of fat in cream is in almost direct proportion to that in the whole milk. The variation in the amount of whole milk or of the liquid used for flushing does not cause an appreciable difference in the percentage of fat in the cream. The slime deposit does not materially affect the tests of the cream and the skim milk until there is so much that the passages in the bowl become clogged."

The Babcock test and its application, R. E. HUNDERTMARK (*Washington Sta. Popular Bul. 75 (1915), pp. 14, figs. 6*).—General instructions are given for making the Babcock test.

The creamery and testers' license law.—Report of work for the year ending March 31, 1915, O. F. HUNZIKER and G. L. OGLE (*Indiana Sta. Circ. 50 (1915), pp. 36, figs. 9*).—This circular explains some of the provisions of the Indiana law relating to testers' and creamery licenses, describes methods of testing glassware, discusses the effect of factory inspection on equipment and methods used in the Babcock test, treats of the direct benefits derived from the enforcement of the law, and lists the licensed testers and plants for the year.

Markets and prices of Wisconsin cheese, B. H. HIBBARD and A. HOBSON (*Wisconsin Sta. Bul. 251 (1915), pp. 56, figs. 23*).—This bulletin is a continuation of work previously reported (E. S. R., 29, p. 675), dealing mainly with Swiss, brick, and Limburger cheese, which constitutes about one-third of that made in the State.

The successive steps from producer to consumer are outlined. More than half of the Swiss, brick, and Limburger cheese factories are cooperative. The organization, equipment, and management of these and the private factories are discussed.

The operations of the Sheboygan County Cheese Producers' Federation, composed of 48 local cooperative cheese factories, are described. It is said that this movement has reduced the wide margin between producers' and consumers' prices comparatively little, but it has sold somewhat more directly, eliminating one middleman and possibly two. In the instances where this advantage has not been offset by increased transportation charges it has meant a lower cost to the retailer and at the same time a price slightly higher to the producer. What the federation has accomplished is to educate the farmers on the subject of marketing. They have learned that the great portion of the middleman charges in marketing cheese are legitimate and, for the present, necessary. Instead of saving several cents by the new method of handling cheese, it develops that a few eighth-cents are all that can be hoped for until essentially more economical methods are discovered in the manner of distributing the product.

In the brick, Swiss, and Limburger districts most milk is bought by the hundred pounds, regardless of butter fat or casein test. This method is admitted to be unfair, but is said to be preferred by the milk producers. In 1913 the farmer received on an average of from $1.29 to $1.33 per 100 lbs. of milk taken to a cheese factory. The cost of manufacturing a pound of cheese is from 1.2 to 1.75 cts. The length of time cheese is stored depends greatly on market conditions. The charge for storing is ⅛ ct. per pound per month, or from ⅜ to ½ ct. for the season. In the consideration of marketing cost, the shrinkage of cheese in storage must be taken into account. The amount of this shrinkage during a given time depends on the type, quality, and size of cheese, the temperature, paraffining, wrapping, and time in storage. Data are presented showing the influence of these factors.

Nearly all cheese passes through the hands of one or more middlemen between factory and retailer. The dealer gets a margin of about 1 ct. per pound, the wholesaler about 2 cts., the broker from ⅛ to ¼ ct., and the retailer from 5.5 to 9 cts. The factory, dealers', and wholesalers' prices fluctuate widely during different seasons of the year. The retail price is largely a customary one. The farmer gets about one-half the money paid by the consumer, the remaining half going to pay distributing costs.

In conclusion it is said that "the producers and the consumers are a long way apart. Direct marketing is well-nigh impossible so far as cheese is concerned. The cooperative ownership and management of a cheese factory is of relatively small consequence, although undoubtedly better than any other system, because it solves such a small part of the marketing problem. The long line of middlemen is still intact, and the line is too long. Probably the farmer can not hope to break into the retailer's realm. If that is improved it will have to be by action on the part of consumers. The farmer has therefore at best a hope of effecting savings from but a relatively small part of the total increase in price from factory to consumer. This hope is based very largely on his ability to understand the market and first of all to understand that on himself rests the responsibility of supplying a product of known high quality. In some manner those farmers who produce the high-grade goods should be able to unify their efforts, and by establishing a brand command a higher price for their product than that secured for inferior goods."

VETERINARY MEDICINE.

Annual report veterinary research, 1913–14 (*Union So. Africa Dept. Agr. Rpt. 1913–14, pp. 107–139*).—This report deals first with routine work, which relates largely to inoculations against horse sickness, blue tongue, redwater, etc. Under the heading of research it deals briefly with tuberculosis in hogs, contagious abortion, chick fever in ostriches, pernicious anemia in horses, jagziekte in sheep, and redwater and gall sickness in susceptible cattle. Particular attention is given to investigations of the life history of the ostrich wireworm (*Strongylus douglasii*), and the life history of the sheep scab parasite (*Psoroptes communis ovis*). Under the heading of miscellaneous investigations the report deals with diseases of cattle, effect of dipping working oxen, and dun sickness in horses. A brief report on miscellaneous poisonous plant feeding experiments and a historical sketch of the investigations into lamziekte are included.

Protective enzyms, cytotoxic immune sera, and anaphylaxis, R. M. PEARCE and P. F. WILLIAMS (*Jour. Infect. Diseases, 14 (1914), No. 2, pp. 351–363*).—"On the basis of Abderhalden's theory of protective enzyms and by the use of his dialysis method it has been shown that the serum of a rabbit receiving a single injection of kidney substance develops the power to digest dog's kidney in vitro, but has no effect upon the kidney of the dog when administered intravenously. Thus it would appear that the so-called protective enzyms are not to be classed with the immune cytolysins. The digestive power of the serum which develops after the injection of kidney is not limited to the kidney but acts also upon the liver. This is true after one injection or after four or five injections. There is some evidence, however, after multiple injections of a tendency to a more definite effect on the kidney than on the liver.

"A few attempts to demonstrate protective enzyms in the serum of dogs receiving dog's kidney and of animals with experimental nephritis have failed. Attempts to demonstrate protective enzyms in the serum of dogs sensitized to horse serum have not been as successful as those of Abderhalden with the serum of the guinea pig sensitized to egg-white. Negative results have been the rule before shock, and positive results, difficult of explanation, after shock. Dialysis, alone, of small amounts (2 cc.) of serum, obtained either before or five to ten minutes after 'shock' in dogs sensitized to horse serum, gives no evidence of the presence of the products of protein disintegration. Larger amounts (10 to 20 cc.) taken ½ to 1½ hours after shock give positive results after dialysis, but the interpretation of these is doubtful on account of the difficulty, under these circumstances, of obtaining serum free of traces of hemoglobin.

"The results of the injection of renal tissues support Abderhalden's general contention concerning protective enzyms, but indicate a lack of specificity. On the other hand, the work with anaphylaxis, while suggestive, is not sufficiently definite to be used in support of the theory that the essential mechanism of anaphylaxis can be explained on the theory of the development of a protective enzym.

"Finally, the authors state that on account of the many difficulties which the technique of this method presents—and especially because of the frequent presence of ninhydrin reacting substances in the serum of normal animals—thus rendering exact control observation difficult, these results are presented with some hesitation. Moreover, without desiring to detract in any way from the importance of the underlying principle of Abderhalden's theory of protective enzyms as exemplified by his work on pregnancy, we urge caution as to hasty attempts to apply this theory as a general explanation of widely diverse conditions of altered physiology."

Studies on so-called protective ferments.—I, The sensitization of substratum for the Abderhalden test, J. BRONFENBRENNER, W. T. MITCHELL, JR., and M. J. SCHLESINGER (*Biochem. Bul., 3 (1914), No. 11–12, pp. 386–389*).—This is an attempt to determine whether the substances brought into play in the Abderhalden reaction are of the nature of antibody, as "antibody" was understood in 1909, or whether they are entirely different.

The result of the work, while it does not seem to furnish definite proof that the nature of defensive ferments is identical with that of the antibody or amboceptor, is nevertheless said to contribute additional evidence to the effect that a certain amount of parallelism between the two apparently exists. In these investigations it was found that "there was not only no dialysis in the containing placenta and the pregnant serum when the temperature was low, but also that the placenta as well as the serum underwent changes absolutely similar to those we should have expected if we had used, instead, a hemolytic amboceptor and corresponding erythrocytes—namely, the serum was deprived of its property of digesting fresh placenta-protein, and the placenta-protein acquired the property of being digested by any fresh serum. Moreover, such a placenta (sensitized?) could also be digested by serum which was deprived of its specific antibody by exhaustion with placenta in the ice box. . . .

"To those making routine examinations by the Abderhalden method, it is known that the blood of a patient taken under certain conditions, as when there is high temperature, pus formation, or recent ingestion of a meal, may contain an amount of amino acid sufficient to mask the specific reaction. Whereas the last mentioned factor can be regulated with little inconvenience to the patient, blood being taken before breakfast, it is impossible to obviate the complications in the other cases." A modified procedure is presented which will remove some of the errors in the method.

A note on the preparation of bacterial vaccine, W. J. STONE (*Jour. Amer. Med. Assoc., 63 (1914), No. 12, pp. 1011, 1012*).—When the bacterial growth is removed from the agar, or other medium, there is a tendency to take with it metabolic products and constituents of the medium. These products are apt to cause a relatively severe local reaction. The author recommends washing all bacterial suspensions and separating them with the centrifuge.

"For purpose of standardization, a suspension of the living, rather than dead, washed organisms is employed. The following method, which is preferable to the blood-cell slide method of Wright because of greater accuracy, was suggested some years ago by Dr. L. H. Spooner of Boston, and has been used by me as a routine procedure with satisfaction: A small amount of the suspension is drawn into an ordinary erythrocyte mixing pipette, diluting 1:100 with a fairly deep colored, thoroughly filtered, aqueous carbolthionin stain (the phenol content is 0.5 per cent). The suspension in the counter is well shaken to secure an even distribution of cells and a small drop placed on the shallow blood-platelet counting chamber of Helber-Zeiss. The organisms in 25 small fields are counted and the sum divided by 25 to obtain unit value. The number so obtained is mutiplied by the dilution (100), by 50 (the depth of chamber), by 400 (the number of small squares per cubic millimeter), and lastly by 1,000 to convert to cubic centimeters."

Some further investigations on the detection of anthrax with the precipitation method, SCHÜTZ and PFEILER (*Arch. Wiss. u. Prakt. Tierheilk., 40 (1914), No. 4–5, pp. 395–424*).—A continuation of the work previously noted (E. S. R., 25, p. 883; 27, pp. 577, 781; 29, p. 378; 30, p. 682), a larger variety of domesticated animals (bovines, horses, sheep, goats, and pigs) and deer being studied. The extracts of the organs were compared by three methods, viz, boiling (physiological salt solution), chloroform, and Ascoli's modified boiling (acetic acid added to the physiological salt solution extract).

The use of acetic acid as a remover of turbidities in the extract did not seem to have any particular advantage, and after trying other substances, filtration of the extract through dried powdered animal charcoal and filter paper was utilized. Keeping the extract in contact with charcoal for a long time absorbed some of the precipitinogen. In these investigations it was again proved that a chloroform extract of an organ under test gives better results than the ordinary physiological salt (boiled) extract. The latter gave more negative results than the bacteriological examination. The precipitation test was found reliable for detecting anthrax in bovines horses, and sheep, and may also be used for diagnosing anthrax in pigs.

Vaccination against anthrax according to Sobernheim's method, F. ENGEL (*München. Tierärztl. Wchnschr., 65 (1914), No. 5, pp. 107, 108; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 33, p. 602*).—In all, 274 bovines were treated with serum plus culture subcutaneously. Of this number 3 animals died (after 5½, 9, and 10½ months, respectively). In one establishment where the inoculations were made on November 22, 1911, a newly lactating cow was introduced on December 27 of the same year and this animal died January 9, 1912, from anthrax. The method is considered a good one.

Blood examinations in combating glanders, L. NEVERMANN (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 29, pp. 522–524*).—A report of the tests carried out in the pathological institute of the Veterinary High School at Berlin and in the Emperor William Institute in Bromberg from April 1, 1911, to March 31, 1912. Of the 1,635 horses examined, 219 were given autopsy, and 175 of these were found glandered tests. The results obtained in the various districts of Prussia with the agglutinization and complement fixation are stated.

The eradication of glanders in Prussia by the blood test, L. NEVERMANN (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 32, pp. 580, 581*).—From April 1, 1906, to December 31, 1912, 12,597 horses and 2 mules were tested by the agglutination method. There were 1,786 autopsies made and 1,275 were found glandered. The average percentage of horses destroyed on the basis of the blood test from March 31, 1909, to December 31, 1912, was 91.1.

Vaccination tests with serum against rabies in domestic animals, W. PFEILER and G. KAPFBERGER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 4, pp. 284–297; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 33, pp. 602, 603*).—As a result of continuing the work previously noted (E. S. R., 30, p. 282) an antirabic serum was prepared from horses. In order to protect against rabies it is necessary to give intraspinous injections of the serum five days before the appearance of the disease in the animals. Curative properties of the serum have not been noted up to date, but it was found that rabid animals treated with the serum lived longer than untreated rabid animals.

The diagnosis of bovine tuberculosis with the complement fixation reaction according to Hammer's method, K. BIERBAUM and G. BERDEL (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 249–258; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 30, p. 539*).—The antigen in this procedure is an alcohol or acetone extract of the tissue. The procedure is not deemed any more accurate than other methods proposed for the purpose.

The microscopical detection of tubercle bacilli in open tuberculosis of bovines, W. MEYERHOFF (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 31, pp. 551–554*).—For the microscopical detection of tubercle bacilli in cases of open tuberculosis in bovines which can not be made to cough by artificial means, the method of Müller, Wiemann, and Jonske must be employed for collecting the sputum. When coughing can be induced Rautmann's method of catching the sputum can be employed.

Sampling lung mucus from bovines for diagnosing open pulmonary tuberculosis, E. SCHARR (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 24, pp. 426, 427*).—Instead of the cotton wad recommended in the Scharr and Opalka method (E. S. R., 26, p. 679) silk of a particular texture is recommended, as eliminating some of the disadvantages encountered with cotton.

Some observations on the tuberculin test, W. JOWETT (*Jour. Compar. Path. and Ther., 27 (1914), No. 2, pp. 129–151, figs. 8*).—The purpose of this work was to determine the value of the so-called local tuberculin tests and also of the associated tuberculin tests. The first experiments were made with a few tuberculous animals, and subsequently the results obtained on these animals were used as a guidance in tests conducted on other animals, imported and otherwise.

The subcutaneous test is discussed in a very comprehensive manner and the following facts are emphasized: "In some animals, especially in case of overfat, recently imported 'show' cattle, as also in cows and heifers advanced in pregnancy and those in which parturition has recently occurred, the body temperature is liable to show variation from day to day of 1 to 2° F. or more. Not all tuberculous cattle respond thermally to the subcutaneous tuberculin test. Even amongst those animals which are capable of giving a febrile reaction in response to the injection of tuberculin the highest temperature recorded after inoculation may fall below 104°, and if such animals are retested, even with a double dose of the same stock tuberculin, after an interval of only one month, the chances in favor of their nonreaction are greater than of their reaction."

Tuberculin loses some of its properties when stored under unfavorable conditions or in a diluted state. It is not strictly correct to assume that animals injected with tuberculin will not show a local swelling such as is observed with the mallein test in a glandered animal. These phenomena, although not constant, sometimes occur and one should be on the lookout for them, especially when retesting doubtful reactors. The swellings may vary in size but they are at times as large as the palm of one's hand. They are most often evident in thin-skinned animals and those in somewhat poor condition.

The conjunctival-, ophthalmic-, or oculo- tuberculin reaction when conducted simultaneously with the subcutaneous test does not give a marked reaction. It is better to make the conjunctival test shortly before or some four or five days after the subcutaneous test. One may, however, apply the intradermal test simultaneously with the conjunctival test with excellent results. Good results may be obtained by submitting the animals to a conjunctival test the day previous, or even twelve hours or so before applying the subcutaneous test. The author is not inclined to concur in the belief of some workers that a previous subcutaneous test does not influence in any way or prevent a subsequent conjunctival reaction, as animals do not acquire a tolerance against the conjunctival test. A tuberculous animal previously submitted to the conjunctival test will after a few days when given a subcutaneous injection of tuberculin show a secondary reaction in the eye. This was noted in a minority of the subjects.

The intradermal test (E. S. R., 30, p. 883) was tried on upwards of 225 animals. The results were controlled in every case by a later subcutaneous test, and whenever possible the animals were slaughtered and submitted to a careful post-mortem examination. "The subjects of the experiments comprised calves, bulls, cows, heifers, in fact all classes of bovines, some being known tuberculous animals which were purchased for the purpose of experiment, others being doubtful reactors to the subcutaneous tuberculin test, whilst a large number were imported or colonial cattle, the former history of most of these being unknown. Briefly, the intradermal test has given very satisfactory results and has proved, to the satisfaction of the writer, its utility as a diagnostic method. It is not claimed that the intradermal test is superior to the ordinary subcutaneous (tuberculin) test, but in the writer's opinion the first-mentioned test is very nearly, if not quite, equal to the latter as a diagnostic method; moreover, it possesses a number of advantages over the subcutaneous method."

A remedy for clover bloat, D. J. Healy and J. W. Nutter (*Breeder's Gaz., 67 (1915), No. 25, p. 1198*).—The occurrence of bloat in the Kentucky Experiment Station dairy herd following the consumption of clover led the authors to experiment with a view to discovering an efficient remedy therefor.

Analyses showed that red clover blossoms contained sugar to the extent of 3.6 per cent, alfalfa blossoms 2.8 per cent, and white clover blossoms 2.4 per cent, whereas in the blossoms of blue grass and in the leaves of clover and alfalfa the quantity of sugar present was found to be less than 1 per cent. In the test with fermentation tubes it was found that when white clover blossoms were thoroughly ground and mixed with a quantity of sterile distilled water and held at a temperature of 37° C. for 24 hours an active fermentation took place; at the end of this period the quantity of carbon dioxid gas which had been formed equaled 45 per cent of the volume of the original clover blossom mass.

The bloated condition of the animals was alleviated through the use of a solution of formaldehyde as a drench. In two cases in which formaldehyde was administered the cows refused their dry feed and suffered diminished milk production for a period. The authors have demonstrated that under laboratory conditions urotropin will act as efficiently as formalin, although it requires a somewhat larger dose. For the present they strongly recommend the use of 1 qt. of a 1.5 per cent solution of formalin, followed by the placing of a wooden block in the animal's mouth and gentle exercise if the animal can be gotten up.

Thiele's hog cholera remedy "544" (*North Dakota Sta. Spec. Bul., 3 (1915), No. 17, pp. 289–291*).—A test made by Dr. Paul Fischer, of the bureau of livestock industry of the State of Ohio is briefly noted. Either 8 or 9 pigs were used in each test, all belonging to the same litter. All pigs received 2 cc. of hog-cholera virus, some either antihog-cholera serum or Thiele's "544" in addition, and some were kept as checks. The pigs receiving "544" died on almost precisely the same days as the checks, or in some cases a little earlier.

Poultry diseases (*Wisconsin Sta. Bul. 250 (1915), p. 40*).—In the course of investigations by B. A. Beach, H. E. Lothe, and J. G. Halpin of an outbreak of a disease from which nearly 2,000 chickens died in less than 10 months, a bacillus was isolated which caused death in five or six days when introduced beneath the skin of healthy fowls. This organism, in many respects resembling the bacillus causing fowl cholera but differing in that it does not affect ducks, is believed to be present in addition to those causing roup or chicken pox in the outbreaks with excessive mortality. A vaccine is said to have been prepared which will render a fowl immune to the disease. See also a previous note (E. S. R., 31, p. 887).

Some factors in combating fowl tuberculosis, L. van Es (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 32, pp. 575, 576*).—A detailed discussion of the etiology of tuberculosis in fowls, as well as of the predisposing causes, and the means for controlling the disease. See also a previous note (E. S. R., 31, p. 582).

RURAL ENGINEERING.

The use of water in irrigation, S. Fortier (*New York: McGraw-Hill Book Co., 1915, pp. XIII+265, pls. 10, figs. 71*).—This volume deals with the agricultural side of irrigation. It is intended for the use of new settlers in the West, irrigation farmers and those who are interested in irrigated agriculture, and students in agricultural high schools and in agricultural and engineering classes of colleges and universities.

The subject matter is confined almost exclusively to the irrigated farm and to the problems confronting the irrigator. The legal, economic, and engineering phases of the subject are touched upon, but only in so far as they affect the welfare of the farmer. The subject matter is presented under the chapter headings of the irrigated farm, the necessary equipment and structures, methods of preparing land and applying water, waste, measurement, delivery, and duty of water, and irrigation of staple crops.

"Considerable space has been given to methods of preparing land and applying water, for the reason that the manner in which these are done determines to a large degree the profits derived by the farmers and the success of canal companies. . . . The manner in which water is used in irrigation as described in these pages is nation wide. The same care and attention which were paid to the irrigation of cotton and sugar cane in the Southwest, to rice in the Gulf States, and to truck and fruit crops along the Atlantic seaboard were given to the irrigation of forage and cereal crops in the mountain States and to vineyards and orchards along the Pacific."

The author states that the contents of this publication are drawn in the main from the publications and work of the Irrigation Investigations Division of this Department.

Treatise on engineering studies and works for water transportation, H. ENGELS (*Handbuch des Wasserbaues für das Studium und die Praxis. Leipzig: W. Engelmann, 1914, pp. XII+1499, figs. 1623; rev. in Engin. News, 73 (1915), No. 3, pp. 116, 117*).—This book, in two volumes, contains, in addition to several sections giving a large amount of general hydraulic engineering information and working data, a section treating of agricultural hydraulics, especially drainage and irrigation. Sections of the pumps used for drainage purposes in the Holland polders and elsewhere are given and tide gates are described. The reclamation and cultivation of peat lands are also considered.

Report of the state engineer, A. J. PARSHALL (*Bien. Rpt. State Engin. Wyo., 12 (1913–14), pp. 201, pls. 16*).—This reports the activities of the state engineering force during the years 1913 and 1914, which included, among other work, irrigation and stream gaging.

[Irrigation and other experiments, Umatilla project, Oregon, 1914], R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1914, pp. 1–8, fig. 1*).—Climatic and agricultural conditions on the project are described briefly, including the results of measurements of precipitation, evaporation, wind velocity, and temperature, and irrigation experiments to determine the most economical methods of handling water are reported.

It was "found that upon virgin land without crops a 2½-in. application of water is retained in the first 4 ft. of soil. Five in. of water applied under identical conditions filled the first 10 ft. to its full carrying capacity and part of the water passed even below this depth. Twenty-four hours after 5-in. and 10-in. applications of water were made on two plats having the same kind of soil there remained an equal quantity of water in each plat to the depth of 4 ft., and this quantity was practically the same as was retained by the same layer of soil where a 2½-in. irrigation was applied. On land of a finer texture and bearing a crop of alfalfa, a 4-in. application of water was all held in the upper 4 ft. This shows that in either case heavy losses result from applying heavy irrigations to the lighter soils of this project. . . .

"The frequency of applying water had a very marked influence upon crop yields. A plat of alfalfa given 4.4 ft. of water at eight applications yielded 4 tons of hay. . . . Another plat given 5.3 acre-feet applied in twelve irrigations yielded 5.3 tons. . . . A third plat given 9.7 acre-feet of water in twenty-four irrigations yielded 5.57 tons. . . . Thus, the best results were obtained from 5.3 acre-feet of water applied in twelve irrigations. . . .

"To get the greatest benefit from irrigation water on these sandy soils it should be very carefully handled. The necessity for economical use requires that special emphasis be placed on (1) using short irrigation furrows, ranging from 100 to 200 ft. in length, (2) making irrigation furrows 20 to 30 in. apart, (3) using fairly shallow furrows, well opened, to facilitate the flow of water,

(4) running water for but a short time in one place, as loss soon occurs from deep percolation, (5) the use of a small amount of water for each irrigation, since the storage capacity of the soil is very low, (6) the frequent application of water to maintain an adequate supply for plant growth, as the small quantity that it is possible to store in the soil is quickly taken up by the plants or evaporated, and (7) using a comparatively large stream of water while irrigating, in order to cover the land as quickly as possible."

Irrigation of the plains of Kep, Voi, Bao-Loc, Pins, and Phu-Lang-Thong, ROUEN (*Bul. Écon. Indochine, n. ser., 17 (1914), No. 109, pp. 517–540, pl. 1*).—This article describes the irrigation works, including dams, storage reservoirs, canals, etc., and reports briefly the general results obtained in the irrigation of rice. It is stated that the net benefit realized from the irrigation of rice in Kep has amounted annually, in round numbers, to about $38 per hectare ($15.40 per acre), thus justifying the extension of the irrigation works.

Water regulation in the different water districts of Java and Madoera (*Verslag Burgerl. Openb. Werken Nederland. Indië, 1911, pt. 4, B. Bijlage II, pp. IV+174*).—This report covers developments in irrigation, the distribution and use of irrigation water, conveyance and diversion of water, and water regulation.

Surface water supply of Missouri River basin, 1913 (*U. S. Geol. Survey, Water-Supply Paper 356 (1915), pp. 291, pls. 2*).—This report, prepared in cooperation with the States of Montana and Nebraska, presents the results of measurements of flow made on the Missouri River and its tributaries during 1913.

Surface water supply of the lower Mississippi River basin for 1913 (*U. S. Geol. Survey, Water-Supply Paper 357 (1915), pp. 86, pls. 2*).—This report, prepared in cooperation with the State of New Mexico, presents the results of measurements of flow made on the Arkansas, Yazoo, Red, and Canadian river basins in the lower Mississippi River basin in 1913.

Water resources of the Rio Grande basin, 1888 to 1913, including surface water supply of the western Gulf of Mexico basins, 1913, R. FOLLANSBEE, H. J. DEAN, ET AL. (*U. S. Geol. Survey, Water-Supply Paper 358 (1915), pp. 725, pls. 3*).—This report describes the general features of the Rio Grande basin and presents the results of measurements of stream flow made in the basin and in the western Gulf of Mexico basins. The results of studies of precipitation, evaporation, and sedimentation as factors in determining the value of reservoir sites for the storage of flood waters are also presented.

Report of progress of stream measurements for the calendar year 1913, P. M. SAUDER, G. H. WHYTE, and G. R. ELLIOTT (*Dept. Int. Canada, Sess. Paper 25c (1914), pp. V+414, pls. 20*).—This report presents the results of measurements of flow made on streams and irrigation ditches in Alberta and Saskatchewan during 1913.

Pumping water by means of steel windmills, B. MÜLLER (*Fördertechnik, 7 (1914), No. 13, pp. 161–167, figs. 15; abs. in Wasser u. Abwasser, 9 (1914), No. 1, pp. 9, 10*).—This article gives considerable tabular data regarding wind velocities, wind power, power of windmills for pumping purposes, and data to be used in determining the size and location of the windmill and the size of suction and pressure pipe for pumping under certain given conditions, especially from deep wells. In comparative tests of windmill power and electrical and gas engine power for meadow draining in east Prussia, using a vertical submerged centrifugal pump, it was found that the expense of operation over a long period of time was much the least with wind power, followed in order by electrical and gas engine powers.

Irrigation with fresh water from the sea, E. J. Moynihan (*Sci. Amer. Sup., 79 (1915), No. 2040, pp. 84, 85*).—The author proposes the use of sea water for irrigation purposes and maintains that its distillation to remove the injurious salts is practicable.

He describes two methods of procedure, the first of which is based on the fact that the temperature of sea water varies considerably with the depth and that probably "for those months in the year in which water is most needed there are suitable places near shore where a temperature difference of 5° exists in very moderate depths of water . . . Under these conditions it is easy to evaporate the water at the higher, and to condense it at the lower, temperature.

"The second method of distilling the water consists of increasing the pressure and therefore raising the temperature of the distilled vapor or the water to be distilled by mechanical means, such as a compressor turbine, and condensing the vapor in a surface condenser, the condensation water being the same water that is being evaporated. In this way the whole of the latent heat of condensation is returned to the water which is being condensed."

Proceedings of the tenth annual meeting of the Iowa State Drainage Association (*Proc. Iowa State Drainage Assoc., 10 (1914), pp. 93*).—These proceedings contain the following special articles:

Drainage Conditions in the Province of Manitoba, by F. G. Churchill (pp. 11–13); What the Drainage Investigations of the U. S. Department of Agriculture Are Doing for Farmers in the Humid Regions, by F. F. Shafer (pp. 13–22); An Investigation Into the Efficiency and Equity of Present Methods of Levying Assessments for Drainage Benefits, by J. W. Lee (pp. 26–32); Drainage Assessments and Their Relation to the Farmer, by M. L. Henderson (pp. 33–37); Mutual Interests of Drainage Organizations and Highway Organizations, by J. H. Ames (pp. 39–42); Standard Methods of Testing Drain Tile and Sewer Pipe, by A. Marston (pp. 43–46); Tile Testing Machine Demonstration—Demonstration of Ditching Machine (pp. 46, 47); The Maintenance of Small Drainage Ditches, by S. Dean (pp. 47–50); Minnesota Drainage Commission, by J. T. Stewart (pp. 52–58); Problems of a Drainage Contractor, by J. A. Dunkel (pp. 59–64); The Possibilities for Experimental Work in Drainage Investigations, by W. J. Schlick (pp. 64–68).

Alkali and water-logged lands (*Salt Lake Com. Club Bul. 1 (1914), pp. 30, figs. 11*).—This bulletin contains the following special articles: The Soils of Salt Lake County, by R. Stewart; Redeeming Alkaline Lands, by E. D. Ball; Drainage of Alkali Lands, by L. A. Merrill; Drainage a Factor in the Future Growth of Salt Lake City, by R. A. Hart; and Tile Drainage in the Reclamation of Water-logged and Alkaline Lands, by J. C. Wheelon.

West Tennessee gullied lands and their reclamation, R. S. Maddox (*Resources Tenn., 5 (1915), No. 1, pp. 8–22, figs. 3*).—This article deals with an area of more or less eroded and gullied lands lying in a belt extending in a northeast and southwest direction through the State, and which is practically contained in the counties of Henry, Benton, Carroll, Henderson, Madison, Chester, McNairy, Hardeman, and Fayette.

It is stated that in this area more than 115,000 acres of land once cultivated are now occupied or influenced by gullies and that over 230,000 acres once cleared and cultivated are lying waste. The soil in this belt is very sandy and in some localities is mixed with enough clay to make it subject to easy erosion.

For starting the reclamation of these lands the author recommends the planting in gullies of such quickly-growing and widely-rooting trees as the black locust, yellow poplar, black walnut, and sycamore, and such crops as Japan clover, wild honeysuckle, and Bermuda grass. All these are said to be particularly adapted for stopping up gullies and for the protection of lands which tend toward gullying. It is pointed out in this connection that the soil in the bottoms of gullies is usually sufficiently fertile for the growing of the above-mentioned plants.

The law of highways, W. W. Mackenzie (*London: Butterworth & Co., 1911, 16. ed., pp. CXIV+1252*).—This is the sixteenth edition of this book, covering English laws in regard to highways, main roads, streets, and bridges. It is divided into two sections, the first dealing with the law of highways independent of statute and the second with statutes relating to highways, main roads, streets, and bridges.

The chapters under the first division are highways in general; dedication of highways; ownership of the way; repair and nonrepair of highways and bridges, and remedies for nonrepair; obstructions and nuisances; and extinguishment and diversion of highways. Under the second division the chapters are highways, main roads, and streets; locomotives on highways; highways interfered with by railways; tramways on highways; and bridges.

Report of the state commission of highways (*N. Y. Rpt. State Com. Highways, 1912, pp. 694, pls. 26*).—This is a report of the activities of the commission during the year 1912.

Road models (*U. S. Dept. Agr. Bul. 220 (1915), pp. 24, pls. 13, figs. 2*).—This is a revision of Bulletin 47 of the Office of Public Roads of this Department, previously noted (E. S. R., 28, p. 890).

Surfaces or floors for bridges, C. Older (*Good Roads, n. ser., 9 (1915), No. 6, pp. 60–63, figs. 9*).—The author relates the results of his experience regarding floors for highway bridges and concludes that ordinary plank floors having an average life of not more than three and one-half years are to be avoided when possible.

"With the exception of the floor with the bituminous surface, the cost of the floor increases as the weight decreases, and yet the cost of the entire superstructure decreases as the weight of floor decreases. The saving in cost for the lighter floors increases with an increase in the unit cost of structural steel in place, and decreases with an increase in the cost of the materials used in such floors. In reflooring old steel bridges of satisfactory design, a creosoted subplank with bituminous wearing surface has been found to give reasonable service. . . . The cost of maintaining the bituminous surface is only about 20 per cent of that of an ordinary plank floor. There seems to be no place in the economic design of new highway bridges for floors consisting of a creosoted plank subfloor with a brick wearing surface."

Use of the Abney hand level, T. F. Hickerson (*N. C. Geol. and Econ. Survey. Good Roads Circ. 99 (1914), pp. 6, figs. 7*).—This circular describes a hand level, for use in road engineering, which not only gives a level but also an inclined line of sight by means of a vertical arc graduated in degrees and minutes and a vernier reading to five minutes.

RURAL ECONOMICS.

Principles of rural credits, J. B. Morman (*New York: The Macmillan Co., 1915, pp. XVIII+296*).—The author describes the methods of financing farmers in European countries, indicating how the different forms of credit are made available to them. He claims that the first step for placing rural credit on a firm basis in the United States and Canada is the organization of farmers into cooperative societies. This should be brought about not only by the farmers themselves, but encouraged by state and national laws. With a view to their future federation the cooperative organizations should have as much uniformity as possible in their rules and regulations. It is considered essential that the association should select and determine the character of its own membership, that it should limit the amount of stock any member may hold, that no member should have more than one vote, and that the profits, if any, should be distributed to the members on the basis of the amount of business transacted by each with the organization or should be held as a reserve fund against the possibility of future losses.

The second step is the protection of the farmers against usurious conditions; the third, the granting by the State of long-time loans to farmers on first mortgages at reasonable rates of interest and on the amortization plan of repayment; the fourth, the adoption of a more rational and less expensive system of land registration; and the fifth, an educational propaganda by the national government on the principles of cooperation and on the proper use of credit.

Agricultural organizations in European countries, R. A. PEARSON (*N. Y. Dept. Agr. Bul. 66* (*1914*), *pp. 451–636, pls. 47*).—The author, in describing those features of agricultural organization which are adaptable to American conditions, points out that the success of cooperative efforts is in proportion to the need of them as well as to the efficiency with which they are carried out. An examination of foreign cooperative organizations shows that the effort is constantly made to prove by reasoning and by practice that cooperative buying and selling by farmers is not detrimental to legitimate business interests, but no effort is made to conceal the fact that those societies are distinctly injurious which thrive on unreasonable profits. He considers the importance of putting the responsibility directly upon the individuals who compose the society, as this insures the personal interest and activity which are necessary to success. Any effort made by the nation or State to assist in cooperation must carefully avoid the removal of this important personal incentive.

[Cooperation in Switzerland] (*Pubs. Sec. Suisse Paysans, No. 49* (*1913*), *pp. 87*).—This is the seventh annual report relating to cooperative organizations, and indicates the membership by types of societies and principal activities during the year 1913.

The social anatomy of an agricultural community, C. J. GALPIN (*Wisconsin Sta. Research Bul. 34* (*1915*), *pp. 34, pl. 1, figs. 10*).—This bulletin outlines the methods used by the author in making a social survey of Walworth County, Wis., describes and discusses conditions as found by him, and gives a number of maps indicating the extent of the various influences in the villages and cities upon the surrounding rural districts. The author concludes from his studies of these maps that the farm people on the land are situated upon the slopes of social watersheds draining into one specific village or small city; that these social watersheds ignore township and county lines; therefore it is difficult to get people who belong to different social basins, whose paths constantly lead over different roads toward different civic centers to work together aggressively under a township plan in regard to matters which belong naturally only to the homes that move together in the larger affairs of ordinary life. This maladjustment of local government is deemed perhaps the fundamental handicap of the farm home. The readjustment of rural populations into communities, steps in replanning a comprehensive community, and evidences of an alliance between town and farm are discussed with a view to alleviating such conditions.

[The dwellings of agricultural workers], R. DURAND and J. SÁNCHEZ (*Bol. Mens. Museo Soc. Argentino, 4* (*1915*), *No. 37–38, pp. 75–103, figs. 17*).—The articles written by the above authors relate to housing conditions as found among different types of agricultural people in Argentina.

A report on public administration in relation to agriculture and allied interests, J. W. GARNER (*Chicago: Effic. and Econ. Com., 1914, pp. 51*).—This report calls attention to the fact that in Illinois the state boards and offices for the administration of laws relating to agricultural interests have been entirely independent of one another and not correlated in their activities. The committee advises that the various boards and offices be brought together in a single department with one administrative head.

Negroes in the United States (*Bur. of the Census* [*U. S.*] *Bul. 129* (*1915*), *pp. 207, figs. 21*).—There has been brought together in this one bulletin the greater part of the statistical information of the census relating to the negroes. Among the statistical tables are those that show for rural districts the number of negroes and the school attendance by age periods, number of voting age, marital condition and illiteracy and ownership of farm homes, number engaged in agriculture by sex, number of farms, total and improved acreage, and tenure and value of farm property. This information is given for the individual States and for groups selected because of their relation to the negro problem.

Live stock [in Costa Rica] (*Internat. Inst. Agr. Rome, Bul. Agr. and Com. Statis., 6* (*1915*), *No. 2, p. 79*).—The number of live stock in Costa Rica is reported for 1914 as follows: Cattle, 336,061; horses, 52,095; pigs, 63,552; mules, 2,469; asses, 107; goats, 522; sheep, 122.

Agricultural statistics of Sweden (*Statis. Årsbok Sverige, 1915, pp. 60–75*).—Statistical data are given for 1913, showing by departments the area of land devoted to different agricultural purposes; the area, total production, average yield and value of the principal crops; the number of live stock, and the production of dairy products. For many items comparative data for the country as a whole are shown.

Agriculture in Algeria (*Statis. Gén. Algérie, 1912, pp. 233–280*).—These pages of the annual report contain statistical data showing the area in crops, number of agricultural implements, number of operators by tenure, and number of live stock.

[Agricultural statistics of Egypt] (*Ann. Statis. Egypte, 6* (*1914*), *pp. 319–370*).—These pages of the annual report give the number of farm operators, the area in farms by size, the area cultivated and not cultivated, the area in the principal crops, the number of live stock, and the trade in the principal agricultural products. The data are for 1913 and by minor subdivisions, with comparative data for earlier years for the more important items.

[Chinese agriculture] (*China Year Book, 1914, pp. 47–59*).—These pages of the annual report give, for the principal agricultural products grown, a brief statement concerning the localization of the crops, the domestic and foreign trade, and the uses to which they are put.

[Agriculture in Japan] (*Statis. Rpt. Dept. Agr. and Com. Japan, 30* [*1913*], *pp. 836, pls. 3*).—These pages continue the statistical data previously noted (E. S. R., 31, p. 491) by reporting information for 1913.

[Agriculture of New Zealand] (*New. Zeal. Off. Yearbook 1914, pp. 506–620, pls. 2*).—These pages of the annual report relate to land tenure, settlement, land transfer, occupation and ownership of land, area and yield of crops, and number of live stock.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 1* (*1915*), *No. 2, pp. 8*).—This number contains estimates as to the condition of a large number of crops on June 1, 1915, and of cotton on May 25, 1915, by States, with comparisons for earlier years, and as to the farm value of many important products on May 15 and of others on June 1, together with data as to the range of prices of agricultural products at important markets, and miscellaneous data. It also contains a series of diagrams, indicating by States the period of wheat harvest, corn and oats planting, and of planting and picking cotton.

The revised estimate of the 1914 cotton acreage is given as 37,406,000 acres. The estimated number of bushels of apples carried on railroad lines representing four-fifths of the total United States mileage and on practically all the boat lines from June 1 to November 30, 1914, is 45,066,000.

Statistical notes on the production, imports and exports, prices and maritime freights of cereals (*Internat. Inst. Agr. Rome, Bul. Agr. and Com. Statis., 1915, Mar., Sup., pp. 47*).—There have been brought together in this report statistical data showing the world's production of wheat, rye, barley, oats, maize, and rice in order to determine whether the cereal harvest of 1914–15 is sufficient to meet the average world consumption until the time of the next harvest. The harvest for the individual countries and the world as a whole is shown for 1913–14, with comparative data for the five and ten year periods preceding. The study seems to show that the world's crop of wheat, rye, and maize exceeds the quantity necessary for consumption, while there is a deficit of barley and oats.

[Prohibited exportation of agricultural products] (*Internat. Inst. Agr. Rome, Bul. Agr. and Com. Statis., 6 (1915), Nos. 1, pp. 23–26; 2, pp. 80–84; 3, pp. 124–128; 4, pp. 171–173*).—There are briefly outlined the restrictions placed upon the exportation of agricultural products by different countries because of the war situation.

AGRICULTURAL EDUCATION.

[Progress in agricultural education in Manitoba] (*Rpt. Dept. Agr. and Immigr. [Manitoba], 1913, pp. 15–21, 85–89, pls. 2*).—This report contains the eighth annual report of the board of directors on the progress of the Manitoba Agricultural College, and a report on the agricultural societies and college extension work for 1913 dealing with agricultural society fairs, agricultural and arts associations, agricultural special trains, boys' and girls' clubs, good farming competitions, home economics societies, seed fairs, short courses in agriculture, standing grain competitions, and plowing matches.

Report of the department of agriculture for 1912 (*Landtbr. Styr. Meddel. [Finland], No. 89 (1912), pp. 222+28*).—This is a report on the work of the department of agriculture, the agricultural education and research institutions, societies, and experts for the advancement of Finnish agriculture.

The use of land in teaching agriculture in secondary schools, C. Colvin (*School Sci. and Math., 15 (1915), No. 4, pp. 329–333*).—The author suggests how land may be used by the city high school having little land, the township high school having a medium plat of ground, the high school having access to or owning a large farm, and the academy operating a farm.

Tenth acre gardening demonstration, E. Kirkpatrick (*Iowa Agr., 15 (1915), No. 7, pp. 423, 424*).—A cooperative experiment was carried out during the past year by the departments of agricultural education and horticulture of the Iowa State College on a tenth-acre plat of comparatively rich soil without special preparation or the use of fertilizers or irrigation to test to what extent school gardening pays. The returns from the garden showed a profit of $25. Tomatoes proved to be the most paying crop in proportion to space planted.

Agricultural extension service (*Wisconsin Sta. Bul. 250 (1915), pp. 53–96, figs. 20*).—An account is given of the activities of the extension service, which is organized into the following main groups: (1) Departmental extension, which is largely demonstration work carried out mainly under field conditions; (2) the county agricultural representative system, in which resident instructors are located in the several counties for educational work, mainly along demonstration lines; (3) the combined or collective activities of two or more departments presented mainly through the medium of extension courses, schools, educational trains, exhibits, etc.

[Agricultural and home economics instruction in the public schools of New Hampshire], G. H. WHITCHER (*N. H. Dept. Pub. Instr., Inst. Circs. 1914–15, Nos. 2, pp. 4; 12, pp. 18; 17, pp. 6; 18, pp. 15; 20, pp. 3*).—These circulars offer suggestions to domestic arts teachers starting the first course in cooking, on household appliances having to do with heating, ventilating, sanitation, food storage, and sewage disposal, and on the tomato project for domestic arts classes; and to agricultural teachers in secondary schools on beginning project work in the spring.

[Instruction in agriculture, cooking, and sewing in Porto Rico] (*Rpt. Comr. Ed. P. R., 1913, pp. 334–338*).—This is a report on the status of instruction in agriculture, cooking, and sewing in the public schools of Porto Rico in 1912–13.

Education for the home, B. R. ANDREWS (*U. S. Bur. Ed. Buls. 1914, Nos. 610, pp. 53, pls. 6; 611, pp. 207, pls. 10; 612, pp. 109, pls. 10; 613, pp. 61*).—This is a comprehensive report on the present status of education for the home, arranged in four parts, viz, (1) an introductory survey of certain of the findings and a discussion of equipment for teaching household arts in elementary, high, and normal schools and colleges; (2) state legislation and provisions for education for the home and the work of the rural, elementary, high and normal schools, technical institutes and special institutions, and other agencies and organizations in the home betterment movement; (3) organization of home economics instruction in the various colleges and universities; and (4) a list of references on education for the home, and a list of cities and towns teaching household arts.

Cooking in the vocational school as training for home making, I. P. O'LEARY (*U. S. Bur. Ed. Bul. 625 (1915), pp. 36, pls. 2, figs. 4*).—This bulletin discusses the conditions which underlie the necessity for instruction in cooking, defines the aim of such instruction, and offers suggestions toward the final solution of the problem under the following topics: Home making as a vocation for girls, regular school methods and "trade" training in cooking, markets for the product, part-time classes for housekeepers, taking instruction to the pupil, and the kitchen and its equipment, including plans and price list of equipment and utensils.

Lesson plans for teachers in nature-study agriculture, ALICE J. PATTERSON and LORA M. DEXHEIMER (*Bloomington, Ill.: Authors, 1914, pp. 166*).—These lessons, which are based upon the Illinois state course of study and are arranged in monthly sequence for the eight years of the grammar grades, deal with birds, trees, flowers, garden plants, farm crops, and animals, including poultry, insects, weeds, soils, farm machinery, good roads, dairying, physiology, etc. In addition to the necessary fundamental facts they offer suggestions on how to obtain material, what to have the children observe, how to report the observations, how to conduct simple experiments, etc.

[Rural school agriculture] (*Univ. Minn., Dept. Agr., Rural School Agr. 4 (1914), Nos. 3, pp. 8, figs. 2; 4, pp. 8, figs. 3; 4 (1915), Nos. 5, pp. 8, figs. 2; 6, pp. 4, figs. 2*).—These circulars include a study of legumes, wheat, and alfalfa, an outline for an illustrated corn booklet, a report of boys' and girls' club work for 1914, and directions for organizing pig clubs in 1915.

Practical lessons in tropical agriculture, Book I, R. L. CLUTE (*Yonkers, N. Y.: World Book Co., 1914, pp. X+228, figs. 180*).—This text, for pupils in the Philippine schools, treats of the plant and its parts and practical applications of the laws governing plant life, each chapter being followed by demonstration exercises. An appendix gives directions for making a balance and rain gauge and a list of agricultural literature.

Soils and fertilizers for public schools, C. L. Quear, edited by O. L. Boor (*[Muncie, Ind.]: Author, 1915, pp. X+202, figs. 83*).—This text, which is designed for the average district or graded school, includes chapters on the conditions necessary for plant life, soil formation, classes, improvement, moisture, drainage and tillage, elements valuable in fertilizers, natural and artificial fertilizers, the hotbed and water supply, and studies in concrete. These are followed by experiments, directions for making agricultural apparatus, review questions and problems, and references to the literature.

Potato growing, W. D. Hurd (*Mass. Agr. Col., Dept. Agr. Ed. Circ. 31 (1914), pp. 23, figs. 12*).—This circular for the members of boys' and girls' clubs describes the various operations and methods in growing potatoes.

Rice judging and study, J. C. Rundles (*Philippine Agr. and Forester, 3 (1915), No. 8, pp. 181–190*).—An outline prepared by the College of Agriculture of the Philippines is given for the study of different varieties of rice, together with exercises in seed selection and vitality tests, a score card, and its explanation, for rice in the hull.

Productive vegetable growing, J. W. Lloyd (*Philadelphia: J. B. Lippincott Co., 1914, pp. XIII+339, pl. 1, figs. 193*).—This book is written primarily as a text for use in schools and colleges, from the viewpoint of conditions in the corn belt, but the principles laid down are applicable in all sections. The aim has been to emphasize principles rather than mere details of practice. Temperature requirements of the different crops are made the basis of the classification of vegetables and given special prominence in the cultural directions for the various crops. A chapter is devoted to suggestions for laboratory work, and an appendix gives the chemical composition of vegetables.

Suggestions to teachers of fruit growing in the high schools, C. S. Wilson (*Cornell Countryman, 12 (1915), No. 5, pp. 391–393*).—The author discusses the adaptation of subject matter in fruit growing to the needs of high school students, and gives an outline of topics under the subject of pruning, indicating those suitable for use in the high school.

MISCELLANEOUS.

Twenty-sixth and Twenty-seventh Report of Rhode Island Station, 1913 and 1914 (*Bul. R. I. State Col., 10 (1915), No. 4, pp. 23–27, 30–32*).—These pages include a report of the director for the period from June 30, 1912, to December 31, 1914, on the work, publications, and personnel of the station, and a financial statement for the fiscal year ended December 31, 1914.

Annual Report of South Dakota Station, 1913 (*South Dakota Sta. Rpt. 1913, pp. 38*).—This contains a report by the director on the organization, work, and publications of the station, a list of exchanges, a financial statement for the fiscal year ended June 30, 1913, and departmental reports, portions of that of the agronomist being abstracted on pages 321 and 331 of this issue.

Report of the director, 1914, H. L. Russell (*Wisconsin Sta. Bul. 250 (1915), pp. 109, figs. 49*).—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, 1914.

NOTES.

Arkansas University and Station.—J. H. Miller, dean of the extension division at the Kansas College, has been appointed dean of the extension service beginning July 14. W. C. Lassetter will continue as director of agricultural extension. A special effort is to be made to carry the benefits of the station work to the farmers through the agency of the extension workers, looking to the station as authority for facts in the instruction placed before the farmer.

H. A. Sandhouse, of the Colorado College, has been appointed assistant in animal husbandry, vice D. H. Branson, who resigned July 1 to take up graduate work. G. W. Hervey, of Rutgers College, has been appointed assistant in animal husbandry for special poultry work, beginning August 1. George L. Caldwell has been appointed assistant in veterinary science, beginning September 1, and will also assist in research work in bacteriology.

Florida University and Station.—At the recent session of the legislature $16,500 was appropriated for the station during the biennium, $5,000 being for maintenance, $4,000 for repairs and fixtures, and $7,500 for printing.

Director P. H. Rolfs of the station has been made dean of the college of agriculture, beginning July 1. W. C. Etheridge, assistant in farm crops at Cornell University, has been appointed professor of agronomy. M. N. Beeler has been appointed to have charge of extension publications beginning July 1, as well as of the correspondence courses and a short course to be offered in agricultural journalism.

Georgia College.—J. P. Campbell has been appointed director of extension work.

Kentucky University and Station.—J. N. Camden, of Versailles, has succeeded L. L. Walker as a member of the board of control. A department of animal pathology and diseases of live stock was established July 1 with Dr. Robert Graham as head. Dr. Philip Lee Blumenthal, whose resignation from the Iowa Station has been previously noted, has been appointed research chemist, and H. K. Wright to a position in connection with the hog cholera serum laboratory.

Missouri University and Station.—J. O. Rankin, assistant agricultural editor at the Wisconsin University and Station, has been appointed agricultural editor beginning September 1. Among his duties will be the organizing and editing of the publication work of the college of agriculture and station, the supplying of agricultural items directly to the farm press, and the furnishing of news items regarding the college of agriculture to the university publisher. Other appointments include J. S. Gardner as assistant in horticulture beginning September 1, and D. J. Griswold as research assistant in animal husbandry beginning July 1.

Ohio State University and Station.—It is announced that of the 190 1915 graduates in the four-year course, 75 per cent were expecting to engage immediately in farming. Of the remainder, 10 per cent were to take up agricultural teaching and 5 per cent graduate work.

Plans for the new home economics building call for a three-story E-shaped structure, with 182-foot frontage and 136-foot wings. The first story will be of Bedford limestone and the remainder of brick. The main portion will contain offices, class rooms, a museum, etc., while the wings will be occupied by laboratories, lecture rooms, a model apartment, dining rooms, an auditorium seating 500, etc.

The board of control for the station provided by the last legislature was named by the governor July 8 as follows: G. E. Jobe, Cedarville; Horatio Markley, Mt. Gilead; M. L. Ruetenik, South Brooklyn; Charles Flumerfelt, Old Fort; and George E. Scott, Mt. Pleasant. An act was also passed, authorizing the board of control to purchase lands suitable for the growth of forest trees at a price not exceeding ten dollars per acre and to manage such lands as state forests. An appropration of $10,000 was made for beginning this work. Other appropriations to the station included $180,780 for salaries and labor and $91,763.20 for maintenance. The fiscal year of the State has been changed from February 16 to July 1.

Oregon College and Station.—Requirements for admission to all degree courses at the college have been advanced from 12 to 15 units of high school credits, beginning with the next academic year. Provision for the admission of other students deemed sufficiently mature to select their life work and prepared to take advantage of the opportunities for college instruction is made through the vocational courses. The school of commerce announces additional courses in the literature and exposition of farm life, economics of distribution, and markets and marketing.

The following research assistants severed their connection with the station July 1: F. R. Brown, horticultural by-products; A. F. Vass, bacteriology; and Leroy Childs and G. F. Moznette, entomology. H. S. Jackson, head of the department of botany and plant pathology, has been appointed head of the botanical department of the Purdue Station to take effect September 1, vice Dr. J. C. Arthur who retires as a beneficiary under the Carnegie Foundation for the Advancement of Teaching.

Texas College and Station.—J. H. Foster, professor of forestry at the New Hampshire College, has been appointed state forester, professor of forestry, and forester to the station beginning September 1.

Virginia College.—T. J. Murray has been appointed associate professor of bacteriology and plant pathology.

West Virginia University and Station.—Dr. John L. Coulter, of the George Peabody College for Teachers at Nashville, Tenn., has been appointed dean of the college of agriculture and director of the station, beginning September 1. Other appointments, effective August 1, include Jonathan Yoke as instructor in animal husbandry, vice R. R. Snapp, resigned; Arthur C. Ragsdale, instructor in dairy husbandry, vice George L. Thompson, resigned; and Aubrey J. Swift as instructor in animal husbandry in the college and assistant in animal husbandry in the station.

Association of Official Agricultural Chemists.—The thirty-second annual convention of this association is to be held at Washington, D. C., November 15–17. The arrangement of the program has been altered from that of recent years, the first day being given over to the reports of the referees on water, feeds and feeding stuffs, sugar, separation of nitrogenous substances, dairy products, and food adulteration. The second day is to be devoted largely to committee reports and the address of the president, and the third day to reports from the remaining committees and referees, including the sections of fertilizers and medicinal plants and drugs.

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A. C. TRUE, DIRECTOR

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1915

U. S. DEPARTMENT OF AGRICULTURE.

Scientific Bureaus.

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BUREAU OF ANIMAL INDUSTRY—A. D. Melvin, *Chief.*
BUREAU OF PLANT INDUSTRY—W. A. Taylor, *Chief.*
FOREST SERVICE—H. S. Graves, *Forester.*
BUREAU OF SOILS—Milton Whitney, *Chief.*
BUREAU OF CHEMISTRY—C. L. Alsberg, *Chief.*
BUREAU OF CROP ESTIMATES—L. M. Estabrook, *Statistician.*
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THE AGRICULTURAL EXPERIMENT STATIONS.

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College Station: *Auburn;* J. F. Duggar.[a]
Canebrake Station: *Uniontown;* L. H. Moore.[a]
Tuskegee Station: *Tuskegee Institute;* G. W. Carver.[a]
ALASKA—*Sitka:* C. C. Georgeson.[b]
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CONNECTICUT—
State Station: *New Haven;* } E. H. Jenkins.[a]
Storrs Station: *Storrs;* }
DELAWARE—*Newark:* H. Hayward.[a]
FLORIDA—*Gainesville:* P. H. Rolfs.[a]
GEORGIA—*Experiment:* R. J. H. De Loach.[a]
GUAM—*Island of Guam:* A. C. Hartenbower.[b]
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[a] Director. [b] Agronomist in charge. [c] Acting director.

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[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. XXXIII. October, 1915. No. 5.

The question of experiment station publications continues to command attention. It formed one of the main topics on the program of the experiment station section of the Association of American Agricultural Colleges and Experiment Stations at its recent Berkeley meeting. An entire afternoon session was devoted to the discussion of the most effective forms in which to publish station work, and this was well warranted in view of its timeliness, its complexity, and its importance.

Consideration was given in the discussion to the annual report, the station bulletins, and the publication of scientific and technical material in the *Journal of Agricultural Research*, other scientific journals, and similar mediums. Some differences of opinion were expressed upon each class, and it is clear that the matter has not yet been fully worked out. This is not surprising, for despite an experience extending over twenty-five years conditions have been rapidly changing, especially of late, and in many instances policies have necessarily been influenced by local requirements and as a result of extension activities.

As regards the annual report, the general sentiment expressed was adverse to the practice of making it too detailed and voluminous. The inclusion of special articles and technical papers, or the binding of all the bulletins of the year together with an introduction into the report, was not looked upon as best meeting the needs of the situation economically or otherwise. In its place a reasonably brief annual report was favored, which would review the principal events of the year, discuss the work by projects, give a brief synopsis of the various publications issued, and report upon the station's resources and expenditures.

The character which the bulletins should now assume, and the best means of recording the more strictly technical features of station investigations, were considered at length but without definite conclusions. The procedure in this respect is a matter of special importance at the present juncture. With the assumption of the general information bulletins by the extension service, the most effectual means of presenting station work needs to be carefully considered. Some stations have already modified their plan of publication; others have not.

The stations need to continue to maintain their own series of publications for presenting the results of their work to the agricultural public in a form which will be readable and easily understood. This definite end will naturally influence the character of the station bulletins. There is otherwise some danger that the station publications may become too exclusively technical. In that case their work would not reach the people directly as it has in the past, but would be filtered down to them through the extension service. The stations might thus lose to some extent in closeness of contact with the public and possibly in credit for their work. This would be unfortunate, since their prestige and their recognition as the source of reliable tested information must, of course, be maintained.

In addition to the dissemination of the practical results of station work among the agricultural public, the station publications have another important function. This is to record the more technical scientific results of their investigations for the benefit of other investigators and for the general advancement of agricultural science. It is naturally desirable that accounts of this work be placed where they will reach the special audience interested in them, and will be as permanent and accessible as reports of investigation in any other branch of science. They represent contributions to science and they deserve a place alongside similar contributions from other institutions. This is due the station as a scientific institution and the author as a scientific investigator. The ultimate purpose or application of the work need not alter the case.

It has come to be quite generally recognized that the regular bulletin series is not the best place for recording such features of station work in detail. To an increasing extent this material is being placed in the current scientific journals, and in a considerable number of cases a separate series of research or technical bulletins has been provided to which special distribution is given. The latter plan has numerous advantages. It avoids the commingling of the technical and the more popular material in the same series, and makes it possible to distribute each class appropriately. The main question appears to turn on its effectiveness and permanence as a means of publicity. Where the station output of technical material is confined to one or two bulletins a year, and these published at irregular intervals, they become more or less isolated and are correspondingly more liable to be overlooked by the scientific world.

Within the past year, a new medium of publication has been opened to the stations in the *Journal of Agricultural Research*. This journal is now the joint official organ of this Department and the Association, with an editorial board drawn equally from each, and with department and station papers received and published on equal terms. Reference to it was made by Dr. Pearl, of the editorial board, in a paper at the Association meeting.

Articles have already been published or accepted for publication in the *Journal* from eighteen stations, indicating that it is meeting a real need in their work and is to receive their support in increasing measure. This is distinctly encouraging, for as Dr. Pearl stated, "in the editing of the *Journal* the attempt is being made to set a standard as to scientific content and literary form for the papers which shall be as high as the highest maintained by independent scientific journals, whether in the field of pure or applied sciences. . . . For the first time it provides a medium of publication altogether worthy of the best American work in agricultural science."

Beginning with Volume 5, issued in October, the *Journal* becomes a weekly in order to accommodate the increased material presented for publication. This will often have the effect of insuring greater promptness in publication.

The practice of outside publication is one which has been followed to a greater or less extent ever since the stations were started. Most of the earlier stations, it will be recalled, printed their bulletins in newspapers or the agricultural press, giving them regular serial numbers. In this way a large number of people were reached promptly and at small expense, but at an inevitable sacrifice as regards the permanence of the bulletins themselves. Periodicals of this sort are not usually preserved, and to-day it is practically impossible to assemble a file of these earlier bulletins. It is only by good fortune and a rare foresight on the part of the stations that a fairly complete collection was brought together by the Office of Experiment Stations, and this could not be duplicated if destroyed.

Since the passage of the Hatch Act, with its definite provision for the publication of bulletins and reports and their free transmission under frank, the bulk of the experimental work has been published by the stations themselves. Within recent years, however, there has been an increasing tendency to look to the various scientific journals and similar agencies for the reporting of some of the scientific and technical material. For this there are several reasons. The stations are employing larger staffs and attacking a greater number and variety of research problems, and in consequence are accumulating more results for dissemination than ever before. More of their studies are necessarily of technical scientific character. To a greater extent the stations are rapidly becoming research institutions, which means that the results of their activities have an interest and value quite outside the agricultural public.

In many cases, however, the funds available for printing have not kept pace with the increase in the amount to be printed. Another important factor is the virtual doubling of the station mailing lists within the last decade in response to the growing popular desire for information, this appreciably increasing the size and cost of editions and adding to the demands upon the printing funds. Such conditions, unless remedied, would inevitably lead to a congestion of unpublished data, sometimes sufficiently great to jeopardize its timeliness and detract from its ultimate practical value. As a matter of fact, several of the stations are already facing this situation.

The scientific journals have performed a useful service in relieving a part of this congestion. The publication of the results of agricultural research in journals devoted to such general sciences as chemistry, botany, biology, and the like has also done much to secure recognition for it. There has been a greater certainty of bringing the research to the attention of workers in foreign countries and to others especially interested, with less likelihood of unintelligent criticism. In many cases there has been the special advantage of relieving the station bulletins of a considerable amount of detailed data of slight general interest, such as the minutiæ of technical methods, complex mathematical formulas, and other material of a strictly technical nature.

Another frequent benefit was set forth by Dr. Pearl, which applies to the stations and to the station men themselves. In publishing in this way, "the work will be judged by the editorial board of the journal strictly on its own merits as a piece of scientific research, and on no other basis. *Journal* publication provides each director with an opportunity to see the scientific work of his station as others see it. Scientific papers are not unlike favorite sons—it is often very difficult for the fond parent to discern in them any faults at all. Independent editorial boards, on the other hand, do that sort of thing very well. If an independent chemical, or botanical, or zoological, or bacteriological, or agricultural journal refuses to publish a paper submitted from a station, the author and the director are bound to come to the conclusion, since no other is possible, that in some way or other this paper does not measure up to a standard which disinterested experts in the given field of knowledge regard as the irreducible minimum below which sound scientific work can not fall. On the other hand, if it is accepted the work receives the hall-mark of standard character." It is admitted, of course, that the limitations of space or of the field of a journal may lead to the rejection of papers, and it is true, moreover, that certain phases of station investigation find among existing scientific journals no special medium to which they are directly appropriate.

These are real and concrete benefits, and it seems quite likely that, as Dr. Pearl predicted, "as the experiment stations take on more and more the character of research institutions, and leave behind more and more that type of activity which was essential at the beginning but is now being taken over by extension departments, there will be all the time an increasing proportion of the scientific output published in the standard established scientific journals."

At the same time there are some complications which arise in publishing station work outside the station. One of the most important of these is that of scattering the station work and rendering a portion of it less readily identified as a part of the activities of the institution. The objection is sometimes raised that this may detract from the credit accruing to the station. There seems little cause for apprehension on this score, however, as the journals are a well recognized standard channel for bringing new results to the attention of the scientific public. Furthermore, the very fact of this dispersal of station work calls wider attention to it. The *Journal of Agricultural Research* would serve to bring this material more largely together, and thus more adequately indicate the volume and variety of current agricultural research.

Whatever channel may ultimately be decided upon for the publication of the scientific and technical accounts of station work, the need of a general policy in regard to outside publications and of a systematic and formal method of procedure will be evident. There has been some laxity in this regard in the past. At least two requirements seem necessary to be observed: Each paper should be plainly accredited to the station from which it emanates, and record of it should be preserved in the station files.

The principles in the matter seem quite clear. Since the kind of material under discussion is that derived primarily from station funds and work, it is for the station to determine its disposition, and to look upon it as a part of its published records. It should, therefore, realize its responsibility in these articles. It may be necessary for it to consider whether the utilization of an external medium will be in harmony with its general policy and preferable to the use of its own publications, whether the journal selected is the one best adapted for the purpose in view, whether the space available and style of treatment are adequate, and similar questions, bearing in mind both its own interests and those of agricultural science and of agriculture as a whole.

Of late these journal articles have come to contain a relatively large proportion of the technical results reported in some lines, and much of it is available in no other form. The articles constitute an essential part of the station's permanent records, and hence merit due care and attention to see that they may be readily identified with and accredited to the institution. If, as has sometimes occurred, they have not been accredited to the institution, by footnote or otherwise, or if the station has not followed some system of keeping track of them so that they can be traced by those interested, the difficulty of obtaining a complete record of work performed is much increased. The fact that the stations are state institutions and are required to report upon their activities makes these matters more important than might be the case with other classes of institutions.

Furthermore, it is important that each station should preserve a file of all of its publications, whether issued by it directly or through a journal. But unfortunately the systematic collection of the separates of journal articles in the libraries or files of the respective stations has not been a matter of uniform practice, and it is feared that a considerable number of stations lack copies or even a record of these products of their own investigations. It seems desirable also that the annual report of the station should contain a list of these technical papers, and often a synopsis of them. This places them definitely on record and makes it easier to find the references to them.

Several stations are already publishing such lists, while some are giving greater prominence to this literature. Thus in New Hampshire, reprints of the articles are obtained and reissued by the station in a numbered series entitled *Scientific Contributions*. The North Carolina Station has reprinted in its annual report some articles originally appearing in scientific journals. Recently the Maine Station included in its annual report not only the titles of the papers but a brief abstract in each case. Such practice meets to a considerable extent the feeling shared by some of the stations that all their work should be published in some form in their own series.

In what is said as to procedure, it is of course not intended to minimize the position of the author of such scientific papers or to eliminate him from consideration. He deserves the credit and the stimulus which come from publication of his work. As in the conduct of the work itself, a large measure of freedom is to be expected. But because of its position as a public institution the station needs to be a party in the matter of publication as it is in the general oversight of the investigations, and the credit to the author loses nothing by association of its name with it.

The station and the investigator are in partnership in carrying on certain lines of investigation. Both are interested in giving the product of this partnership to the world in a way which will be most effective and bring greatest usefulness. It goes out as a contribution from the station, whether in bulletin or journal form, but the investigator is credited with being the real author of the work and is so recognized by the reading public. In that sense it is his work. In a large degree the investigators comprise the station, and the organization exists to give them support and opportunity and in numerous ways to represent them before the public.

These principles are quite generally recognized in the Federal Department of Agriculture where outside publication has greatly increased in recent years, both as a means of relief from congestion of material and as a more effectual means of recording certain types of scientific work. While considerable latitude is followed in the matter, permission for outside publication is required and proper credit to the Department insured. Copies of such manuscripts are retained in the Department and a permanent record is kept of all publications of this nature as they appear.

Such Department papers, like those of the stations, are widely disseminated in the literature and easily lost sight of. To avoid the latter difficulty, an effort is now being made, beginning with the present volume of the *Record*, to include references to all Department papers reporting scientific or technical work. The range of the Department's work, including as it does extensive police and supervisory functions, is somewhat broader than that of the *Record*, and papers which do not relate rather definitely to agricultural subjects will be listed by title only. The lists will be combined in the index number of the *Record*, and it is hoped that they may prove of service, both as a convenient means of reference and, by assembling the material in a comprehensive way, to convey more adequately a conception of the full scope and importance of the researches of the Department.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The hexone bases of casein, D. D. Van Slyke (*Jour. Biol. Chem., 16 (1914), No. 4, pp. 531–538*).—In a preliminary description (E. S. R., 25, p. 710) of the method for the analysis of proteins by the determination of the chemical groups characteristic of the different amino acids, an analysis of casein was reported. The results agreed well with the analysis reported by other investigators in work with the Kossel method. "The discrepancy, noted in the preceding article, between the free amino nitrogen of casein, and the lysin content previously determined, rendered a repetition of the nitrogen distribution in this protein desirable." The bases were determined by the method of Kossel and Patten as modified by Osborne, Leavenworth, and Brautlecht (E. S. R., 20, p. 1102), and the bases and nitrogen distribution were redetermined by the modified Van Slyke method.

The most significant difference between the present results and the previous ones occurred in the lysins. By exercising particular care in the Kossel method, 9.36 per cent of the casein nitrogen was obtained as the analytically pure picrate. The group determination gave 10.3 per cent which is believed to be more nearly correct, as the amount of lysin picrate which one can crystallize represents necessarily the minimum amount present.

"For arginin the results are practically the same, 7.4 to 7.8 per cent of the total nitrogen, as those previously obtained by both methods. The histidin results are a little higher than previously, but not to a marked extent.

"The source of error in the author's former results for lysin lay in the cystin determination. The lysin is estimated from the total amino nitrogen of the bases precipitated by phosphotungstic acid, after the cystin nitrogen has been subtracted. The cystin was estimated from the amount of organic sulphur precipitated with the bases. The original form of the method, however, made the cystin figures liable to error from the fact that sulphates could be dissolved from a glass flask used in one stage of the operation."

In the form in which the method was modified (E. S. R., 26, p. 22), the sources of error in the cystin and lysin determinations have been eliminated. "In the determination by the picrate method, as usually performed, it appears that the most probable source of loss lies in the decomposition of lysin phosphotungstate with barium hydrate. In this operation one insoluble precipitate (lysin phosphotungstate) is transformed into another (barium phosphotungstate) a process the completeness of which is necessarily difficult to judge. Moreover, the bulky barium phosphotungstate has marked adsorptive properties, so that even skill and experience might not insure against loss from this source. In working out the details of the group determination method, it was noticed that several per cent of the total nitrogen of the protein could be lost from the base fraction through adsorption or occlusion by the barium precipitate." A practice is made of reducing this loss to a minimum by completely dissolving the bases precipitated by phosphotungstate acid with alkali and precipitating the barium phosphotungstate in a dilute solution. The best results with the Kossel method were obtained when the lysin phosphotungstate was dissolved in ammonia and the solution diluted to a large volume before treating with barium hydrate.

Oxyproteic acids, P. GLAGOLEW (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *89* (*1914*), *No. 6*, *pp. 432–440; abs. in Jour. Chem. Soc.* [*London*], *106* (*1914*), *No. 621*, *I*, *p. 885*).—These substances, having the nature of polypeptids, possess a definite number of amino groups which increases on hydrolysis. The amino acid nitrogen when estimated by Van Slyke's method (E. S. R., 26, p. 22) amounts to 44.3 per cent of the total nitrogen. Most of the nitrogenous substances, viz, 80 per cent, obtained on hydrolysis of oxy- or alloxyproteic acid were not precipitated by phosphotungstic acid. Both of the acids contained cystin and arginin. Hydrolyzing with 25 per cent of hydrofluoric acid (E. S. R., 22, p. 301) prevents the formation of melanins, and ammonia production is less than when 20 per cent of boiling hydrochloric acid is employed.

Oils of the Coniferæ.—III, The leaf and twig and the cone oils of western yellow pine and sugar pine, A. W. SCHORGER (*Jour. Indus. and Engin. Chem.*, *6* (*1914*), *No. 11*, *pp. 893–895*).—In western yellow pine the percentage composition of the leaf and twig and the cone oils, respectively, is approximately as follows: Furfurol ? per cent and trace; *l*-pinene 2 and 6 per cent; *l*-pinene 75 and 60 per cent; dipentene 6 and 12.5 per cent; ester as bornyl acetate 2 and 2.5 per cent; free alcohol (*l*-borneol) 7 and 4 per cent; "green oil" 3 and 3.5 per cent; and undetermined material 5 and 10 per cent. In sugar pine the leaf and twig and the cone oils contain, respectively, furfurol in trace; *l*-pinene 21 and 22 per cent; *l*-camphene ? and 21 per cent; *l*-pinene 51 and 39.5 per cent; dipentene 12 and 4.5 per cent; ester as bornyl acetate 1.5 and 1.5 per cent; free alcohol (*l*-borneol) 8 and 3.5 per cent; "green oil" 1 and ? per cent; sesquitorpene (?) ? and 1 per cent; and undetermined material 7 and 7 per cent.

Oils of the Coniferæ.—IV, The leaf and twig oils of digger pine, lodgepole pine, and red fir, A. W. SCHORGER (*Jour. Indus. and Engin. Chem.*, *7* (*1915*), *No. 1*, *pp. 24–26*).—The constituents found in the leaf and twig oils of digger pine, lodgepole pine, and red fir, are, approximately, as follows: Furfurol, 0 per cent, trace, and trace, respectively: π-heptane, 3, 0 per cent, and 0 per cent; ι-α-pinene, 58 to 59 per cent, 3, and ? per cent; ι-camphene, 0 per cent, 5 to 6 per cent, and 0 per cent; ι-β-pinene, 0 per cent, 49 to 50 per cent, 16 to 18 per cent; ι-limonene, 18.0 per cent, and 0 per cent; bornyl ester (as acetate) 3.5, 2, and 3.5 per cent; free alcohol (as ι-borneol), 6, 7.5, and 7.5 per cent; methylchavicol, ? per cent, ? per cent, and 0 per cent; "green oil," 2 to 3 per cent, 0 per cent, 13 per cent; cadinene, 0 per cent, 7, and 0 per cent; and losses by polymerization, etc., 9.5, 6, and 6 per cent. The dipentene and ι-phellandrene were determined together in lodgepole pine and amounted to 19 per cent; the dipentene and ι-phellandrene content of red fir and digger pine leaf and twig oils were 0 and 52 per cent, respectively.

Contribution to our knowledge of the oxidation ferments of plants, O. BEGEMANN (*Ztschr. Allg. Physiol.*, *16* (*1914*), *No. 3–4*, *pp. 352–358*).—This investigation deals with oxidase, peroxidase, catalase, and reductase.

Existing qualitative and quantitative methods for determining the activity of oxidase were studied, but aside from Chodat and Bach's method for peroxidase, in which the purpurogallin is weighed, no method, according to the author's knowledge, is available for the purpose. Two new colorimetric methods in which the benzidin reaction is the basis are presented.

Reductase was studied qualitatively and quantitatively with methylene blue.

The questions especially studied were the distribution and the quantitative location of the ferments in plants. Oxidizing ferments were found widely distributed, but the quantities present differed markedly. Numerous sections of roots, stems, cotyledons, plumules of Pelargonium seedlings, sections of *Lemna minor*, *Riccia fluitans*, *Nectria cinnabarina*, *Scolopendra vulgaris*, and *Ricinus communis* were studied. Some Mucorineæ with sporangia were examined for catalase, but the hyphæ were found to contain catalase only on the exterior. Sections through geranium seedlings showed that catalase was especially active in the region of the vascular system. Even in the wide lumened Scolopendra leaf and in the large vessels of the *R. communis* leaf the gas originated outside of the living cells. Bubbles could be observed on the walls of the cells but not within. Staining tests with eosin showed that where this coloring matter penetrated hydrogen peroxid could also gain entrance and this was proved by the catalase reaction which occurred.

Eosin and hydrogen peroxid, however, did not penetrate the living cell. Tests on *L. minor* and *R. fluitans* proved that green chlorophyll is not catalytic. By treating the objects with infusorial earth the chromatophores were isolated. In all localities where catalase was found peroxidase could also be noted. Peroxidase was found by Chodat and Bach's pyrogallol method in the vascular and in the intercellular tissues, but not in the chromatophores, and, like catalase, not on the epidermis and its formations, i. e., buds, hairs, etc. If a preparation of pyrogallol and glucose was added, the pyrogallol passed through the tissue and the reddish brown purpurogallin crystals could be seen in the interior of the cell, indicating direct oxidase. An increase of temperature increased the catalase and peroxidase content of seedlings. The various lengths of light rays acted specifically upon catalase and peroxidase formation and gradually incresed both in amount. Potato buds and geranium seedlings were studied in this respect. Catalase and peroxidase activities are two artificial phenomena, and it is concluded that they represent two concurring reactions whose courses are dependent upon conditions favorable to one or the other.

Assuming that oxygenase is an aldehyde-like substance, it may also produce reductions, i. e., act as a reductase. Methylene blue, according to this, when a peroxidase is absent will be reduced outside of the cell. Therefore, oxygenase might be identical with reductase or with the catalase and peroxidase reactions, two artificially produced reactions in which oxygenase is the basis. Extracts from potato buds were used to prove a portion of this theory and the influence of temperature, light, and dialysis were noted. A marked parallelism for catalase, oxidase, and peroxidase was found at 50, 60, 70, 78, 79, and 80° C. Both reactions decreased slowly in activity at 78°, were only slightly present at 79°, and ceased at 80. This is believed to prove the identity of the enzyms. Geranium seedlings grown in nutrient solutions were exposed to red, blue, violet, green, covered, and uncovered incandescent lights. Almost all of the tests gave a complete parallelism between the catalase and peroxidase reaction, the length of the ray controlling the amount of ferment present. Dialysis tests with potato bud extracts showed that catalase and peroxidase passed through the semipermeable membrane with the same degree of rapidity. Direct oxidase behaved in the same manner as catalase and peroxidase. The position of reductase in the system was as follows: Catalase—oxidase—peroxidase—and reductase.

The enzyms of Aspergillus terricola, F. M. SCALES (*Jour. Biol. Chem., 19 (1914), No. 4, pp. 459–472*).—"*Aspergillus terricola* produced inulase, diastase, invertase, maltase, alcoholoxidase, emulsin, lipase, protease, and amidase when grown in a medium without these substances. It is evident from the number of enzyms formed that filamentous fungi as well as bacteria may be concerned in the production of the various organic decomposition products which have been isolated from the soil.

"Many of the products of enzymic action are excellent sources of carbon and nitrogen for bacteria. The ammonia produced by the fungus from protein material may, in the form of a salt, be directly assimilated by some plants. The living organism hydrolyzes a small amount of cellulose in cellulose agar, but the presence of cellulase could not be demonstrated in an enzym powder. Neither lactase nor zymase were present in a powder from the growth in lactose and glucose solutions respectively. Tannase was produced by the fungus when grown in a tannin solution. The fungus showed no nitrogen-fixing power in nutrient solutions containing either a carbohydrate (dextrose or mannite) or nitrogenous substance (peptone or ammonium sulphate) or both together."

The soluble polysaccharids of lower fungi.—I, Mycodextran, a new polysaccharid in Penicillium expansum, A. W. Dox and R. E. Neidig (*Jour. Biol. Chem., 18 (1914), No. 2, pp. 167–175*).—"This paper presents a study of a soluble polysaccharid isolated from the apple fungus, *P. expansum*, which has heretofore not been recognized in fungi nor observed in any of the higher plants." The organism was selected for study on account of its great importance to the apple industry. The indications were that the fungus also contains mannitol, peptone, glucose, inorganic salts, amino acids, pentosans, hemicelluloses. and a chitin-like substance which on hydrolysis yields glucosamin.

The soluble polysaccharids of lower fungi.—II, Mycogalactan, a new polysaccharid in Asperigillus niger, A. W. Dox and R. E. Neidig (*Jour. Biol. Chem., 19 (1914), No. 2, pp. 235–237*).—A polysaccharid was obtained from a not quite mature culture of *A. niger*. It was found to be a galactan and the name mycogalactan is proposed. Mycogalactan like mycodextran (see above) appears to be a reserve carbohydrate and is used by the fungus as a food supply as soon as the sucrose of the medium is exhausted.

Selective adsorption, E. G. Parker (*Jour. Indus. and Engin. Chem., 6 (1914), No. 10, pp. 831–835, figs. 2*).—"Soils not only have the power of absorbing dissolved salts from solution, but also adsorbing one ion at a greater rate than the other, or of selectively adsorbing to an extent easily determined quantitatively. The nature of the surface of the constituents of a soil is such that the cation is adsorbed at a much greater rate than the anion.

"The presence of bases of the soil (Ca, Mg, etc.) in solution, after contact of certain salt solutions with a soil, is not due to a direct chemical reaction of the salt in solution with the silicates of the soil, but to a secondary reaction of free acid resulting from the selective adsorption of the cation with the mineral constituents of the soil. In general, the smaller the soil particles the greater the selective adsorption of the cation. The selective adsorption of the cation from a solution of an electrolyte by a soil increases with the concentration up to a certain point, and then remains practically constant, the surface of the soil particles having taken up all that it is able at this point. At very low concentrations the adsorption of the cation is practically complete. The presence of other substances may or may not affect the selective adsorption by a soil."

The determination of ammonia in soils, R. S. Potter and R. S. Snyder (*Iowa Sta. Research Bul. 17 (1914), pp. 3–19, fig. 1*).—These experiments were conducted with a view of supplying a reliable method for the estimation of the ammonia in soils. It is claimed that the method should meet the following requirements: "Closely agreeing duplicate results should be given and the same result obtained whether the reagent or reagents act, within reasonable limits, for a longer or shorter period. . . . Upon the addition of a known amount of ammonia, the method must give this added amount plus that previously found in the soil. . . . For use in a soils laboratory, the method should permit one to run several determinations within a reasonable length of time. . . .

"It was found, from a comparison of methods, that the amount of ammonia extracted by hydrochloric acid from soils is within the limits of our experiments, independent of the strength of the acid and the period of extraction. In the five soils tested hydrochloric acid removes approximately from 60 to 70 per cent of the ammonia added. The Folin aeration method can advantageously be applied directly to the hydrochloric acid extract. The amounts of ammonia obtained by distillation of the soil directly with magnesia is dependent upon the duration of the distillation. The Steel method of aeration [E. S. R., 24, p. 703] is not suitable for the determination of ammonia in soils. The Steel reagents slowly decompose acetamid.

"The Folin method of aeration is suitable for the determination of ammonia in soils, for the same result is obtained whether the reagent acts for a shorter or longer period, and all added ammonia is recovered." "The digestion is carried out in the usual way, and the aeration conducted in much the same way as Kober recommends. . . .

"In the soils tested there is no interference through formation of triple phosphate. There was no advantage found in using sodium chlorid with the sodium carbonate. Acetamid is not decomposed by 4 per cent sodium carbonate. The results for ammonia obtained by examination of the hydrochloric acid extract are lower, while the results obtained by direct distillation of the soil with magnesia are higher, than those obtained by the aeration method. The high results obtained by the former method are due to occlusion of the ammonia by the soil, the nature of which is not clear, and the lower results by the latter method are due to a partial decomposition of the organic material by the magnesia to give ammonia."

See also previous notes by Kelley and McGeorge (E. S. R., 30, pp. 419, 420).

Solubility of calcium phosphates in ammonium citrate solution, T. WARYNSKI and J. LANGEL (*Ann. Chim. Analyt., 19 (1914), No. 1, pp. 1–6; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 617, II, p. 216*).—In view of the fact that mono-, di-, and tri-basic calcium phosphates are soluble in both water and ammonium citrate solution to some extent, the method in use for separating these salts, which depends on the insolubility of di-basic and tri-basic calcium phosphates in water, yields only approximate results. The solubility of the salts in ammonium citrate solution reaches an equilibrium in about one hour at 30° C., but this is not strictly the case with fertilizers where the phosphates may be enveloped by other substances. A better separation may be obtained by treating the phosphates for one hour with a cold saturated ammonium citrate solution. The solubility of the mono- and tri-basic phosphates varies with the concentration of the citrate solution and reaches a maximum with a concentration of from 10 to 15 per cent.

Separation of calcium from magnesium, F. HALLA (*Chem. Ztg., 38 (1914), No. 10, p. 100; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 617, II, p. 219*).—The following method is recommended for the separation of very small quantities of calcium in the presence of large amounts of magnesium:

"The neutral solution containing the chlorids of the two metals is heated to boiling, and solid ammonium oxalate is added until the magnesium oxalate, at first precipitated, redissolves; the calcium oxalate remains insoluble. After a few hours, the calcium oxalate is collected on a filter, washed with hot water, then with cold water, ignited, sulphated, and weighed as calcium sulphate. The magnesium oxalate may be precipitated from the filtrate by the addition of acetic acid."

Titration of small quantities of carbon dioxid, A. DORNER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 88 (1913), No. 6, pp. 425–429, fig. 1; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 617, II, p. 218*).—In this method, heating of the barium hydroxid is dispensed with because it leads in glass vessels to an appreciable change of titer. In the modified process good results are obtained by absorbing the carbon dioxid with $\frac{N}{100}$ barium hydroxid in the cold using a special form of apparatus which is shown.

A comparison of methods for the determination of oxygen in waters in presence of nitrite, E. ELVOVE (*Pub. Health Serv. U. S., Hyg. Lab. Bul. 96 (1914), pp. 15–35*).—"In comparison with the Winkler method, the Levy method [a] is decidedly disadvantageous. Regarding the Winkler method as modified by Hale and Melia (E. S. R., 31, p. 411), it is pointed out that their warning 'that solutions acidified ready for titration should not stand in contact with air for several hours before titrating' may be misleading, since low results were obtained even when the solutions were kept in closed bottles which had been completely filled with these solutions. Furthermore, even a period of only one hour was sufficient to cause low results. In the presence of considerable nitrite the results may also be too high if there is not a sufficiently long period intervening between the addition of the potassium acetate and the titration of the iodin.

"In order to obtain accurate results by the acetate modification of the Winkler method, the titration should therefore be carried out immediately after a certain interval has elapsed since the mixing with the potassium acetate. Under the present conditions (5 parts per million of nitrite and temperature about 20°C.), an interval of 15 minutes was found to be the proper time to allow for the potassium acetate to remain in contact with the iodin before the latter is titrated.

"Hale and Melia's apparent explanation of the counteracting effect of the acetate on the nitrite interference on the assumption that its function is 'to neutralize the hydrochloric acid and render the solution acid with acetic acid' does not seem to be a sufficiently complete explanation, since an acetic acid medium was found not to prevent these interferences. The power of potassium acetate to counteract the nitrite interference is probably due to its further depression of the dissociation of the acid; an excess of the acetate is therefore essential.

"The permanganate modification of the Winkler method, since it is applicable in the presence of nitrite and organic matter, is preferable to the acetate modification which counteracts only the interference from nitrite. In carrying out the permanganate modification in bottles of about 270 cc. capacity, each bottle should contain not less than 0.45 gm. potassium iodid and the amount of excess of potassium oxalate should not be more than 1 cc. of the 1 per cent solution."

A study of the methods for extractions by means of immiscible solvents from the point of view of the distribution coefficients, I, J. W. MARDEN (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 315–320*).—"A practical application of the distribution ratio has been made in a study of a few of the extraction methods given in the bulletins of the U. S. Bureau of Chemistry with the view of pointing out the fact that definite directions are needed in our extraction methods which give a definite amount of the material in question. A modification of the method of analysis for acetanilid in hydrogen peroxid has been suggested. The method for acetanilid, vanillin, and coumarin

[a] Arch. Hyg., 32 (1897), p. 305.

in vanilla extracts has been discussed from the point of view of the distribution ratio. The methods now in use for salicylic acid, benzoic acid, and β-naphthol have been studied and found satisfactory from this point of view. A method has been suggested for the analysis of saccharin by extracting with amyl acetate and a modification of the present method with sulphuric ether proposed which gives definite results. It has been shown in the analysis of caffein (in the particular case referred to) that the amount of chloroform used for the extraction was excessive. The fact has been emphasized that a larger number of extractions, using a smaller volume of solvent for each washing, is better than a fewer number of extractions using a larger amount. A much more extended study of the methods of extraction is being carried on in this laboratory at the present time."

A reaction of succinic and malic acids, W. Œ. de Coninck (*Bul. Soc. Chim. France, 4. ser., 15 (1914), No. 2, pp. 93, 94; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 617, II, p. 224*).—When a concentrated aqueous solution of succinic acid is added to a suspension of several grams of calcium salicylate in a little cold water and the mixture gently warmed, a pale pink coloration is quickly obtained which persists for several days even when the mixture is exposed to direct sunlight. Under similar circumstances malic acid develops a delicate pink coloration which gradually disappears when the mixture is gently boiled. It is completely removed after several hours and the liquid then becomes yellowish brown in color.

Methods for the detection and investigation of tryptoproteases, F. M. Marras (*Centbl. Bakt. [etc.], 1. Abt., Orig., 74 (1914), No. 5–6, pp. 505–515*).—The methods studied were the fibrin method, Mett's method, Fermi's gelatin plate method, the serum plate method according to Jochmann and Müller, the Gross and Fuld casein method, and the biuret, tryptophan, and tyrosin reactions. Fermi's method gave more satisfactory results than those of either Jochmann and Müller or Gross and Fuld.

The distillation of volatile fatty acids and the value of the Reichert-Meissl number, J. Prescher (*Chem. Ztg., 38 (1914), Nos. 112–113, pp. 1081–1083; 114–115, pp. 1091–1093*).—A digest of the literature.

Catalase and reductase determination in cow's milk in practice and the relation between catalase and reductase on the one hand and the specific gravity, fat, and acidity on the other, A. Stetter (*Milchw. Zentbl., 43 (1914), No. 14, pp. 369–381, figs. 2*).—The morning and evening milk from two dairies was examined fairly regularly during the year 1913 for specific gravity, fat content, reductase, and acidity. The cows were fed chiefly hay and various concentrates, with beet tops and leaves during the fall months.

No relation was found to exist between the catalase and reductase figures and the specific gravity or fat content of milk. On the other hand, a high acidity degree almost always pointed to a high reductase content. No correlation was found between acidity and the catalase figures, as milk with a high acid value often showed a normal catalase figure. It often occurred that the catalase and reductase figures of the morning and evening milks were alike but, generally speaking, the figures for each were highest in the evening milk. The catalase figure varied considerably from day to day and the reductase test also showed very marked variations. In most instances a milk which decolorized (reductase test) in one-quarter hour also had a high acid value. Although a high catalase and reductase figure lead to a suspicion of pathological milk, still one must be cautious when pronouncing a condition pathological on the basis of these tests.

Description of the cryoscope, and several freezing-point determinations of a single sample of fresh milk with varying degrees of supercooling, M. C. Dekhuizen (*Chem. Weekbl., 11 (1914), No. 4, pp. 126–131, fig. 1; abs. in Jour.*

Chem. Soc. [*London*], *106* (*1914*), *No. 617, II, p. 169*).—This is a modified form of Beckmann apparatus. "The cooling bath is large, and consists of two concentric glass cylinders, the inner one 17 by 27 cm., and the outer 23 by 30.5 cm. The copper cover is replaced by a thick plate of ebonite. The freezing tube is round at the closed end, and is surrounded by a two-walled Dewar vacuum tube. The part projecting above the ebonite cover is protected by a wooden air chamber to prevent change of temperature." Cooling is promoted by immersing in a wide test tube containing mercury cooled to a suitable temperature.

The results of a series of experiments on a sample of milk are given.

The influence of ammonium sulphate upon the specific rotation of lactose, R. ROSEMANN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *89* (*1914*), *No. 1–2, pp. 133–140*).—The results show that the specific rotation of lactose is reduced when ammonium sulphate is present and that the reduction increases with a corresponding increase of ammonium sulphate to the solution. In a solution saturated with ammonium sulphate the rotation is reduced from 52.53 to 50.47°, and in the Salkowski method (E. S. R., 27, p. 506), which employs a solution with 40 per cent ammonium sulphate, from 52.53 to 51.55°. With a solution containing from 4 to 6 per cent of lactose the results will consequently appear from 0.07 to 0.11 per cent too low, which corresponds to the figures found by Jahnson-Blohm, i. e., 0.08 to 0.14. As Kretschmer found values which were generally higher with the Salkowski method it seems advisable to make no corrections at all.

On the estimation of fat in feces, F. C. GEPHART and F. A. CSONKA (*Jour. Biol. Chem.*, *19* (*1914*), *No. 4, pp. 521–531, fig. 1*).—The proposed method is said to be time saving and to yield good results with feces for fat or cholesterol ester determinations.

"Weigh out finely powdered or well mixed moist sample. Saponify with KOH in alcohol (4 gm. of stick KOH and 20 cc. of 95 per cent alcohol). Dilute with 50 cc. of water and acidify with HCl (20 cc. of 20 per cent in 5 cc. portions). Shake out with ether and wash ether extract. Distil off ether and dry fatty acids. Take up with petroleum ether, filter, and titrate with $\frac{N}{10}$ alcoholic KOH. Calculation:

$$\frac{\text{CC.}\frac{N}{10}\times 0.0296}{\text{Weight of substance taken}}\times 100=\text{per cent tristearin.}$$

"By the Liebermann-Székely method one determines a small amount of cholesterol with the fatty acids. The Kumagawa-Suto method is laborious and difficult of manipulation, and does not yield good results with pure fats or cholesterol esters."

A volumetric method for the estimation of total sulphur in urine, G. W. RAIZISS and H. DUBIN (*Jour. Biol. Chem.*, *18* (*1914*), *No. 2, pp. 297–303*).—This volumetric method has for its basis the estimation of the precipitate of benzidin sulphate rather than of sulphuric acid. Benzidin in an acid medium reduces potassium permanganate quantitatively with the instant production of a canary-yellow product which on further oxidation is converted into a colorless substance. With the method very small amounts of sulphate may be accurately determined in a short time.

SOILS—FERTILIZERS.

Lake County soils, C. G. HOPKINS, J. G. MOSIER, E. VAN ALSTINE, and F. W. GARRETT (*Illinois Sta. Soil Rpt. 9* (*1915*), *pp. 52, pl. 1, figs. 9*).—This is the ninth 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 some of the prevailing types.

Lake County lies in northeast Illinois in the late Wisconsin glaciation. The soils of the county are divided into four classes, as follows: (1) Upland prairie soils, usually rich in organic matter, (2) upland timber soils, including nearly all upland areas that were formerly covered with forests, (3) terrace soils, which include bench lands or second bottom lands that were formed at the time of the melting of the glacier, and (4) swamp and bottom land soils, which include the overflow lands or flood plains along the streams, the swamps around some of the lakes, the poorly-drained lowlands, and the area of sand beaches deposited by Lake Chicago.

The yellow-gray silt loam of the upland timber soils covers about 40 per cent of the county, the brown silt loam of the upland prairie soils about 28 per cent, and the swamp and bottom land soils about 15 per cent. It is emphasized that the supplies of some of the necessary elements of fertility in the plowed soil of the most prevalent types in the county are extremely limited when measured by the needs of large crop yields. The variation among the different types of soils in the county with reference to their plant food content is also very marked. "Thus, the yellow silt loam contains in 2,000,000 lbs. of surface soil sufficient total nitrogen for 12 'maximum' crops of corn, sufficient phosphorus for 31 crops, and potassium for 800 such crops; while the deep peat contains in 1,000,000 lbs. of surface soil, nitrogen for 217, phosphorus for 67, and potassium for only 53 corn crops of 100 bu. each." It is stated that more than 90 per cent of the soils of the county contain no limestone in the surface or subsurface to a depth of 20 in.

Improving Iowa's peat and alkali soils, W. H. STEVENSON and P. E. BROWN (*Iowa Sta. Bul. 157 (1915), pp. 43–79, figs. 15*).—This bulletin describes the peat and alkali soils of Iowa and reports field and laboratory studies to determine methods of reclamation and cropping which will render them profitably productive.

There are two classes of peat deposits in Iowa, namely, the shallow peat, varying from a few inches to 3 or 4 ft. in depth, and underlain with a clayey or muck subsoil; and the deep peat, ranging from 5 to 15 ft. in depth. The shallow peats tested contained an abundance of lime, nitrogen, and organic matter, but the potassium and phosphorus contents were low. "The muck or clay underlying the shallow peats are, however, rich in potassium and contain some phosphorus, so that the lack of these two elements in the peat does not restrict crop production to any large extent."

Field tests of the shallow peats showed that limestone, gypsum, phosphorus, and potassium applied alone or in combination in amounts in which such materials are usually applied to soils produced no profitable increase in crops. These results are taken to indicate that the shallow Iowa peats do not need the addition of commercial fertilizing materials to make them productive. Methods of treatment recommended are (1) adequate drainage, (2) proper plowing and cultivation, and (3) the choice of crops best suited to such soils. Fall plowing and deep plowing are considered to be advisable for peat soils and timothy and alsike clover are thought to be the best crops to grow on reclaimed peat soil.

The salt deposits on the surface of the alkali soils of Iowa consist mainly of calcium carbonate and sodium in the form of sulphate and bicarbonate and occasionally nitrate. Tile drainage is considered to be the quickest method of preventing the appearance of alkali in these soils and a liberal application of manure is the most effective means of removing the salts causing the alkali deposit. The plowing under of straw and green crops is also said to be of much value.

The radio-active content of certain Minnesota soils, J. C. SANDERSON (*Amer. Jour. Sci., 4. ser., 39 (1915), No. 232, pp. 391–397, fig. 1*).—Reference is made to previous work by the author (E. S. R., 25, p. 718) and others bearing on the subject, and experiments to determine the interdependence, if any, existing between the radio-active content and fertility of 13 Minnesota soils are reported. The apparatus and method of procedure used in determining the radium content of a soil are also described.

Without exception, the very fertile soils were found to be richer in radium and thorium emanations than soils of inferior fertility, which it is stated is in accord with the results of experiments on artificial enrichment of soils. "The conclusion seems justifiable that the hygroscopic properties of a soil are a valuable index of its fertility . . . because the presence of moisture increases the radio-active emanating power of the soil and . . . the ability to retain moisture implies fineness of texture, which also means great emanating power, so that at least part of the effect is due to a greater proportion of 'free' radium and thorium emanations."

A report on the Piedmont soils, particularly with reference to their nature, plant food requirements, and adaptability to different crops, C. B. WILLIAMS ET AL. (*Bul. N. C. Dept. Agr., 36 (1915), No. 2, pp. 122, figs. 14*).—This report deals briefly with the origin, topography, and drainage of the soils of the Piedmont section of North Carolina and more fully with the soil material, soil types, chemical composition of the soils, and field tests of the fertilizer requirements of certain of the prevailing types.

This section, including about 38 per cent of the State or 11,814,700 acres of land, embraces a wide belt running in a northeast and southwest direction across the central part of the State. The topography is dominantly rolling and uneven. The soils are all of residual origin and with the exception of a few local areas have good natural surface drainage. It is stated that the soils of the region are adapted to a wide range of crops, including field, truck, and fruit crops.

"While there is considerable variation, all the Piedmont soils have been found to be fairly high in potash, low in phosphoric acid, and to contain a fair amount of lime. The amount of nitrogen is usually very small. . . . In most of the Piedmont soils there is sufficient potash in the surface soil to produce maximum crops for a hundred years or more, while twenty to twenty-five such crops would entirely exhaust the phosphoric acid. . . . As a general thing crops like corn, cotton, and wheat are not generally benefited by applications of potash, but phosphoric acid first and nitrogen second, except with the Iredell loam where it is first, are the controlling constituents in increasing yields. In the use of fertilizers for the production of profitable crops or for the improvement of the soil, liberal applications of phosphates must be made, and nitrogen must also be supplied either in fertilizers or from soil-improving crops. Lime has not materially increased the yields of cereals and seed cotton, but has seemed to prove beneficial in most cases with the legumes grown on soils of this section to which lime has not been added in recent years."

Crop rotations are considered necessary in the management of these soils to build up a permanent system of fertility and three, four, five, and six-year rotations are outlined.

Moisture relation of Texas soils, G. S. FRAPS (*Jour. Amer. Soc. Agron., 7 (1915), No. 1, pp. 31–33*).—Three years' percolation experiments in galvanized iron cans with 4 clays and clay loams and 4 sands and sandy loams, each being subjected to six different treatments, brought out the fact that the clays and clay loams show little appreciable saving of moisture due to cultivation or the application of manure under Texas conditions, there being very little more percolation from cultivated and manured pots than from bare uncultivated pots. On the other hand, the sands and sandy loam soils showed a decided gain in moisture with cultivation and manuring, the increased percolation indicating decreased evaporation resulting from both treatments.

Lavas of Hawaii and their relations, W. CROSS (*U. S. Geol. Survey, Prof. Papers No. 88 (1915), pp. 97, pls. 4*).—This report describes and discusses the petrography of Hawaii. It contains information of importance in the study of lava soils, especially those of Hawaii.

Soil investigations in the Lüneburg Heath region, A. ALBERT (*Ztschr. Forst u. Jagdw., 44 (1912), Nos. 1, pp. 2–10, pls. 3; 3, pp. 136–153, figs. 2; 6, pp. 353–364; 11, pp. 655–671, fig. 1; 45 (1913), No. 4, pp. 221–237, pl. 1; 46 (1914), No. 2, pp. 82–90*).—A series of investigations of the physical, chemical, and biological properties of the sandy soils of the heath districts of northwest Germany, with reference to the forestation of waste portions, is reported.

These soils are of two classes, namely, the gray or bleached sands and the brown sands. The bleached sands consist of a leached-out surface soil and a hard impervious subsoil resembling ortstein, which is formed by the leachings from the surface soil. This impervious layer varies in color from rust red to brownish black, varies in depth from about 12 to 14 in. in diluvial sands and from about 20 to 39 in. in alluvial sands, and frequently runs into an extensive layer of bowlders. The brown sands occupy the higher elevations and have a higher content of fine matter than the gray sands. The topsoil does not have a leached-out appearance, the hardpan subsoil is usually absent, and no sharp transitions occur between layers. The sand grains are covered with a brown layer consisting of iron and humus compounds.

Shallow cultivation, crop rotations consisting of legumes followed by rye or potatoes, and artificial fertilization are suggested as being the proper treatments for both of these soils before tree planting.

The vertical soil zones in mountainous Russia, W. P. SMIRNOFF (*Internat. Mitt. Bodenk., 4 (1914), No. 4–5, pp. 405–417, fig. 1*).—This article discusses the theory of the zonal distribution of soil types in Russia proposed by Dokouchayev (E. S. R., 12, pp. 704, 807), and reports the general results of a soil survey made in Turkestan and Altai in which particular attention was paid to the vertical distribution of the types. It was found that the theory proposed by Dokouchayev is, with slight modifications, applicable to the scheme of vertical distribution in the Altai region. The opinion is expressed that the common laws governing the life of a soil type will hold good several thousand feet above sea level and that when clearly defined for a certain region will afford a safe basis for further study of soil types.

Chemical composition of the alluvial soils of the Falcat basin, Eritrea, A. MAUGINI (*Agr. Colon. [Italy], 9 (1915), No. 1, pp. 1–24, pl. 1*).—Studies of the origin and physical and chemical properties of the soils of this region are reported, and the possibilities of their agricultural utilization, especially by the aid of irrigation, are discussed.

The soils are of alluvial origin, are of considerable depth, very uniform in texture, and contain a high percentage of fine particles. Their physical structure is in most cases favorable to cultivation and their permeability varies according as the sandy or clay particles predominate. In the more compact soils capillary action is very intense during dry seasons. Most of the soils are deficient in calcium carbonate but contain considerable organic matter and phosphoric acid and potash, chiefly in insoluble condition. They are also more or less highly impregnated with soluble alkali salts, of which sodium and magnesium chlorids predominate. The deficiency in calcium carbonate and the presence of quantities of soluble salts are thought to retard bacterial activities in the soil, especially with reference to the transformation of organic matter.

As regards alkalinity the soils are divided into two classes, viz., those made alkaline by sea water and those characteristic of alkaline soils in arid regions. The sodium chlorid content of the soils was found to vary within wide limits, according to the elevation, stratification, and physical structure of the soil. Near the sea the salt content increased with the depth, while the reverse was true with other soils subjected to annual inundation.

The relations between irrigation and alkali accumulation are also discussed and conditions in the basin are compared with similar conditions in this and other countries. It is stated that the irrigation of these alkali soils with the more or less salty Falcat water presents a problem which can only be solved by proper drainage and cultural treatment.

Investigations on usar land in the United Provinces, J. W. Leather (*Allahabad, India: Govt., 1914, pp. 88, pls. 68, fig. 1*).—This report, in three parts, contains the results of investigations into the characteristics of certain classes of alkali land in the United Provinces in India.

The first part deals with unproductive irrigated soils in the neighborhood of Bhadan. These soils were found to contain a certain amount of sodium carbonate and bicarbonate but no other alkali salts, and are water-logged to a depth of about 7 to 9 ft. The results of the investigation seem to indicate that the alkali in the soil is a product of the soil itself and is not deposited by the canal water. It is thought possible to reclaim some of these lands by lowering the ground-water level and maintaining about 2 ft. of water on the surface for a period of six months or a year.

The second part reports experiments on the reclamation of alkali soils. The application of gypsum was the only really effective method of reclamation tested, and the cost of this was prohibitive. Deep and thorough cultivation with heavy manuring was unsuccessful and scraping off the salts was found to be practically useless.

The third part reports comparative investigations of alkali soils under canal and well irrigation. The conclusions drawn are that "in respect of frequency, infertility, nature and amount of salts, or physical condition, there is substantially no difference between the soil of the usar [alkali] patch which has been under canal irrigation for many years and that which has never been subject to this influence at all."

Descriptions of the methods of investigation employed, tables of analytical data, and maps and charts are appended.

Description of the soil types within the boundaries of the "Banjoemas" residency, Java, P. W. Houtman (*Meded. Proefstat. Java-Suikerindus., 5 (1914), No. 2, pp. 13–28, pls. 7; Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 50, pp. 1791–1806, pls. 7*).—This report briefly describes the geography and geology of the residency, and discusses the soils mainly with reference to origin and physical and chemical properties. These are divided into seven groups and consist of volcanic and alluvial material, silts, and clays having textures varying from heavy to light, and lateric formations.

Tables of analyses and soil maps accompany the report.

Recent soil investigation in the Cape Province, C. F. Juritz (*Agr. Jour. Union So. Africa, 5 (1913), No. 6, pp. 856–870; 6 (1913), Nos. 1, pp. 38–49; 2, pp. 337–345; 3, pp. 455–461; 5, pp. 785–791; 6, pp. 934–939; 7 (1914), No. 1, pp. 62–67*).—This article reports the results of additional investigations of the soils of Cape Colony (E. S. R., 20, p. 1014). Analyses of about 272 soil samples collected from 36 districts are reported and discussed, mainly with reference to physical and chemical composition.

The improvement of lands and intensive exploitation of the soil, E. CATZEFLIS (*Bul. Union Agr. Égypte, 11* (*1913*), *No. 101, pp. 244–249; 12* (*1914*), *Nos. 102, pp. 11–17; 105, pp. 117–122*).—This article discusses the economic aspect of the physical, mechanical, and chemical improvement of the soils in the northern part of the Egyptian Delta.

A study of some physical properties of soils, R. TRNKA (*Internat. Mitt. Bodenk., 4* (*1914*), *No. 4–5, pp. 363–387, figs. 3*).—The results of studies of methods of determining volume weight and porosity of soils are reported.

It is pointed out that methods of determining volume weight in which the original soil structure has been disturbed are usually inaccurate, and it is concluded that the method worked out by the author and A. Slavik of determining volume weight by the water displacement of a clod in original condition which has been given a waterproof coating by dipping in melted paraffin is more nearly exact and more practicable. On the ground that the determination of porosity depends on the correct determination of volume weight and specific weight, it is further concluded that the method of using a paraffin coated clod in natural condition should also be applicable for determining porosity.

An apparatus for accurately measuring water displacement is described.

The adsorptive power of soils, P. ROHLAND (*Internat. Mitt. Bodenk., 4* (*1914*), *No. 4–5, pp. 393–404*).—Substantially the same views are expressed in this as in previous articles along the same line (E. S. R., 31, p. 514; 32, p. 318).

On osmosis in soils, C. J. LYNDE and J. V. DUPRÉ (*Jour. Amer. Soc. Agron., 7* (*1915*), *No. 1, pp. 15–19, fig. 1; Proc. and Trans. Roy. Soc. Canada, 3. ser., 8* (*1914*), *Sect. III, pp. 133–138, fig. 1*).—This article reviews previous work on osmosis in soils (E. S. R., 29, p. 124), and reports further experiments in which a column of very fine soil was used as a semipermeable membrane and a concentrated soil solution as the active solution.

With a column of soil approximately 2.5 in. deep an osmotic pressure equal to the pressure exerted by a column of water 11.5 ft. high was observed. "The results indicate that the pressures observed are not due to the swelling of the soil column . . . [but] are due to osmosis as follows: (1) The semipermeable membranes used in investigations on osmotic pressure are colloids, (2) there is strong evidence that the action of semipermeable membranes is one of unequal absorption. One liquid is absorbed more readily than the other and the movement is toward the liquid least absorbed."

The consistency curves of mineral soils, S. JOHANSSON and A. ATTERBERG (*Internat. Mitt. Bodenk., 4* (*1914*), *No. 4–5, pp. 418–431, figs. 13*).—In continuation of work along the same general lines (E. S. R., 28, pp. 320, 620), studies are reported of different mineral soils with reference to their consistencies with variable water content. Twenty-five so-called consistency curves showing the water content and the corresponding consistency are given and discussed.

At approximately the middle of each curve is found a sharp knee and from this the curve extends in both directions in the form of a hyperbola. The position of this knee with reference to consistency varies for different soils, being highest for the clays and lowest for the loams. To the left of the knee the curve rises rapidly as it approaches the ordinate or consistency axis for the heavy loams and clays, while for the lighter soils it is more nearly parallel to the abscissa or water content axis. To the right of the knee the curve is the longest for clays and the shortest for loams.

These consistency curves indicate at what water content a soil is most easily tilled. They show that most loams are tillable at all water contents from zero to 14 or 20 per cent and that only the heaviest loams are not tillable when dry. The less plastic clays may be classed with the heavier loams and may be tilled with a water content of from 5 to 13 per cent, but require relatively more power than the loams. The highly plastic clays can be tilled only with high water content and in that condition are too soft to permit good work.

It is further pointed out that the knee of the curve corresponds to the shrinking limit of soils on drying.

Further studies of consistency curves with reference to soil classification are to be made.

Some dynamic processes in soils in the region of the distribution of frozen soils, K. Nikiforov (*Pochvovîedîenîe (Pédologie), No. 2 (1912); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 5, pp. 456, 457*).—This article describes certain peculiar phenomena connected with the escape of water resulting from summer thawing. This water accumulates between different layers of the soil, and when the winter freezing begins the increased pressure upon the localized water-bearing areas forces the water to the surface either gradually through outcropping of ice or rapidly with the bursting of the upper frozen layer. In either case the properties of the soil are more or less profoundly affected.

Soil analysis, C. T. Gimingham (*Jour. Bath and West and South. Counties Soc., 5. ser., 8 (1913–14), pp. 142–147; Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1913, pp. 103–107*).—This article discusses the practical value of soil analysis to the agriculturist and horticulturist and indicates some of the considerations which must be taken into account by the analyst.

Relation of chemical composition to soil fertility, G. S. Fraps (*Jour. Amer. Soc. Agron., 7 (1915), No. 1, pp. 33–36*).—It is stated that experiments at the Texas Experiment Station indicate that there is a relation between the total nitrogen and the active (soluble in fifth-normal nitric acid) phosphoric acid and potash of the soil and the soil deficiencies as shown in pot experiments.

Alkali in soils, J. W. Paterson (*Jour. Dept. Agr. Victoria, 11 (1913), No. 5, pp. 288–299, figs. 6*).—The common alkali salts occurring in soils are described and remedial measures discussed, particularly the use of gypsum for black alkali and proper land drainage for white alkali.

Organic matter in soils (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1914), pp. 55–64*).—In this article the changes undergone by organic matter in the soil and the effects produced in the soil by these changes are discussed.

With reference to tea culture it is stated that fine textured soils containing over 50 per cent of silt, fine silt, and clay should contain about 10 per cent of organic matter. Coarser textured soils containing over 50 per cent of coarse and fine sand require not less than 5 per cent of organic matter.

It is also stated that an abundance of organic matter in a soil is likely to prevent attacks of white ants.

On nitrification: Preliminary observations, E. R. Allen and A. Bonazzi (*Ohio Sta. Tech. Bul. 7 (1915), pp. 42, figs. 6*).—So-called physiological studies of the nitrifying bacteria of soils are reported, together with brief reviews of the work of others bearing on the subject. A bibliography is appended.

In experiments on the nitrifying power of soils taken from representative plats at the station to determine the effect of soil treatments in cropping, it was found that the nitrifying power of naturally noncalcareous soils was rather feeble as compared with naturally calcareous soils, even after receiving moderate applications of ground limestone, but that very heavy applications of ground limestone imparted a high nitrifying power. The results of these experiments are also taken to indicate that the nitrifying power of the soil may or may not correlate with its crop-producing power, it being considered possible that the conditions limiting the growth of higher plants in one case may be different from those in another. Continuous cropping, especially without fertilization, reduced the nitrifying power of the soils. "Although the possibility of the production of toxic material is not eliminated, it seems that in the plats studied the deleterious effects of continuous cropping on higher plants, as well as on the bacteria, are closely connected with the nitrogen relations."

The results of nitrification studies in solutions, using the Omelianski solutions to which were added portions of greenhouse soils from the station, indicate that the organisms producing nitrification in these soils are *Micrococcus nitrificans* and *Bacillus nitrificans*. The growth of the nitrite formers was much more feeble in solution than was that of the nitrate formers. Aqueous extracts of ignited and nonignited soils used when reinforced by the regular mineral nutrients possessed no superiority over Omelianski's nutrient solution for the growth of the nitrate producer.

The results of nitrification studies in porous media led to the conclusion that soil, particularly ignited soil, as a medium possesses the property of supporting nitrification better than sand.

A critical consideration of the present methods of studying nitrification led to the conclusion that "the methods in vogue for studying the process of nitrification . . . contain many errors, which must be largely eliminated before the problem of soil bacteriological differences can be satisfactorily attacked."

Action of oligodynamic elements on the nitrifying bacteria, C. MONTANARI (*Staz. Sper. Agr. Ital., 47 (1914), No. 6, pp. 441–448*).—The author briefly reviews the work of others bearing on the subject, and reports experiments on the effect of the dioxid, sulphate, and carbonate of manganese on nitrification in different soils treated with ammonium sulphate.

Nitrification was apparently stimulated in the soils treated with the dioxid and carbonate of manganese, particularly in the case of a sand washed with hydrochloric acid and distilled water. Manganous sulphate stimulated nitrification much less than the other manganese compounds and was often detrimental.

As a result of further experiments, the stimulation of nitrification by the dioxid and carbonate of manganese is attributed to the oxygen introduced directly by the former and indirectly by the latter rather than to any catalytic action of the element manganese.

Note on nitrification in the peat soil in the vicinity of Laon, COQUIDÉ (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 7, pp. 253–255*).—Several plats of uncultivated peat soil in natural condition were fertilized with different combinations of potassium chlorid, kainit, sodium nitrate, and slag to determine the effect of fertilization, particularly with nitrates, on the natural vegetation.

Each fertilizer when used alone had an effect on the vegetation, but nitrates were especially effective in increasing the growth. Favorable results were obtained with mixtures containing the three fertilizing elements, but where nitrate was excluded the results were unsatisfactory.

Observations on the formation and layer distribution of nitrates in soils with different nitrogen fertilizers, V. I. TKACHENKO (*Khoziaistvo, Nos. 37–40 (1912); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 6, p. 585*).—In a study of the amount and distribution of nitrates at different depths in the soil from June 27 to September 9, 1911, and from April 8 to May 10, 1912, it was found that the minimum amount of nitrate was present in the latter part of August and the earlier part of September, but no direct connection between nitrate and temperature and moisture was observed.

Fertilizing with nitrate of soda in general increased the nitrate content of the soil, but not in all cases. Cyanamid and ammonium sulphate increased the accumulation of nitrates in the soil to a greater extent than sodium nitrate. There was little leaching of nitrates during rainy periods and this was not noticeable in any case below 25 to 50 cm.

The observations in the spring of 1912 were made on the same plats used in the earlier experiments which had in the meantime been seeded to winter wheat. In general, considerably less nitrate was found than during the preceding summer. The loss of nitrates by leaching was less pronounced on plats fertilized with nitrogenous materials and which, therefore, had a heavier growth of wheat.

The prevention of loss from manure heaps in winter and early spring, E. J. Russell and E. H. Richards (*Jour. Bd. Agr. [London], 21 (1914), No. 9, pp. 800–807, fig. 1; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 2, p. 93*).—Observations were made on the losses of nitrogen and phosphoric acid in heaps of manure stored in the open and under shelter.

Of two heaps stored in the open, one lost 25 per cent of its nitrogen from January to April and the other 33 per cent of its nitrogen from November to May. The loss of nitrogen fell most heavily on the easily available portion, that is, the ammonia and the amids. There was a loss of about 8 per cent of the phosphoric acid. In the case of the manure stored under cover, the loss of nitrogen was 6.9 in one case and 7.9 in the other, and there was no loss of phosphoric acid.

The experiments indicated that rain was the most potent source of loss. That the loss is not due to leaching was shown by experiments in which the manure heap was artificially watered but not to the extent of causing increased leaching. The artificial watering caused a large loss of nitrogen as compared with the unsprinkled manure heap.

The conclusion is reached that the loss of nitrogen from an exposed manure heap is not due to volatilization of ammonia to the extent that it is generally supposed to be nor entirely to leaching, but that a considerable proportion of the loss is due to the fact that nitrates are formed on the surface of the manure; these nitrates are washed down by the rainfall into the interior of the heap and are rapidly decomposed with the escape of free nitrogen. Observations are also reported which indicate that considerable loss in nitrogen results from any turning over or moving of the manure heap, but the cause of this was not established.

The results in general indicate that losses in manure can be practically prevented by compacting and storing under cover. They show that the pumping of liquid manure on to a manure heap does not reduce the loss.

Purification of sewage by aeration in the presence of activated sludge, E. Bartow and F. W. Mohlman (*Jour. Indus. and Engin. Chem., 7 (1915), No. 4, pp. 318–320, figs. 3*).—This is an account of experiments carried on in the laboratory of the Illinois State Water Survey at the University of Illinois testing a modification of Fowler's aeration method for the treatment of sewage.

As a result of the treatment there was obtained a sludge containing large numbers of microscopic animals, predominant among which was an annelid worm (*Aeolosoma hemprichi*), which appear to play an important part in the reduction of the sludge. Analyses of the sludge showed 95.54 per cent of water; the dry matter contained 6.3 per cent of nitrogen, 1.44 of phosphorus, and 4 of fat. In pot tests in comparison with an equivalent amount of nitrogen from dried blood the experiments with the sludge showed better growth at the end of 18 days than those with dried blood and much better than those with no added nitrogen.

Can sewage sludge be made valuable as a fertilizer? (*Engin. News, 73 (1915), No. 12, p. 593*).—Brief reference is made to the experiments noted above in which a practically inodorous sludge of high fertilizing value was obtained by forcing air through sewage tanks.

Analyses of guano, A. Hutin (*Ann. Chim. Analyt.*, 19 (1914), No. 9–12, pp. 332, 333; abs. in *Chem. Abs.*, 9 (1915), No. 5, p. 684).—Analyses of six samples of guanos recently collected on the Chincha Islands are reported. In these the nitrogen varied from 2.98 to 9.3 per cent, the phosphoric acid from 7.73 to 9.02, and the potash from 2.47 to 4.08.

Prohibition of collection of guano in the Ballestas Islands, Peru (*Riqueza Agr.* [Lima, Peru], 4 (1914), No. 27, pp. 161–163; abs. in *Internat. Inst. Agr.* [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 12, pp. 1565, 1566).—In view of the increasing consumption of fertilizers in Peruvian agriculture and the insufficiency of the supply of guano available for this purpose, the Peruvian Government issued a decree February 5, 1914, prohibiting the exploitation of the guano deposits of the Ballestas Islands for three years, after which period they are to be worked entirely for domestic consumption.

The preparation of fertilizer from kelp, J. W. Turrentine (*Amer. Fert.*, 42 (1915), No. 5, pp. 37–42).—This article deals briefly with the distribution, amounts, composition, and fertilizer value of the Pacific coast kelps, and discusses the feasibility from an industrial standpoint of making a fertilizer by drying and grinding the kelp.

The results of the study of composition of the different kinds of kelp common on the Pacific coast indicates that the potassium content of Nereocystis is greater than that of Macrocystis, and that while the potassium content of the northern kelp is higher than that of the southern there is no marked difference in the iodin content of the two. Proximity to the mouth of a fresh water stream had no appreciable effect upon the potash and nitrogen content of the kelp, and there was no essential difference between the potash and nitrogen content of fronds and stipes. The average of the analyses of wet kelp showed water 85 per cent, nitrogen 0.3, potash 2.5, and phosphoric acid 0.2.

In the author's opinion kelp can, in the beginning at least, be most advantageously prepared for use as a fertilizer by drying and grinding. Methods of preparing such a fertilizer are described and data for the cost of the processes are given.

The utilization of air nitrogen for fertilizing purposes, A. Kraisy (*Ztschr. Ver. Deut. Zuckerindus.*, No. 706 (1914), II, pp. 911–926, figs. 4).—The development of the manufacture of nitrogen compounds from the air is briefly reviewed, and the principles upon which the leading processes for this purpose are based are discussed. A list of factories in operation in 1913 with their estimated output is given.

The cyanamid process, F. S. Washburn (*Amer. Fert.*, 42 (1915), No. 7, pp. 21–29).—The recent development and present status of this process are discussed.

The Kalusz kainit, W. Kolski (*Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 12, pp. 892–901; abs. in *Internat. Inst. Agr.* [Rome], *Mo. Bul. Agr. Intel. and Plant Diseases*, 6 (1915), No. 3, pp. 390, 391).—Numerous analyses showing potash, lime, magnesia, chlorin, and sulphuric acid in the kainit from the Kalusz deposits in Galicia are reported. The potash averaged about 10 per cent, the sulphuric acid 17.5, and the chlorin about 29. Many of the samples contained small amounts of manganese.

Does fertilizing with kainit conserve water? Gerlach and Schikorra (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 6 (1915), No. 5, pp. 368–381, 389–393).—Several series of experiments are reported which show that applications of as much as 1,069 lbs. per acre of kainit, which is more than is ordinarily applied in practice, exerted no observable effect on evaporation of water from the soil and plant, and that absorption of water vapor, by soil was but slightly increased (about 98 lbs. per acre). The evaporation of water from the soil and plant was not influenced by kainit fertilizing, either absolutely or relatively, so long as there was no increase in yield of crop. When there was an increase in yield, however, there was a reduction in the relative utilization of water. This, however, is an effect not confined exclusively to potash salts, but is shown by fertilizing materials in general when an increase of yield results from their use.

The composition of muds from Columbus Marsh, Nevada, W. B. HICKS (*U. S. Geol. Survey, Prof. Paper No. 95-A (1915), pp. 11, fig. 1*).—An investigation of these muds as a possible source of potash is reported.

Analyses of water from wells sunk to varying depths in the muds, as well as of surface muds, indicate the presence of small amounts of potash associated with large amounts of sodium chlorid and other salts, principally sulphates, carbonates, and borates. The high percentages of soluble salts in the muds usually corresponded to low percentages of potash in the salts. "It is believed that a large part of the potassium in the muds has been absorbed from surrounding or percolating solutions and is held in a loosely combined form, probably by colloids. Such a conclusion offers an explanation of the apparent disappearance of the potassium from the brines and saline deposits of the desert-basin regions."

The manufacture of fluosilicates and their use, A. HUTIN (*Rev. Chim. Indus., 25 (1914), No. 295, pp. 188, 189; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 2, p. 93*).—Attention is called to the fact that most mineral phosphates contain fluorin, which in the manufacture of superphosphate is converted into hydrofluosilicic acid and allowed to go to waste. A simple and cheap method of preventing this waste is described. The method consists essentially of drawing the gases from the superphosphate chamber through a lead-lined tower in which they meet a spray of brine, resulting in the formation of sodium silicofluorid, which can be separated by filtration.

Contributions of the chemist to the fertilizer industry, H. W. WALLACE (*Jour. Indus. and Engin. Chem., 7 (1915), No. 4, p. 281*).—This is a brief statement of the rôle which the chemist has played in building up the fertilizer industry.

AGRICULTURAL BOTANY.

Nutritional physiology of higher plants, V. GRAFE (*Ernährungsphysiologisches Praktikum der höheren Pflanzen. Berlin: Paul Parey, 1914, pp. X+494, figs. 186*).—This book is intended as an aid to laboratory work, and its field lies somewhat between that of the usual laboratory courses in plant physiology, on the one hand, and that of a methodology for biochemical investigations, on the other, dealing more particularly with the chemical and physical phases of the nutritional physiology of plants. It is intended primarily for the use of scientific investigators, and secondarily for scientific agriculturists and students. It covers a wide range of technique related to the factors, processes, and products concerned in higher plant life.

Nutritive exchanges in plants. The rôle of protoplasm, P. MAZÉ (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 24, pp. 809–811*).—In order to test the rôle of protoplasm in the nutritive exchange of plants with their external medium, the action of heat on maize and of chloroform on beets was employed. The effects as tabulated are held to show that it is the protoplasm which regulates the nutritive relations of the plant with the external medium, independently of osmosis.

The plurality of starches, C. TANRET (*Compt. Rend. Acad. Sci.* [*Paris*], *159* (*1914*), *No. 13*, *pp. 530–532*).—In continuation of previous studies (E. S. R., 31, p. 828) the author has investigated some of the physical qualities of starch, particularly the effect of heat. Starches derived from 16 different sources were submerged in a water bath at temperatures varying from 35 to 90° C. and also at boiling temperature. The results indicate that starches from different plants vary quite decidedly in their physical attributes.

Some recent work on plant oxidases, W. R. G. ATKINS (*Sci. Prog. Twentieth Cent.*, *9* (*1914*), *No. 33*, *pp. 112–126*).—A critical review is given of recent publications relating to the nature of plant oxidases, their physiological function, distribution in relation to pigmentation, and rôle in plant pathology, and the bearing of oxidase investigations on technology.

Lipase in the germinating coconut, M. L. ROXAS (*Philippine Agr. and Forester*, *3* (*1914*), *No. 2*, *pp. 33–39*).—The results are given of a study in which the author found that lipase was present both as an enzym and a zymogen in germinating coconuts. It occurs mainly in the outer part of the haustorium, smaller amounts being found in the water of the coconut and in the inner surface of the endosperm.

Correlation between the anatomical coefficients of maize and its size and nitrogen content, S. MOSKVICHEV (*Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *15* (*1914*), *No. 4*, *pp. 266–281*).—From a study of five varieties of maize, the author concludes that cell size shows a positive correlation with height of this plant, but a negative correlation with nitrogen percentage.

The effect of detasseling maize, E. HECKEL (*Compt. Rend. Acad. Sci.* [*Paris*], *159* (*1914*), *No. 16*, *pp. 595–597*).—In a previous publication (E. S. R., 28, p. 225) the author showed that there was a considerable increase in sugar content of the stalks of maize after the removal of the staminate and pistillate flowers. These experiments have been continued with the same general results.

It was noted, however, that all plants did not behave in a uniform manner. In a planting made of giant Serbian maize, while showing in some instances an increase in glucose and saccharose in the stems after detasseling, the average sugar content of the detasseled lot was below that of the check lot grown under similar conditions. Selections have been made of the high-yielding individuals, and breeding experiments are in progress to learn whether increased sugar content can be transmitted to the progeny.

A biochemical study of nitrogen in certain legumes, A. L. WHITING (*Illinois Sta. Bul. 179* (*1915*), *pp. 469–542*, *figs. 23; Bul. 179*, *abs.* (*1914*), *pp. 8*, *figs. 2*).—After giving a résumé of information relating to the biology of nitrogen assimilation through *Bacillus radicicola*, the author describes experiments conducted to determine through which organs the legumes obtain their nitrogen from the air, and the relative percentages of nitrogenous compounds in the various parts of the soy bean and cowpea at definite periods of growth.

As indicated in the first series of experiments, carried on with soy beans and cowpeas, the plants were grown under control conditions. One lot received a definite proportion of oxygen, nitrogen, and carbon dioxid, a second oxygen and carbon dioxid, while a third received ordinary air. As the result of these experiments it was found that the cowpea and soy bean utilize atmospheric nitrogen through their roots and not through their leaves. Under the conditions of the experiments no combined nitrogen could have been assimilated.

In the second series of investigations the total nitrogen determinations showed that about 74 per cent of the nitrogen of cowpeas and soy beans at the time of harvest is in the tops, while the remainder is distributed between the roots and the nodules. In the earlier periods of growth the roots contain the larger part of the nitrogen. The percentage of soluble nitrogen varies with the different parts of the plant and the period of growth. The nitrogen precipitated by phosphotungstic acid was determined for different parts of the plant, and other forms of soluble nitrogen than those precipitated by phosphotungstic acid and sodium hydroxid were found to occur. Fixation was found to take place at a very early period in the growth of the seedling, sometimes within 14 days, and in some cases was quite rapid, especially with cowpeas. Plants grown under the conditions of these experiments were found to contain no ammonia, nitrites, or nitrates, as measured by the most accurate chemical methods.

The protective action, against magnesium carbonate, of calcium carbonate for Azotobacter chroococcum, C. B. LIPMAN and P. S. BURGESS (*Jour. Agr. Sci. [England], 6 (1914), No. 4, pp. 484–498*).—The authors have studied the effects, separately and together, of calcium carbonate and magnesium carbonate on nitrogen fixation by *A. chroococcum.* They state that while the first is stimulating and never toxic to this organism in concentrations up to 2 per cent in mannite solution cultures, the second is sharply toxic thereto in concentrations above 0.1 to 0.2 per cent in such cultures. While the calcium salt in soil cultures is without effect when present in amounts up to 1.4 per cent of dry soil weight, when it becomes slightly toxic in Anaheim sandy soil, the magnesium is even more toxic in such soil cultures than in solution cultures. The toxic effect of magnesium carbonate is ascribed to the magnesium ion.

Calcium carbonate exercises a protective influence in solution cultures and soil cultures for *A. chroococcum* against the toxic properties of magnesium carbonate. The optimum ratios found of these two components are 6:1 and 15:1 in these two media, respectively, when the absolute values of the two components employed are 1.25 and 0.2 per cent in solution and 1.5 and 0.1 per cent in soil cultures.

Study of the gas exchange and the variation of sugars and glucosids during the course of the formation of anthocyanic pigments in the flowers of Cobæa scandens, E. ROSÉ (*Rev. Gén. Bot., 26 (1914), No. 307, pp. 257–270*).—A brief account of this investigation has been previously noted (E. S. R., 31, p. 427).

Investigations on the penetration of violet and ultraviolet rays in various plant organs, P. A. DANGEARD (*Bul. Soc. Bot. France, 61 (1914), No. 1–3, pp. 99–103*).—The author reports investigations on the penetration of violet and ultraviolet rays through the tissues of various plant organs.

It was found that different species of plants behaved quite differently toward the different wave lengths of the lights, some of the wave lengths readily penetrating leaves, while others were greatly reduced or entirely prevented from passing through. Hairy leaves retarded penetration more than glaucous or smooth ones.

The action of Salton Sea water on vegetable tissues, M. A. BRANNON (*Carnegie Inst. Washington Pub. 193 (1914), pp. 71–78, pls. 3*).—This is a fuller report than that already noted (E. S. R., 30, p. 431), on the anatomical study of dead plants submerged for one to five years in the Salton Sea, on the bacterial study of the water, and on the processes engendered in fresh woods kept in such waters at room temperature.

Woody plants submerged in the Salton Sea were decorticated in about one year. Fresh woods kept in Salton water showed a breaking down in the zone of meristematic cells, but sterilized specimens kept in such water did not decorticate during ten months.

An organism belonging to the Amylobacter group was isolated, which produces an enzym capable of hydrolyzing pectins.

Woods emerging annually from 1907 to 1911 showed no breaking down of cell walls in any portion. It is believed that the action of this water on woody plant tissues is related to hydrolyzing agents of bacterial origin. No evidence of petrifaction was noted.

The relative action of cold on herbaceous plants, W. RUSSELL (*Bul. Soc. Bot. France, 61 (1914), No. 1–3, pp. 113–118, figs. 1*).—Observations are given on the effect of freezing on herbaceous and semiherbaceous plants in the vicinity of Paris during the winter of 1913–14. This winter is said to have been especially severe, and while perennial plants were not seriously affected, herbaceous ones whose growth had been prolonged late into the fall were destroyed.

The author found that ice formed within plant tissues caused modifications dependent upon the form of the cells. Where the ice occurred in superficial cells, but little injury resulted, but where it was formed deep within the tissues, especially within the vessels and parenchyma surrounding them, the death of the plant usually followed. It was also found that certain cells could continue living for a time although the rest of the plant was killed, and that there could be temporary growth of organs although the members on which they depended were dead.

Further studies of the effects of smoke from towns upon vegetation in the surrounding areas, C. CROWTHER and D. W. STEUART (*Jour. Agr. Sci. [England], 6 (1914), No. 4, pp. 395–405*).—The authors have extended the studies previously noted (E. S. R., 33, p. 126) by making attempts to measure directly the effects of atmospheric pollution upon trees and upon crops grown on agricultural land near the city of Leeds, and they give some details thereof, with the general effects of air-borne impurities.

In case of trees, individual buds may be injured so that they open late, if at all. Leaves are injured at any stage, but particularly when young, and if they are injured for several successive seasons the tree becomes sickly and gradually dies away, the forms of progressive injury being described. Conifers are more susceptible than deciduous trees, and both are more so than are most farm crops.

As regards cultivated crops, heavier tillage is required in the smoky district. Hedges also are injured and wire fences, metallic roofing, etc., are less durable. The finer and more valuable grasses tend to die out. Young leaves of cereals may redden or bleach at the points, the shoots are thinner, the crops are more uneven in ripening, and the grain is impaired as to appearance, quality, and market value.

The detrimental action of smoke, etc., is at its height in damp weather under conditions favoring accumulation of smoke gases over the growing crops. Quick-growing plants with thick leaves best resist the influence of the smoke. Fruits do not bear well or thrive. Some late vegetables suffer more than early ones. With a few exceptions noted, ornamental flowers die out or fail to do well in this region.

The seed coat of clover, V. FOMINYKH (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 4, pp. 294–316, figs. 15*).—A study of the seed coats of red clover has led to the conclusion that a thick seed coat is not characteristic of sound and full seeds, but that this character diminishes germinability. A glossy seed coat is an indication of sound and full seed, but this appearance may be impaired or lost by injury in threshing. Ripeness of seed is indicated by a violet or dark blue-green color, which is lost, however, in unfavorable situations, such as excessive moisture. A gray-brown color and shriveling of the seed coats show correlation with quick germination, but not necessarily with high quality of stock.

On the origin of cultivated rice, A. CHEVALIER and O. RŒHRICH (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 14, pp. 560–562*).—The authors have made a study of rice plants growing in Asia and Africa, comparing the species growing spontaneously with the forms generally grouped under the name *Oryza sativa* in Asia.

Of the numerous spontaneous species in Asia only one is said to resemble *O. sativa.* From Africa four species are described, some of which are cultivated, that differ in taxonomic characters from the cultivated rice usually referred to *O. sativa.* Among the species described from Africa are *O. latifolia*, *O. breviligulata*, *O. brachyantha*, and *O. longistaminata.*

Plant chimæras, M. SKENE (*Sci. Prog. Twentieth Cent.*, *9* (*1914*), *No. 33*, *pp. 127–134*).—A popular account is given of a number of plant chimæras, or graft hybrids, as they are sometimes called, beginning with *Cytisus adami* and embracing a number of other forms, among them the so-called graft hybrids of Solanum produced by Winkler (E. S. R., 21, p. 320).

Spore plants, L. K. ROSENVINGE (*Sporeplanterne* (*Kryptogamerne*). *Copenhagen: Gyldendalske Boghandel Nordisk Forlag, 1913, pp. 7+388, figs. 513*).—This is a discussion, arranged according to class, order, family, and genus, of typical or important thallophytes and archegoniates, with a glossary and index.

Flora of the vicinity of New York, N. TAYLOR (*Mem. N. Y. Bot. Gard.*, *5* (*1915*), *pp. VI+683*, *pls. 9*).—This volume deals with the distribution of the flora of southeastern New York, Long Island, the State of Connecticut, eastern Pennsylvania, and the State of New Jersey. The edaphic and climatic factors are discussed at length.

FIELD CROPS.

Field management and crop rotation, E. C. PARKER (*St. Paul, Minn.: Webb Publishing Co.*, *1915*, *pp. 507*, *figs. 100*).—This book is primarily a text-book, but may serve also as a reference book. It covers the subjects of history, rotations and plans, commercial fertilizers, and experimental evidence, with chapters on soil productivity, soil inoculation, seed selection, fungus diseases, and weeds. A group of problems and practicums concludes each chapter.

A hand chart of farm crops, S. D. SEMENOW (*East Lansing, Mich.: Author, 1915, folio*).—A chart containing data as to time of seeding, method and depth of planting, preparation of seed bed, soil adaptability, time of harvest, average yield per acre, and disease and enemies, compiled for 39 of the more important field crops.

The work of the Huntley reclamation project experiment farm in 1914, D. HANSEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Huntley Expt. Farm, 1914, pp. 23, figs. 8*).—This bulletin reports work in progress (E. S. R., 31, p. 828) conducted by several offices in the Bureau of Plant Industry cooperating with the Montana Experiment Station. Climatic and crop conditions for the year are noted, including plans of the experimental farm and a detailed statement of the numbers of live stock on the project. Yields in crop rotation experiments that include alfalfa, sugar beets, potatoes, oats, wheat, corn, and flax are given.

Results of pasturing hogs on alfalfa show a return of $76.88 per acre, and on corn of $62.72 per acre in pork produced. The average net values of the crops of alfalfa and nurse crops from different methods of seeding alfalfa, with nurse crops cut for hay and for grain, early seeding, late seeding, and seeding in 18-in. rows, are, respectively, $45.68, $54.46, $43.86, $39.96, and $33.73. The cost of production for the various methods ranged, respectively, as follows: $34.12, $32.18 to $37.86, $29.04 to $36.06, $26.02 to $33.78, and $23.23 to $31.46 per acre.

The results of a time-of-harvesting test show that there were no consistent differences in the yields of the second crop due to delay in harvesting the first crop. On plats where four crops were harvested the total yield was much greater than the total yield from plats cut only three times. It is noted, however, that the yields of the fourth crop were higher than can be expected in an ordinary season, since the date of the first frost was nearly three weeks later than usual. The determinations of shrinkage of alfalfa cut at different dates "indicate that the amount of shrinkage in the second and third crops was slightly more than in the first. There was no very consistent difference in the amount of shrinkage in the first crop as the length of the growing period increased. although the shrinkage was less in the pair of plats cut last than in those which were harvested earlier. The average shrinkage for the three crops was 76.3 per cent, which is within 0.2 per cent of the average obtained on the same plats in 1913."

Methods of seed production are briefly noted. Of ten methods of eradicating alfalfa, that of plowing from 4 to 5 in. deep when the third crop was about 2 in. high, and floating and replowing from 8 to 10 in. deep six weeks later proved the most successful, the eradication being practically complete, as only two plants per square rod were found the following June, and none by November.

A test of separate pasture grasses showed that "excellent stands of all of the grasses were secured except timothy, Kentucky blue grass, redtop, and western wheat grass. The grasses that produced the best growth and largest quantities of hay during 1913 and 1914 were awnless brome grass, meadow fescue, tall fescue, orchard grass, and tall oat grass." The results of pasturing tests on mixtures of these grasses were very satisfactory. Two cows were carried through the season on three-fourths of an acre.

An experiment with sugar beets covering width-of-row and distance-of-thinning tests showed the highest yields by planting the rows 24 in. apart and thinning to 8 in. in the row, the average yield from this spacing being 18.68 tons per acre as against a general average of 16.89 tons. The control of the sugar-beet root louse was secured to a considerable extent by keeping the soil "wet" during the growing season by frequent irrigations, resulting in a suppression of the insect to about 30 per cent of the plants at harvest time, while on the area not so treated 63 per cent of the plants were infested.

Variety tests of wheat, corn, soy beans, garden peas, irrigation of flax, tests of orchard trees and small fruits, and fertilizer experiments with oats are briefly noted.

It is noted that the methods of reclamation of a tract of very heavy impervious clay and rather excessive alkali content, consisting of green manuring, barnyard manuring, and cultivation, are proving effective.

Breeding of Alpine forms of pasture grasses, T. VON WEINZIERL (*Jahrb. Weidew. u. Futterbaues, 2 (1914), Ergänzungsb., pp. 97–192, figs. 39*).—This gives results in the breeding and selection of grasses in adaptation and acclimatization work in the Austrian Alps in continuation of work previously noted (E. S. R., 14, p. 349; 30, p. 633). The general development of the work is reviewed, and the methods employed in planting, cultivation, transplanting, selection and breeding, harvesting, and storing are described. Every phase of the work with each variety is fully recorded and a copy of the breeding record sheet of each of the following-named grasses is presented: *Festuca pratensis*, *Dactylis glomerata*, *Arrhenatherum elatius*, *A. elatius* var. *bulbosum*, *Avena pubescens*, *Poa firmula*, *P. serotina*, *Alopecurus laguriformis*, *F. pseudovina*, *F. rubra* var. *genuina*, *F. rubra* var. *fallax*, *F. arundinacea*, *Phleum medium*, *P. michelii*, *P. alpinum*, and *Agropyrum caninum*.

The effect of frequent clipping on total yield and composition of grasses, W. B. ELLETT and L. CARRIER (*Jour. Amer. Soc. Agron., 7 (1915), No. 2, pp. 85–87*).—This gives results of work carried on at the Virginia Experiment Station in cooperation with the U. S. Department of Agriculture. Data show the weight of air-dried substance, the percentage of protein, and the total protein content for the product of the various clippings, which were made at from 7 to 30 day intervals.

The results of the experiment, which covers several years, show that "the total yield of dry matter varies inversely with the number of times it is cut during the growing season. The percentage of protein in grass decreases as the grass matures. The decrease in percentage of protein when the grass is allowed to mature is sufficient to more than counterbalance the increase in weight of dry matter. The increase in weight of mature grass over frequent clippings must be fiber and other nitrogen-free substance.

"The cost of haymaking would probably offset the gain in carbohydrates in the case of blue grass, so that land utilized as a permanent pasture should be more profitable than it would be as a permanent meadow. It may be of interest to state that the botanical character of the herbage varied greatly with the frequency of the cutting. On the plats that were frequently clipped blue grass, redtop, and white clover predominated, while on those that were cut less frequently, especially on the one that was cut but once a year, these tame grasses gave way to rank-growing weeds, such as wild carrot, paspalums, yarrow, whitetop, etc. This undoubtedly has much to do with the amounts of protein produced."

Laying down land to grass on the Clifton Park system, J. HUNTER (*Chester, England: James Hunter, Ltd., 1915, pp. 32, pl. 1, fig. 1*).—This publication brings together short articles and an address by the author, calculated to show the great value of the Elliot system of farming, previously noted from other sources (E. S. R., 13, p. 1037; 26, p. 734).

Universal hay calculator, MOLLIE D. CHESNUT (*Torrington, Wyo.: Author, 1915, pp. [2]+20*).—This shows the tonnage for any given width and overthrow for oblong stacks 100 ft. in length, based on United States Government rule.

Experiments with small grains, J. R. RICKS (*Mississippi Sta. Bul. 171 (1915), pp. 12*).—This gives results of variety tests with oats and wheat, and notes on the treatment for rusts, smuts, and weevils in stored grain. In tests of methods of seeding oats, drilling on a well prepared seed bed was superior to plowing or disking the seed in. Twelve pk. of oats sown per acre gave larger yields than 6, 8, or 10 pk. Suggestions for the production of oats and wheat in Mississippi are given.

Barley investigations, C. P. BULL (*Minnesota Sta. Bul. 148 (1915), pp. 7–47, figs. 12*).—This bulletin discusses barley production in Minnesota, classes of barley grown in the State, methods of planting and harvesting, managing variety tests of barley, methods of improvement of barley, management of the nursery, and methods of cross-fertilization, and gives data showing results of variety tests with about 400 varieties and strains of barley secured from nearly all parts of the world. These include commercial strains, pedigreed strains, and hybrids, under the following classes: Commercial 6-rowed bearded barleys; commercial 2-rowed bearded barleys; pedigreed strains of 6-rowed bearded barleys, each of which has been developed from a single plant of a promising variety; pedigreed strains of 2-rowed bearded barley developed from a single plant; hybrid 6-rowed bearded barleys developed from hybridization, followed by selection from individual plants; hybrid 2-rowed bearded barleys developed from hybridization and selection; and miscellaneous commercial stock. The grain-breeding investigations were in cooperation with the Bureau of Plant Industry of this Department. The range of yields per acre per year for periods of from 1 to 12 years is given for the respective classes as follows: From 48.3 to 51.1

bu., 38.1 to 41.6 bu., 47.7 to 49.6 bu., 36.3 to 38.8 bu., 32 to 41 bu., 34.8 to 39.6 bu., and 30.6 bu.

In breeding for early and late maturity it is noted that "except in the length of the growing period and in the grade of the grain, no striking difference in the average performance of the two selections is shown. A difference of 4.4 days in the length of the growing period for the average of all stocks for the eight years was obtained, while the grade of the grain of the late selections averaged 8.4 per cent better than that of the early selections."

The results from a comparison of improvement by selection and by crossing "show that the average yield per plant of the five crossbred stocks is 0.2 gm. better than that of the five pure lines, while the strength and stiffness of the latter are higher by 5 per cent and 5.6 per cent, respectively. The grade, however, is 4 per cent better for the crosses, which were also slightly earlier in maturing. These differences do not seem to be sufficient to warrant a definite conclusion as to maturity, strength, stiffness, and grade. In yield, the difference, though small, must be given attention. The difference of 0.2 gm. is an average for the individual plant. Assuming that 490,040 plants to the acre are grown under nursery conditions (4 by 4 in. apart), the increased yield on this basis would be 171.6 lbs. or 3.56 bu. to the acre. Under field conditions more plants are grown to the acre, thus reducing the difference of 0.2 gm. per plant, but it is safe to assume that the reduction of difference in yield per plant would be practically compensated for by the increased number of plants. Therefore, from the nursery results it is evident that crossing, even though three years more are required, will prove the better method for ultimate improvement. This does not, however, preclude the value of the pure-line method of breeding, which is undisputed."

Field beans, C. A. ZAVITZ (*Ontario Dept. Agr. Bul. 232 (1915), pp. 15, figs. 14*).—This bulletin considers the statistical status of bean culture in Canada and gives results of variety tests of the small white pea bean, navy bean, and marrowfat bean. Average yields for the past 20 years are given as 17.8, 19.2, and 17.4 bu. per acre, respectively. Cooking qualities, improvement of varieties, anthracnose, and cultural methods are also discussed.

The effect of fertilizers and stimulants upon the growth and production of Corchorus capsularis, S. F. ALBANO (*Philippine Agr. and Forester, 3 (1915), No. 9–10, pp. 218–226*).—This records results of applications of barnyard manure, kainit, tankage, and potassium sulphate, singly and in varying combinations, on *C. capsularis* (Chinese hemp).

It is shown that "the application of any kind of manure to Corchorus produces a pronounced beneficial effect on the growth of the plant and on the yield of fiber as well. The best result was obtained by the application of a mixture containing nitrogen. Cow dung alone at the rate of 8,000 kg. per hectare [7,120 lbs. per acre] produced as good an effect as kainit at the rate of 2,000 kg. per hectare (taking the average for both sets). The best result was obtained when the plants were set at 20 by 20 cm. [8 by 8 in.] apart; 20 by 40 cm. and 10 by 10 cm. did not give as good a result."

Borax, manganese, mercury, iron, calcium, nickel, zinc, fluorin, and iodin were tried as growth stimulants with varying success on plats of 1 meter square. "The general conclusion to be drawn from these stimulation experiments is that jute is decidedly less subject to stimulation with various chemicals than are some of the other crops with which experiments have been carried on, most notably, for instance, potatoes and radishes. The only chemicals whose use can be recommended as very likely to be profitable as a result of these tests are iron and very dilute nickel. It remains possible that applications of borax, manganese, and zinc more dilute than any which were tested in this experiment would also result in an acceleration of growth sufficient to make their use financially profitable."

The physiology of the pollen of Zea mays with special regard to vitality, D. I. ANDRONESCU (*Thesis, Univ. Ill., 1915, pp. 36, pls. 4*).—The author shows by numerous tables and plates as results of field and laboratory studies of maize pollen that the chemical composition of the pollen seems to be influenced by selection for protein in the kernels. There is evidence of an increase in size of pollen in an F_1 generation. In certain media maize pollen throws out a protoplasmic expansion. There is considerable difference in the germination of pollen of different varieties of maize, and a great variation in the germination of pollen from different tassels of an unselected or unfixed variety of maize.

Dry heat is injurious to the vitality of the pollen while moist heat can be resisted. Pollen exposed in the laboratory died in two hours, uncovered out of doors it lived four hours, in 60 per cent moisture it lived six hours, in a saturated atmosphere it lived 48 hours, and in hermetically sealed tubes it kept its vitality for 24 hours regardless of external conditions. Pollen from early suckers is as viable as pollen from the parent plants, but that from late suckers gives a low percentage of germination. Low temperature (from 8 to 14° C.) has a stimulative effect upon the vitality of the pollen, including that of late suckers.

Grades for commercial corn, J. W. T. DUVEL (*U. S. Dept. Agr. Bul. 168 (1915), pp. 11, pl. 1, figs. 9*).—This bulletin gives the grade classification of white, yellow, and mixed corn promulgated by this Department, showing the maximum of moisture and other factors; discusses methods of determining the various factors; and describes the sieves, moisture tester (E. S. R., 24, p. 215), and the color plate used in making the determinations.

Cotton cultivation in Italian Somaliland, G. SCASSELLATI-SFORZOLINI (*Agr. Colon. [Italy], 9 (1915), No. 4–5, pp. 193–208, pls. 4*).—This article describes varieties of cotton and methods of cultivation employed in the colony station on the east coast of Africa. Tables show meteorological data, and analyses of soils and of the parts of the cotton plant, fiber, seed, capsule, leaves, stems, and roots.

The world's cotton crops, J. A. TODD (*London: A. & C. Black, Ltd., 1915, pp. XIII+460, pls. 42, figs. 6*).—This book treats of the geographical distribution of cotton, the uses of the fiber and of the seed, and the effects of the war on the industry.

The industrial fiber plants of the Philippines, T. MULLER (*Jour. N. Y. Bot. Gard., 16 (1915), No. 184, pp. 69–79, pls. 2*).—This describes several species of palms, screw pines, grasses, sedges, vines, and other fiber plants, the methods of obtaining the fibers, and their uses.

Notes on hops, 1912–1914, E. S. SALMON (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 499–532, pls. 8, fig. 1*).—This describes seedlings of crosses of selected English, German, and American hops and shows the percentage of soft resins in individual plants derived from the various crosses.

A new variety of hop, the "foundling," E. S. SALMON (*Jour. Bd. Agr. [London], 22 (1915), No. 2, pp. 136–140, pls. 3*).—This describes a new variety of hop found at Wye College. It has been thoroughly tested since 1908 and is noted as having good cropping qualities; high resin content; marked resistance to, if not total immunity from, the "nettle-head" disease; and lateness of season.

Influence of color of seed potatoes on the yield, R. SCHANDER (*Illus. Landw. Ztg., 35 (1915), No. 35, pp. 229, 230*).—This gives results of experiments in 1914 that indicate the influence of color on the yield and vigor of the crop. Larger yields were noted for the dark-colored tubers in the variety Wohltmann.

Sugar beets: Preventable losses in culture, H. B. Shaw (*U. S. Dept. Agr. Bul. 238 (1915), pp. 21, pls. 8, figs. 5*).—This bulletin points to striking differences in local yields of sugar beets caused by imperfect stands in the fields. Results are given of observations on three types of soil (deep, sandy loam, well manured and in excellent tilth; very light sandy loam, generally well manured and in good tilth; and heavy black loam, moderately well manured and in fair tilth) in Utah sugar-beet districts, covering the seasons of 1910, 1911, and 1912.

A definite correlation between stand and yield was found. The factors directly causing a decrease in the number of plants to the acre are arranged in three groups, those occurring in the germination stand prior to thinning, careless and improper thinning and blocking, and those incidental to cultural operations between thinning and harvest. The mean percentage of harvest stand and yield in tons per acre for the respective groups of soils are given as 49.96 and 24.56, 63.71 and 17.68, and 46.76 and 13, and the mean of all the plats as 52.26 and 17.43, respectively.

"These studies were made among fair and good beet growers in an old beet district whose mean yield reached the respectable total of rather more than 17 tons to the acre, while the average for the United States for 1910–11 was only 10.17 tons and that for the State of Utah, where these studies were made, was 11.42 tons per acre. The magnitude of preventable loss incurred by a very large proportion of beet growers must be amazing; in fact, it must exceed the entire cost of raising the crop."

Fertilizers in sugar-beet culture, E. Saillard (*Jour. Agr. Prat., n. ser., 28 (1915), No. 41, pp. 309, 310*).—This summarizes some fertilizer experiments conducted by the laboratory of the Syndicate of Sugar Factories of France since 1901.

It is noted that potassic fertilizers generally gave good results in regard to richness, purity, and yield of sugar beets. When beets of the same variety were given similar cultivation in the same field those rich in sugar contained a less amount of soda. A large application of nitrate of soda, especially if part was applied later, retarded the maturity of the beets and reduced the sugar content. Nitrate of soda, nitrate of lime, and cyanamid gave essentially similar results except that nitrate of lime produced beets a little richer and the cyanamid yielded a little less sugar per hectare. Kainit gave better results than chlorid or sulphate of potash.

Experiments in the fertilization of sugar beets (*Inform. Agr. [Madrid], 5 (1915), No. 100, pp. 150, 151, fig. 1*).—The results of the use of nitrate of soda in combination with potassium and phosphorus showed the yields and net profits to be greater with an application of 300 kg. than with 200 kg. per hectare in the Province of Valladolid, Spain. In similar experiments in the Province of Saragossa, 22,500 kg. of beets were produced per hectare without nitrate of soda, and 25,500, 30,900, and 40,000 kg. with the use of 200, 400, and 60 kg., respectively, of nitrate of soda per hectare.

On the variability of the nitrogen appropriation of the offspring of a single mother beet during the first vegetative year, K. Andrlík and J. Urban (*Ztschr. Zuckerindus, Böhmen, 39 (1915), No. 6, pp. 235–240*).—This gives results of analyses of individuals derived from a single mother beet.

Tables show that the amount of nitrogen used per plant ranged from 0.5 to 4.75 gm. The amount of sugar per beet ranged from 20 to 120 gm., and the percentage of sugar from 15 to 18.55 per cent. The number of parts of nitrogen found to each 100 parts of sugar ranged from 2.46 to 5.44 for the various individuals. It is noted that the larger the sugar content of the beet the relatively smaller was the quantity of nitrogen appropriated and the reverse.

Bud development in sugar cane, Z. Kamerling (*Bol. Min. Agr., Indus. e Com. [Brazil], 3 (1914), No. 2, pp. 88–99, pls. 8*).—Results are reported of a microscopical study of the development of the bud of sugar cane, showing the distribution of glucose, starch, tannic acid, and albuminoids in the growing point.

Administration report of the government sugar cane expert for 1913–14, C. A. Barber (*Rpt. Dept. Agr. Madras, 1913–14, pp. 50–52*).—This briefly notes the progress in the work of breeding sugar cane at Coimbatore, in which an attempt is being made to cross the hardy cane of north India with the richer local canes. Canes from the seedlings of other crosses are observed to have increased in sugar content and now reach over 19 per cent of sucrose in the juice.

A review of the results of the experiment fields, J. M. Geerts (*Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 27, pp. 541–600, pl. 1, figs. 6; Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 25, pp. 911–972, pl. 1, figs. 6*).—This discusses the results and methods of calculations.

Variation of flower size in Nicotiana, T. H. Goodspeed and R. E. Clausen (*Proc. Nat. Acad. Sci., 1 (1915), No. 6, pp. 333–338*).—This gives results of some 25,000 measurements taken on some pure lines and hybrids of Nicotiana, covering a period of about five years at the University of California Botanical Gardens.

It has been shown that when plants first come into flower the spread and length of corolla are greater than the spread and length of flowers produced on the same plants later in the growing season. By removing all flowers from the plant as fast as they go by, it is possible to keep up the flower size to nearly that of the first flowers produced, and in some cases to double the life of the plant. During the period which elapses from the time a flower is fully opened to the time at which pollen is shed, there was noted a considerable increase in the corolla spread and associated with it little or no increase in corolla length.

That there is a differential distribution of flowers on tobacco plants according to size at any given time is shown by the comparative measurements of flowers borne among developing seed capsules on the terminal inflorescence of a plant and those borne on laterals of the same plant. Cuttings growing in the greenhouse produced flowers smaller in spread and greater in length than those on the field plant from which the cuttings were taken. Pot experiments showed that flower size could be distinctly influenced by applications of sodium nitrate, and in a direction parallel to that of the influence on vegetative characters.

"The conclusion seems irresistible that flower size in Nicotiana is not so constant as it has been assumed to be, but that it is affected by a number of conditions, and that at least some of these may not affect length and spread in the same manner."

Parthenocarpy and parthenogenesis in Nicotiana, T. H. Goodspeed (*Proc. Nat. Acad. Sci., 1 (1915), No. 6, pp. 341–346*).—This article notes the occurrence of viable seeds of *Nicotiana tabacum* Cuba from flowers that had been emasculated by picking off the anthers near the tops of the filaments, castrated in bud plus the pinching off, with the forceps, of the stigma at the very top of the style, or mutilated by pinching off the stigma in the bud without the removal of the anthers.

The author states that "parthenocarpy is of frequent occurrence in *N. tabacum* Cuba, and parthenogenesis, employing the term to mean the production of viable seed without pollination, is also peculiar to this variety of *N. tabacum*."

Phylogenetic studies of the varieties of tobacco, G. E. Anastasia (*Bol. Tec. Coltiv. Tabacchi [Scafati], 13 (1914), No. 2–4, pp. 51–220, pls. 82, figs. 41; Appendix, pp. 3, pls. 56*).—A study of the structure and form of the leaf, stamens, and stigma, and of general types of over 100 selections of tobacco varieties and strains is reported.

Deli tobacco a mixture of types, J. A. HONING (*Bul. Deli Proefstat. Medan, No. 4* (*1915*), *pp. 29, pl. 1*).—This article, printed in both English and Dutch, gives the results of a study of the types of Deli tobacco, and considers the number of leaves, measurements of leaves, height of the stem, and time of flowering. It is noted that leaf number is dependent on environment. Six types of tobacco were distinguished in Deli tobacco.

The chemical composition of the tobacco plant in its various stages of growth, E. PANNAIN (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 11, pp. 1450–1452*).—Analyses of the tobacco variety Xanthi Yaka, at various stages of growth as produced at Abruzzi, Italy, are reported.

"These results show that seedlings are richer in ash, nitrogen, and organic acids than half-grown or full-grown plants. In plants before flowering, the apical leaves are richer in ash, nitrogen, and substances soluble in ether and alcohol than the lower leaves, but they contain less nicotin and organic acids. In ripe leaves, the ash content decreases from the basal (first picking) to the apical leaves (fourth picking), and the leaves of the first and second pickings are also richer in nicotin, containing double the quantity of the leaves of the third and fourth pickings. The leaf blades are always richer in nitrogen, nicotin, and substances soluble in alcohol and ether than the ribs, and generally also in ash, but they are poorer in organic acids. The stems and roots contain less ash, nitrogen, substances soluble in ether and alcohol, and nicotin than other parts of the plant, but the roots contain more nicotin than the stems."

Determination of wheats, K. FLIAKSBERGER (*Trudy Bi̅uro Pri̅kl. Bot.* (*Bul. Appl. Bot.*), *8* (*1915*), *No. 1–2, pp. 9–210, pl. 1, figs. 43*).—The author has here classified and described 185 varieties of wheat grouped under the following eight species: *Triticum monococcum, T. dicoccum, T. durum, T. turgidum, T. polonicum, T. spelta, T. vulgare*, and *T. compactum*.

Mass selection of spring wheat, A. I. SMEBUM (*Selsk. Khoz. i Li̅esov., 245* (*1914*), *June, pp. 226–246; July, pp. 369–382*).—Mass selection of spring wheat (*Triticum vulgare lutescens* and *T. vulgare erythrospermum*) was undertaken in 1912 and 1913 at the Saratof experimental station with smooth white spikes of the first and bearded white spikes of the second. These were first selected in the field and the collected ears were afterwards separated in the laboratory into groups. The result obtained in the field was the separation from the wheat of botanical admixtures, i. e., the botanical purification of the basic form of wheat.

In the laboratory the ears were selected by type and classified by size, shape, compactness, distribution of spikes, and formation of scales (glumes); by compactness, the maximum being over 2.2 spikes per centimeter and the minimum below 1.7; and by character of the grain, dividing it into mealy, vitreous, coarse-grained, and mixed. Botanical admixtures found among these heads were the milturum, ferrugineum, and hordeiform, also velutinum.

The results obtained from the work of 1912 and 1913 showed that the effect of selection noticed in the first generation disappeared entirely in the second. A repetition of the selection on the same lines gave scarcely any results whatever. The effect of selection on the first generation is of practical importance only when the generation is immediately put to practical purposes.

Individual selection of *T. vulgare lutescens* and *T. vulgare erythrospermum* gave sharply defined types with determined heredity, from which whole series of generations, differing widely from their progenitors and from each other, were evolved. Thus the wheat, which in mass selection gave no marked groups, is bound to contain a wealth of varied individuals stable in their heredity and giving rise to new species.

Mass selection permitted a study of the botanical composition of collective forms, the basic types of *T. vulgare lutescens* and *T. erythrospermum;* the division of spikes into types, showing the dominant characteristics of the fluctuations and their variations; the determination of the wide limits of variations in the form of the shape of the spike, showing that each fluctuation might be considered as a sharply defined hereditary variation of an individual type. This showed in the mass a variation of forms which were in reality genotypically hereditary. In regard to compactness, that of *T. vulgare lutescens* was found more stable than that of *T. erythrospermum*, while that of *T. erythrospermum* was more plastic. The increase of yield was greater for the less compact heads than for the more compact ones. However, care should be taken not to lessen this compactness beyond a certain degree as this causes a deterioration in yield under unfavorable conditions of ripening.

It was found that *T. vulgare erythrospermum* has, with all degrees of compactness, a larger grain than *T. lutescens*, thus maintaining its reputation for having better grain than the latter species. Average compactness gives the largest grain.

Are there wheat varieties that are more or less completely self-fertilizing? H. Nilsson-Ehle (*Ztschr. Pflanzenzücht., 3 (1915), No. 1, pp. 1–6*).—Experiments with three varieties of wheat indicate that some varieties may remain pure while other strains may become more or less cross-pollinated when planted in close proximity.

Yams (Dioscorea), R. de Noter (*Les Ignames. Paris: Augustin Challamel, 1914, pp. 66, figs. 18*).—Already noted from another source (E. S. R., 31, p. 334).

Weeds on the Buzuluk Experiment Field (Samara Province) and in the vicinity, S. Bazhanov (*Trudy Bi͡uro Prikl. Bot. (Bul. Appl. Bot.), 8 (1915), No. 3, pp. 276–293*).—It was found that although the seed wheat contained only from 1 to 2 per cent of weed seeds the crop showed as high as 12.7 per cent of weeds. Investigation showed about 3,000 weed seeds per square meter to a depth of 2 in. of soil in cultivated fields. Lists of weed seeds found on both cultivated and fallow fields are given.

HORTICULTURE.

Field book of American trees and shrubs, F. S. Mathews (*New York: G. P. Putnam's Sons, 1915, pp. XVII+465, pls. 75, figs. 630*).—This work contains concise descriptions of the character and color of species common throughout the United States, together with maps showing their general distribution. Illustrations of leaves and fruiting parts and of typical tree barks, together with several reproductions of tree studies in water-color, crayon, and pen, accompany the text.

Journal kept by David Douglas during his travels in North America, 1823–1827, edited by W. Wilks (*London: William Wesley & Son, 1914, pp. 364, pl. 1; rev. in Quart. Jour. Forestry, 9 (1915), No. 2, pp. 151–157*).—This journal, which is published under the direction of the Royal Horticultural Society, in addition to describing the author's travels in North America from 1823 to 1827, furnishes a record of various trees, shrubs, and flowers observed in different parts of the country. Particular descriptions are given of 33 species of American oaks and 18 species of Pinus. A list of plants introduced by the author is appended.

Colonial plants, H. Jumelle (*Les Cultures Coloniales.—Plantes Oléagineuses. Paris: J. B. Baillière & Sons, 2. rev. ed., vol. 5, 1914, pp. 112, figs. 48*).—This is part 5 of the author's revised work on colonial plants (E. S. R., 31, p. 235). The present volume deals with the culture, preparation, and utilization of a number of oleaginous plants, including the coconut and other palms, peanut, sesame, castor-oil plant, cotton, and soy bean.

Report on the botanic station for the year 1913, E. J. F. CAMPBELL (*Rpt. Bot. Sta. Brit. Honduras, 1913, pp. 6*).—A list is given of economic, fruit, and other interesting plants that have flowered or fruited during the year, together with a list of recent acquisitions at the station and notes on the various economic plants and fruit trees growing at the station.

Vegetable growing, S. C. JOHNSTON (*Ontario Dept. Agr. Bul. 231 (1915), pp. 68, figs. 34*).—A practical treatise on vegetable growing intended both for amateur and commercial growers. In addition to a discussion of the general principles of vegetable growing, specific instructions are given for the growing, harvesting, and marketing of all the ordinary vegetables.

Tomato tests, O. B. WHIPPLE and L. G. SCHERMERHORN (*Montana Sta. Bul. 104 (1915), pp. 339–347, figs. 5*).—This bulletin gives the data on variety tests of tomatoes that were conducted in 1902, 1906, and in the years 1911 to 1913, inclusive. Some of the earlier work has been previously noted (E. S. R., 19, p. 337). Tests were conducted to determine the best varieties for the higher altitudes of the State and to work out methods of culture which would tend to induce early ripening of the fruit.

The data secured from the work as a whole indicate that tomatoes can be successfully grown in the higher altitudes of the State if started in pots or boxes so that they can be transplanted to the field without seriously injuring the root system. Pruning and training have been decidedly beneficial, both from the standpoint of early ripening and quantity of fruit ripened. Although pruning reduces the total amount of fruit produced when both green and ripe fruit are considered, pruned plats have in nearly every case produced from three to five times as much ripe fruit as unpruned plats. Early varieties should be used, and of those tested Earliana, Chalk Early Jewel, June Pink, and Bonny Best have proved most promising.

The cultivation of watercress (*Jour. Bd. Agr. [London], 21 (1915), No. 12, pp. 1093–1098, pls. 4*).—Popular instructions are given for developing watercress beds, propagation and planting, gathering, and marketing, including also information relative to varieties and the enemies of watercress.

The principles of fruit growing, L. H. BAILEY (*New York: The Macmillan Company, 1915, 20. ed., rev., pp. XIV+432, figs. 186*).—The present edition of the author's work (E. S. R., 9, p. 246) has been completely revised and rearranged, much of the subject matter having been rewritten.

The introductory chapter gives an inventory of fruits and discusses the course of development of a fruit region, the determinants in fruit growing, the outlook for fruit growing, the organizing of the business, and different types of fruit growing. In the succeeding chapters consideration is given to the location and its climate, the tillage and the enriching of fruit lands, the plants and planting, laying out the plantation and its subsequent care, accidents and injuries, the spraying of fruit plantations, and harvesting and marketing the fruit.

Michigan laws for the protection of orchards and vineyards (*Lansing, Mich.: State, 1914, pp. 21*).—A compilation of laws dealing with the protection of orchards, vineyards, and gardens from dangerous insects and diseases, impure insecticides and fungicides, trespass, willful and malicious injury, etc., together with acts to prevent fraud and deception in the packing and sale of fruits and vegetables and an act to authorize and regulate a county agricultural department.

Varieties of tree fruits for New Jersey, M. A. BLAKE (*New Jersey Stas. Circ. 41, pp. 8*).—In this circular lists are given of varieties of apples, peaches, pears, cherries, plums, and quinces that are adapted for the home orchard and for commercial planting in New Jersey. Suggestions are also given relative to age and size of trees to plant and time of planting.

Spring versus fall planting, F. M. CLEMENT (*Ann. Rpt. Fruit Growers' Assoc. Ontario, 46 (1914), pp. 51–55, figs. 2*).—A brief discussion of the relative merits of spring *v.* fall planting, including results of experiments conducted with plums and pears at the Vineland Experiment Station, Ontario. Six Reine Claude plums and six Bartlett pears were planted in the falls of 1911, 1912, and 1913, and duplicate check rows in the springs of 1912, 1913, and 1914. In every case the difference in growth is thus far in favor of the fall planting.

In connection with this experiment the value of dynamiting holes for fruit trees was tested. The dynamited trees have made less growth than either the fall or spring planted trees. This is attributed to the fact that the trees were planted immediately after the holes were dynamited, the soil subsequently drying out badly.

Spray calendar for Georgia, T. H. MCHATTON and J. W. FIROR (*Ga. State Col. Agr. Circ. 8 (1915), pp. 8, fig. 1*).—This circular contains directions for preparing spray mixtures, with schedules for apples, peaches, grapes, pecans, and vegetables.

Apple culture in Georgia, T. H. MCHATTON, J. W. FIROR, and C. M. KIGER (*Bul. Ga. State Col. Agr., No. 85 (1915), pp. 36, figs. 24*).—A popular treatise, discussing the orchard location and site, preparation of the land, laying out and planting the orchard, pruning, cultivation, fertilizers, frost injury, protecting the trees from rodents, and insect pests and fungus diseases and their control. Descriptive notes are given of varieties recommended for different sections of Georgia.

Yields of apple trees at different ages, W. T. MACOUN (*Ann. Rpt. Fruit Growers' Assoc. Ontario, 46 (1914), pp. 68, 70–72*).—In a previous publication data were given on a number of varieties of apples growing at the Central Experimental Farm, showing the yields of the best yielding trees of each variety from the third until, in a number of cases, the twenty-second year after planting (E. S. R., 27, p. 343). In the present paper the record of these trees has been extended to the twenty-sixth year after planting for a number of the varieties. The data are given with a view to showing the importance of keeping individual tree records.

What does it cost to grow a barrel of apples? M. ELLS (*Canad. Hort., 38 (1915), No. 5, pp. 121, 122*).—During the past season the author kept an account of three different orchards on different parts of the farm, involving some 32.5 acres with a crop yield of 1,600 bbls. The data secured for the one year showed a cost of production of $1.32 per barrel.

The cherries of New York, U. P. HEDRICK ET AL. (*New York State Sta. Rpt. 1914, pt. 2, pp. XII+371, pls. 57*).—This is the fourth of the station's monographs on the fruits of temperate North America (E. S. R., 27, p. 40).

Chapter 1 discusses cherries in relation to kindred fruits, the distribution of cultivated cherries, uses, amelioration, and the tree and fruit characters of the cherry. A brief conspectus is given of the edible species of Prunus followed by a fuller conspectus of the subgenus Cerasus to which cherries belong. Chapter 2 takes up the history of cultivated cherries both in Europe and America. Chapter 3 deals with cherry culture, consideration being given to the extent of the industry, stocks for cherries, cherry climates and soils, blooming dates of varieties of cherries as observed in the station orchard for the period 1912 to 1914, pollination of cherries, the management of cherry orchards, commercial status of cherry growing in New York, cherry diseases, and insects. Chapter 4 describes in detail the leading varieties of cherries and chapter 5 the minor varieties of cherries. The work concludes with a bibliography and references.

The most important varieties are illustrated in colors and all information that was thought would be helpful in breeding cherries, as well as to students of ecology and of plant distribution, has been included. As in the previous fruit books some prominence is given in footnotes to biographical sketches of persons connected with the development of the cherry industry.

The cherry in Ontario, E. F. Palmer (*Ontario Dept. Agr. Bul. 230 (1915), pp. 40, figs. 16*).—A popular treatise on cherry culture with special reference to Ontario. It reviews the status of the industry, and discusses the relative importance of sweet and sour cherries; methods of propagation; location and soil; planting; cultivation; fertilization; pruning; picking, packing, and packages; markets; cost of production; insect pests and fungus diseases and their control; and varieties.

The following short articles by Ontario cherry growers are appended: Cherry Culture, by G. A. Robertson (pp. 32–35); Sour Cherry Culture, by H. Leavens (pp. 35–38); and Sour Cherry Culture, by P. E. Angle (pp. 38–40).

Smudging an orchard with native material in Alabama, R. E. Malone (*Alabama Tuskegee Sta. Bul. 28, pp. 8*).—This bulletin describes a successful experiment in smudging a large peach orchard at the Tuskegee Station as a protection against spring frost. Materials such as peach prunings, pine boughs, sawdust, and tar were used in the smudge piles. Loblolly pine boughs were especially valuable for making a smudge. The author is of the opinion that smudging, in addition to saving the peach crop, assisted in forcing out the bloom early.

Marketing Georgia peaches, C. W. Baxter (*Canada Dept. Agr., Fruit Div. Circ. 1 (1915), pp. 7*).—This comprises a concise statement relative to general conditions obtaining in the peach-growing sections of Georgia, together with an account of the Georgia Fruit Exchange and exchange marketing methods.

The use of phylloxera-resistant stock, I, M. Blunno (*Dept. Agr. N. S. Wales, Farmers' Bul. 80 (1914), pp. 88, figs. 14*).—The author reviews the results secured in various countries in using phylloxera-resistant stock for Vinifera varieties of grapes, and presents considerable data on the behavior of several varieties grafted on different stocks in New South Wales. A summary is also given of the experience of many growers near Sydney in the use of phylloxera-resistant stocks.

The past and present of American viticulture in Tuscany, V. Racah (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 12 (1915), No. 1, pp. 48–68*).—This paper consists of a short exposition on the progress of reconstituting phylloxera-infested vineyards in the various Provinces of Tuscany, with special reference to the use and value of different American grape species as resistant stocks.

Papaw and papain, H. F. Macmillan (*Trop. Agr. [Ceylon], 44 (1915), No. 3, pp. 179–184, pls. 2*).—This comprises notes on the botany of the papaya (*Carica papaya*), including a detailed description of the fruit, methods of propagation and cultivation, and the collection, preparation, properties, and commerce of papain.

Pecan growing in Georgia, J. W. Firor (*Bul. Ga. State Col. Agr., No. 82 (1915), pp. 24, figs. 5*).—A discussion of pecan culture based upon the literature of this subject, experiences of practical pecan men, and the results of studies and experiments conducted at the college during the past three years.

The introductory portion deals with the present status and prospects of the industry. Information is given relative to varieties, top-working, location. site, soil, fertilizers, planting operations, intercropping and cultivation, cover crops, harvesting and marketing, pecan diseases, and insects.

Citrus fruits, J. E. Coit (*New York: The Macmillan Company, 1915, pp. XX+520, pl. 1, figs. 151*).—An account of the citrus fruit industry, with special reference to requirements and practices in California and similar situations.

The first two chapters deal with the history and development of the citrus industry in the southwestern United States and the geography and climatology of California. The succeeding chapters deal with the botany, gross structure, and habits of growth of the citrus plants; varieties; the citrus nursery; horticultural inspection and quarantine service; improvement of citrus fruits by breeding; judging citrus fruits; selection of site and preparation for planting; planting the orchard; cultivation, fertilization, and cover crops; irrigation; pruning and top-working; frost and orchard heating; picking and packing oranges; picking and packing lemons; blemishes of the fruit and their prevention; by-products; marketing; profit and loss; diseases and their control; citrus insects and their control; insect control by fumigation; and various orchard pests and their control. The concluding chapter is devoted to an extensive bibliography dealing with citrus fruits, their culture, utilization of by-products, etc., and including references to other bibliographies on the subject.

A biometrical study in the variation of acidity and the ratio of total solids to acidity of oranges, S. K. Mitra (*Univ. Cal. Jour. Agr., 2 (1915), No. 7, pp. 245–247, figs. 3*).—As a result of a study of 100 Washington navel oranges of a well-known brand, the author found a wide variation among individual oranges in the ratio of total solids to acidity. Hence it appears important that inspectors' tests relative to the ratio of total solids to acid shall be based on a large number of oranges in each case. In another experiment conducted to determine the differences in the quality of the juice in different parts of the same orange a composite sample of juice taken from basic sections of ten oranges showed a percentage of acidity of 0.98 as compared with 0.9 in a composite sample taken from apex sections of ten oranges. The ratio of total solids to acidity was 13.8:1 in the juice from the basic sections and 15.9:1 in the juice from the apex sections.

The pomerange, a natural hybrid between the orange and pomelo, L. S. Perkins (*Jour. Heredity, 6 (1915), No. 4, p. 192*).—A short descriptive account is given of a natural hybrid between the orange and pomelo which appeared in an orange grove at Winter Garden, Fla., and has borne regularly for a number of years. The fruit, although rather tart when it first ripens, develops a distinct orange taste later.

Reference is also made to another hybrid, probably a cross between the pomelo and the lemon, which is of no special value.

Notice to citrus growers (*Porto Rico Bd. Agr. Expt. Sta. Circ. 4, pp. 2*).—The text is given of the resolution adopted by the Porto Rico Board of Commissioners of Agriculture with reference to the control of citrus canker. The resolution prohibits the entry into Porto Rico of all citrus stocks, buds, scions, seeds, or fruits originating in Florida, Alabama, Mississippi, Louisiana, and Texas.

Plant quarantine regulations (*Porto Rico Bd. Agr. Expt. Sta. Circ. 5 (1915), p. 1*).—The text is given of regulations, effective in 1915, governing the entry into Porto Rico of nursery stock and other living plant materials from the citrus-growing States of the United States and of citrus nursery stock from foreign countries.

California garden flowers, shrubs, trees, and vines, E. J. Wickson (*San Francisco: Pacific Rural Press, 1915, pp. 262, pls. 12, figs. 14*).—A popular treatise on the culture of flowers, shrubs, trees, and vines with special reference to California conditions, including lists of varieties adapted for that State.

Hardy ornamental plants for unfavorable city conditions, L. P. JENSEN (*Gard. Chron. of America, 19 (1915), No. 5, pp. 234, 235, figs. 6*).—A list is given of ornamental trees, shrubs, herbaceous perennials, vines, and climbers which have proved by experience to be adapted for a thickly settled district in St. Louis, where the atmosphere is smoky and sooty. Conifers have failed under such conditions and are not included in the list.

Color grouping for small gardens, ELEONORA ARMITAGE (*Gard. Chron., 3. ser., 57 (1915), Nos. 1466, pp. 51, 52; 1476, pp. 191, 192*).—In this article the author describes a number of groupings of two or three species, especially arranged for developing color schemes in small gardens during the spring months.

Methods and costs of planting a small park to grass, making paths, and planting hedge, H. R. FERRISS (*Engin. and Contract., 43 (1915), No. 14, p. 320, fig. 1*).—Data are given showing the labor requirements and cost of constructing walks and planting grass and hedges in a small park.

A B C of gardening, E. E. REXFORD (*New York: Harper & Brothers, 1915, pp. 115*).—A small popular treatise on ornamental gardening, both indoors and in the open.

FORESTRY.

The relation of forestry to the development of the country, R. H. CAMPBELL (*Dept. Int. Canada, Forestry Branch Circ. 11 [1915], pp. 7, figs. 4*).—A description of some European forest conditions with special reference to their application to forest management in Canada.

The subdivision of forests, J. S. ILLICK (*Forestry Quart., 13 (1915), No. 2, pp. 183–198*).—A discussion of the fundamental principles underlying the orderly subdivision of a forest with an example as applied to a portion of the Mont Alto State Forest of Pennsylvania.

Report of the superintendent of forestry, R. S. HOSMER (*[Bien.] Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1913–14, pp. 33–68, pls. 4*).—This comprises a report for the period from January 1, 1913, to August 31, 1914, relative to the administration and management of Hawaiian forest reserves, forest extension work by the government, tree planting under corporation and private auspices, and miscellaneous forest work. The report for 1913–14 is followed by a summary of forest work in Hawaii during the period 1904–1914.

During 1913 and 1914 ten new forest reserves were established, making a total of 37 reserves with an aggregate area of 798,214 acres, of which 68 per cent belongs to the territorial government.

Report of the acting superintendent of forestry, D. HAUGHS (*[Bien.] Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1913–14, pp. 69–72*).—A brief report supplementary to the above and covering the period from September 1 to December 31, 1914. The text is given of a rule approved by the governor, August 22, 1914, concerning the protection of the watersheds within the Honolulu Watershed Forest Reserve.

During the biennial period 1913–14, 1,183,568 trees were planted in the Territory of Hawaii, largely by corporations.

Report of the forest nurseryman, D. HAUGHS (*[Bien.] Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1913–14, pp. 73–80, pls. 2*).—A progress report for the biennial period ended December 31, 1914, relative to the work at the government nursery, Makiki station, and Tantulas forest, and to the Honolulu watershed planting work.

Annual administration report of the forest department of the Madras Presidency for the twelve months ending June 30, 1914, A. W. LUSHINGTON, H. B. BRYANT, J. S. BATTIE, C. D. MCCARTHY, ET AL. (*Ann. Admin. Rpt. Forest Dept. Madras, 1914, pp. 100+CXXIV+22*).—This is a progress report on the administration of the state forests in the Northern, Central, Southern, and Western Circles of the Madras Presidency for the forest year ended June 30, 1914, including a summary of progress during the previous five years. All important data relative to alterations in areas, forest surveys, working plans, forest protection, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Philippine dipterocarp forests, W. H. BROWN and D. M. MATHEWS (*Philippine Jour. Sci., Sect. A, 9 (1914), Nos. 5, pp. 413–516, pl. 1, figs. 11; 6, pp. 517–568, pls. 13, fig. 1*).—The authors here present the results of a study of the factors influencing the growth and development of Philippine dipterocarp forests. The subject matter is presented under the headings of a general description of dipterocarp forests, distribution, importance, composition and arrangement of Philippine dipterocarp forests, description of selected areas, plant associations on cleared areas, volume of dipterocarp forests, growth, environmental considerations, effect of cutting in dipterocarp forests, planting, and general considerations of management.

Forests of Japan, N. B. ECKBO (*Amer. Forestry, 21 (1915), No. 6, pp. 693–711, figs. 18*).—This comprises the substance of an address delivered before the Society of American Foresters, March 4, 1915. An outline is given of the important forest types and species, together with a short account of forest ownership; the administration, management, and exploitation of the state forests; forest protection; milling operations; reproduction; and forestry education and investigation.

Utilization and management of lodgepole pine in the Rocky Mountains, D. T. MASON (*U. S. Dept. Agr. Bul. 234 (1915), pp. 54, pls. 8*).—An account of lodgepole pine (*Pinus contorta*) in the Rocky Mountains discussing ownership and supply; characteristics of the wood; uses; fire-killed timber; size and contents of various products; annual cut; methods of lumbering; costs and selling prices; charcoal making; the management of lodgepole stands with reference to rotation, methods of cutting, brush disposal, regulating the cut, and reforestation; and protection from fire, insects, diseases, and grazing. A number of volume tables for lodgepole pine are appended.

The management of lodgepole pine, D. T. MASON (*Forestry Quart., 13 (1915), No. 2, pp. 171–182*).—A short discussion of past and present systems of management in the lodgepole pine region of the Northwest.

Life history of shortleaf pine, W. R. MATTOON (*U. S. Dept. Agr. Bul. 244 (1915), pp. 46, pls. 10, figs. 12*).—A detailed account of the shortleaf pine (*Pinus echinata*) with reference to distinguishing characteristics, geographical and economic range, character of stands, size, age, and habit, demands upon soil and climate, light requirements, reproduction, growth, causes of injury, and yield.

The uses of Cornus wood, W. DALLIMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 4 (1915), pp. 179–181*).—This comprises notes on the commercial uses of various species of Cornus wood.

Ash manna, G. MAROGNA (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 7 (1915), No. 2, pp. 77–145*).—An account is given of the production, composition, and adulteration of ash manna. Chapter 1 discusses the culture of ash trees, including information relative to varieties, climatic and soil requirements, cultural practices, harvesting, commercial quality, uses, and consumption of manna.

The succeeding chapters deal with the chemical composition and adulteration of manna and methods for analyzing manna. The paper concludes with a bibliography of the subject.

Memorandum on the oil value of some sandalwoods from Madras, P. Singh (*[Indian] Forest Bul. 6 (1911), pp. 11*).—Analyses were made of 15 different specimens of sandalwood from trees growing on different kinds of soil. The results obtained appear to confirm the popular belief that the wood of sandal trees growing in dry, rocky, mountainous soil is richer in oil than that of the trees found in the more fertile soils of the plains.

A further note on the oil value of some sandalwoods from Madras, P. Singh (*Indian Forester, 41 (1915), No. 4, pp. 123–131*).—In continuation of the above noted work, analyses were made of 44 samples of roots and stems of sandalwoods collected from different localities with special reference to variation in oil content.

The results of these analyses, as here presented, indicate that neither elevation, age, nor locality has any definite relation to the oil content of the wood. The only factor which appears to affect the percentage of oil is the soil. This conclusion confirms the previous findings that the trees growing in comparatively good, fertile soil yield heartwood poorer in essential oil than those growing in poor, rocky, gravelly soil.

Prevention of decay in mill timbers, F. J. Hoxie (*Trans. Nat. Assoc. Cotton Manfrs., No. 96 (1914), pp. 270–292, figs. 8*).—A paper on this subject, with a discussion following in which attention is called to the increasing prevalence of dry rot and other fungus troubles in mill timbers after construction. This is believed to be due largely to the substitution of inferior grades of timber.

The author concludes that specifications for hard pine mill timber based on physics and chemistry are needed in place of the present botanical names which have little significance. Density and resin are suggested as indices of good qualities. Of the several antiseptic treatments which have a record over years of practical service kyanizing with corrosive sublimate appears to be best adapted to mill timber. Other newer materials, such as the fluorin compounds, give promise of usefulness but have not been submitted to long practical tests.

DISEASES OF PLANTS.

Report of the phytopathological institute at Wageningen, 1912, J. Ritzema Bos (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch. [Wageningen], 7 (1914), No. 2–3, pp. 25–100, pl. 1*).—This report deals with the activities of the institute during 1912 in connection with plant injuries of inorganic source as well as those caused by bacteria, fungi, etc., also injuries due to animals or of undetermined causation.

Report of the botanical laboratory and laboratory for plant diseases, L. Linsbauer, F. Zweigelt, and H. Zuderell (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1913–14, pp. 162–186, pl. 1, figs. 3*).—This report includes information obtained during 1913 regarding diseases of pomaceous and stone fruits, grapes, and berry crops, and also on soil infection by plant and animal micro-organisms in the vicinity.

Notes are given on the reaction of plant cells to plant lice.

[Plant diseases in Mauritius], F. A. Stockdale (In *Summary of Investigations Made during the Period July 1 to November 30, 1914. Mauritius: Dept. Agr., 1914, pp. 1, 2*).—Among sugar cane diseases, deterioration of the white Tanna variety was ascribed to a bacterium of a species as yet undetermined. Red rot (*Colletotrichum falcatum*) is again reported, from a locality in a district previously affected, attacking the white and striped Tanna varieties only.

Leaf disease of coffee was controlled with Bordeaux mixture.

Leaf diseases of tomatoes have been reported, and a fruit disease ascribed to a species of Glœosporium has been under investigation.

No definite results have yet been obtained from a study of a disease which causes the dropping of young peaches.

The transmission of rusts in general and Puccinia malvacearum in particular, S. Buchet (*Bul. Soc. Bot. France, 60 (1913), No. 6, pp. 520–524, 558–565*).—This is a critical review of results and conclusions of Eriksson (E. S. R., 14, p. 770) and Blaringhem (E. S. R., 31, p. 841) regarding the wintering-over of rusts.

Smuts and rusts of grain crops, J. E. Howitt and R. E. Stone (*Ontario Dept. Agr. Bul. 229 (1915), pp. 24, figs. 15*).—Popular descriptions are given of smuts and rusts of grain crops, together with suggestions for their control so far as definite means are known.

On the appearance of spores and mycelium of rust within the grains of cereals, J. Eriksson (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 17, pp. 1194–1196*).—Referring to an article by Beauverie on the presence of rust spores in seeds of cereals (E. S. R., 30, p. 241), the author calls attention to the fact that he had already reported their occurrence in 1896, but that he considers their presence abnormal and not of practical importance in the propagation of the rusts. A similar position is taken regarding Pritchard's report of their occurrence in wheat (E. S. R., 26, p. 143).

The efficiency of rust spores contained in seed of grain for the propagation of disease, J. Beauverie (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 17, pp. 1196–1198*).—Reviewing his own investigations (E. S. R., 30, p. 241) and citing other data, the author considers that the evidence favors the hypothesis that spores within the seed coats of cereals and grasses aid in disseminating rust epidemics. He thinks, however, that if this is not already demonstrated there should be controlled investigations carried out to determine the rôle of the intraseminal spores on the wintering of cereal rusts.

Foot rot of cereals, A. Desmoulins (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), Nos. 41, pp. 381–383; 42, pp. 394–399*).—Discussing the various factors, conditions, and characters associated with foot rot of cereals, the author states that this trouble is of complex and as yet incompletely determined causation. It is recommended that late varieties be employed, these being planted as late as possible and not very thickly, that close rotation of cereals be avoided, that early or rank growth be checked by grazing, etc., and that an active fertilizer be supplied in early spring.

Rusts and smuts of Indian corn (*Agr. News [Barbados], 14 (1915), No. 335, pp. 78, 79*).—Discussing briefly rusts and smuts of maize in the West Indies, the author states that *Puccinia purpurea* has not been met with in this connection. but that *P. sorghi* (*P. maydis*) was noted on maize in one locality. Species of Oxalis are not uncommon, members of this genus being subject to attack by the æcidial stage of the fungus in Africa.

Ustilago maydis has not assumed very serious proportions. *Sphacelotheca reiliana* has not yet been noted on maize in this region.

A preliminary investigation on a disease of red clover, P. Baccarini and G. Bargagli-Petrucci (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 11 (1914), No. 2, pp. 23–96, pl. 1, figs. 12*).—The abnormal appearance and structural peculiarities shown by clover affected by a disorder appearing in the valley of the Elsa are described, and the fungi, bacteria, nematodes, etc., found in this connection are discussed. After outlining some infection and other studies carried out therewith, the authors sum up this preliminary study by stating that while investigation has brought into view a number of injurious factors in connection with this progressive deterioration of clover, the fundamental cause of the trouble has not yet been determined.

A bacterial disease of cultivated mushrooms, A. G. Tolaas (*Phytopathology, 5 (1915), No. 1, pp. 51–54, pl. 1*).—An account is given of a disease of mushrooms observed in caves in and about St. Paul, Minn.

An examination of discolored portions of the mushrooms showed the presence of bacteria, which were isolated, the causal organism being a facultative anaerobe of the Pseudomonas type, corresponding to *Bacterium fluorescens* except for the fact that in dextrose broth the reaction is acid instead of alkaline. Some experiments were conducted for the control of the disease, spraying with a number of solutions and fumigating with sulphur being tested.

The fumigation of the mushroom beds with sulphur before planting the spawn gave absolutely clean mushrooms. This treatment, it is said, costs about 5 cts. per 1,000 cu. ft. and has proved entirely practical.

A common but very serious potato disease in Cuba, R. A. Jehle (*Modern Cuba, 3 (1915), No. 4, pp. 46–48*).—A description is given of the late blight or downy mildew, caused by *Phytophthora infestans*, with suggestions for its control.

Experiments in preventing wart disease of potatoes (*Jour. Bd. Agr. [London], 21 (1915), No. 12, pp. 1126–1128*).—In a previous publication (E. S. R., 31, p. 842) the use of formaldehyde for the control of the wart disease of potatoes (*Chrysophlyctis endobiotica*) was recommended. During the summer of 1914 experiments were carried on in a number of places in England to test the value of this treatment, but with unsatisfactory results.

Comparisons were made between formaldehyde solution, corrosive sublimate, fertilizing with sulphate of potash, kainit, salt, superphosphate, etc. These experiments were carried out on land that was known to be badly infected with the fungus, but very little difference was observed so far as the amount of disease was concerned. The plats treated with corrosive sublimate seemed to have had an increased amount of disease.

Experiments on the virulence of Bacillus solanacearum against different Nicotiana species and varieties, J. A. Honing (*Bul. Deli Proefstat. Medan, No. 2 (1914), pp. 15*).—In continuance of previous work (E. S. R., 28, p. 446) the author studied the alleged immunity of *N. rustica*, claimed by Uyeda (E. S. R., 18, p. 151) to be resistant to bacterial wilt.

Of 200 plants (10 each of 20 types) of *N. rustica* inoculated with *B. solanacearum*, all but one died (a result, moreover, practically duplicated in 6 other species), showing that in Deli, at least, *N. rustica* is nonresistant and useless for hybridizing purposes. No variety of *N. tabacum* proved to be really immune, and only 3 varieties (2 from Manila and 1 Japanese variety) were less affected than were most species of Deli tobacco.

Experiments with plants from seed from widely separated regions showed that the introduction of a larger quantity of bacteria, with their excretion products, reduced the inoculation period greatly and was more fatal, the few plants which resisted (10 out of 278) being inoculated by means of a capillary tube and hence with fewer bacteria. These and other observations raise the question as to whether in a fresh culture all or only a portion of the bacteria are virulent.

It is thought that in Deli the differences in climate and in cultivation are in favor of a greater virulence of *B. solanacearum*, also that foreign varieties seem to promise no better hope of producing resistant varieties than does Deli tobacco itself.

Two new species of fungi in tobacco seed beds, P. A. Saccardo and B. Peyronel (*Bol. Tec. Coltiv. Tabacchi [Scafati], 13 (1914), No. 1, pp. 3–6, pl. 1*).—

Descriptions are given of *Glœopeziza turricula* n. sp. and *Hyalopus geophilus* n. sp., which have been found occurring in the soil of tobacco seed beds, from which they attack the tobacco plants, sometimes causing serious loss.

A review of investigations of the mosaic disease of tobacco, together with a bibliography of the more important contributions, H. A. ALLARD (*Bul. Torrey Bot. Club, 41 (1914), No. 9, pp. 435–458*).—This review and bibliography of mosaic disease of tobacco, under its various names, covers investigations from 1886 to 1914, concluding, with the author's own report already noted (E. S. R., 30, p. 450).

Fire blight, W. H. BRITTAIN (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 23 (1915), pp. 10, figs. 2*).—A popular description is given of the fire blight of pears, apples, and occasionally quinces, caused by *Bacillus amylovorus*, with directions for its control. In addition to the trees mentioned above it is known to affect also hawthorn, June berry, and mountain ash.

Fungus and other diseases of the apple and pear, G. P. DARNELL-SMITH and E. MACKINNON (*Agr. Gaz. N. S. Wales, 25 (1914), No. 12, pp. 1037–1044, pls. 6; 26 (1915), Nos. 1, pp. 51–57, pls. 2; 2, pp. 105–113, pls. 10*).—Descriptions and, so far as definite methods are known, suggestions for control are given of canker, bitter rot, Phyllosticta canker, Nectria canker, blight, mildew, crown gall, bitter pit, apple scab, pear scab, black rot, spray injury, frost band, chlorosis, etc.

The toxic action of sulphurous anhydrid on olive blooms, L. PETRI (*Studi sulle Malattie dell'Olivo, VI. Rome: R. Staz. Patol. Veg., 1914, pp. 65–76, pl. 1, fig. 1*).—Continuing previous studies (E. S. R., 30, p. 245), and noting here the results of tests carried out under controlled conditions as regards temperature, moisture, and sulphur dioxid content, the author states that this gas in the concentration of about 1:16,000, while not necessarily hurtful to other parts of the plant, is directly and rapidly injurious to the olive stigma at a relative humidity of 75 to 80 per cent, this effect, however, being lessened by relative dryness of the stigmatic papillæ. Pollen shows much higher resistance to this gas, sepals and petals showing either about the same resistance as do the young leaves, or somewhat less.

The fungus of peach mildew, N. WORONICHINE (*Bul. Trimest. Soc. Mycol. France, 30 (1914), No. 3, pp. 391–401*).—Discussing related literature and detailing his own studies in regard to *Sphærotheca pannosa*, causing mildew of roses and peaches, the author concludes that the biological and morphological divergencies noted are sufficiently great to warrant the separation of this species into the varieties *rosæ* and *persicæ*, corresponding, respectively, to the host attacked by each.

A disease of gooseberry new to Italy, C. GREPPI (*Riv. Patol. Veg., 7 (1914), No. 4, pp. 97–99*).—This is a brief note on the outbreak of *Sphærotheca mors-uvæ* in England and parts of Europe, it appearing at points in Italy in 1913 and 1914, with discussion of measures for its control.

The influence of the medium and of atmospheric factors upon the development of downy mildew, L. MOREAU and E. VINET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 34, pp. 225–235*).—The authors detail and discuss recent observations on downy mildew of the grape, regarding variations in virulence of the parasite and in susceptibility of the host, and the influence of the medium and of atmospheric agents upon the development of the fungus. They discuss also, in this connection, the significance as regards spraying, etc., of these considerations and of recent observations on the temporal and causal relations of the outbreaks with the other phenomena.

Downy mildew and copper sprays, G. Héron (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 35, pp. 258–263*).—The author gives some results of practical experience in combating Peronospora in his own vineyard.

Complete or combined treatments were found to be comparatively inexpensive in comparison with the results obtained. Copper acetate and copper sulphate may be used separately or together. High pressures applied to spraying fluids sufficient to reduce the liquid practically to a fog are found to give more complete access to all portions of both stocks and clusters than do lower pressures.

Spraying in relation to flowering, L. Lebrun (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 23, pp. 711, 712*).—It is stated that in 1913 the injurious effects of copper acetate used as spray on grapevines appeared to be accentuated by the tender condition of the vines owing to their rapid growth and the humidity prevalent at the time of flowering.

Death of mulberry, L. Montemartini (*Riv. Patol. Veg., 7 (1914), No. 3, pp. 65–74*).—A discussion, with bibliography, is given of a fatal disease appearing in a slow or rapid form in mulberry and receiving various local names in parts of France and Italy. A systematic inquiry has been instituted among agriculturists in Lombardy and neighboring territory.

Investigations in connection with cacao root disease, A. J. Brooks (*Rpt. Agr. Dept. St. Lucia, 1913–14, p. 8*).—Experiments are reported of an investigation on the Rosellinia disease of cacao, which show that the fungus can live on large pieces of cut branches such as are found after pruning shade trees in cacao plantations. Lime trees planted in an infected area are also liable to attack from the fungus.

Tests made of the fungicide known as "fungal" showed that it was without effect in controlling the disease. From the present information it appears that the only practical method of control is to surround the infected area with deep isolation trenches, thoroughly liming the infected soil, and burning the diseased wood on the spot.

The mycoplasma theory of Eriksson, Gertraud Haase-Bessell (*Ber. Deut. Bot. Gesell., 32 (1914), No. 6, pp. 393–403*).—The author reports having noted, in case of *Althæa rosea* showing typical hollyhock rust not derived from the so-called mycoplasm of Eriksson (E. S. R., 25, p. 850), the plentiful occurrence of structures apparently corresponding to the secondary promycelia of that author.

A bibliography is appended.

A new disease of chestnut, F. Cavara (*Riv. Patol. Veg., 7 (1914), No. 1, pp. 1–5, figs. 2*).—The author describes a disease affecting the lower portions of young chestnut plants, as due to an organism found in connection therewith, which receives the name *Bacterium castanicolum* n. sp.

Bibliography of the chestnut bark disease, R. K. Beattie (*Penn. Chestnut Tree Blight Com. Rpt. 1913, pp. 97–122*).—A bibliography of publications relating to the bark disease of chestnut to the end of 1913 is given, about 400 references being included.

A disease of pines caused by Cronartium pyriforme, G. G. Hedgcock and W. H. Long (*U. S. Dept. Agr. Bul. 247 (1915), pp. 20, pls. 2, fig. 1*).—The authors give a detailed account of their investigations on the fungus *C. pyriforme*, which causes a disease of pines and has for its alternate host plant *Comandra umbellata*.

This fungus is widely distributed throughout the United States and causes considerable injury to different species of pines, being particularly injurious to pines growing in nurseries.

For the eradication and control of the fungus, attention should be given to nurseries, and all diseased pines destroyed, so far as possible. At the same time it will be necessary to eradicate the Comandra plants in the vicinity of the nursery beds. Spraying these plants with poison substances, it is thought, might prove efficient so far as nursery control is concerned, but under forest conditions this would probably be too expensive. It is recommended that in badly infected areas all diseased trees should be cut out and destroyed wherever possible, and in lumbering, trees showing cankers of the fungus should not be left for seed trees.

A bibliography of literature referred to is given.

A fungus disease of Hevea in the plantations of Bakusu, VERMOESEN (*Bul. Agr. Congo Belge, 5 (1914), No. 2, pp. 312–321*).—Notes are given of a number of diseases observed in a preliminary survey of the Para rubber plantations at Bakusu.

Root diseases due to *Fomes semitostus* and similar parasites were found to be causing considerable loss. A trunk canker or die-back due apparently to *Diplodia cacaoicola* was also troublesome. A number of other parasitic or saprophytic fungi were noted, among them an undetermined fungus near Hypocrella and a species of Cephaleuros occurring on the leaves. A species of Glœosporium was also found present on branches.

Suggestions are given for the control of the different diseases.

Disease of Para rubber trees in the gardens, W. R. RUTTER (*Ann. Rpt. Bot., Forestry and Sci. Dept. Uganda, 1914, p. 4*).—The occurrence of fungus diseases due to *Fomes semitostus* and *Hymenochæte noxia* on Para rubber trees in the botanical gardens is reported. The fungi were traced to old tree stumps and decaying timber left on the land not properly cleared of forest trees.

From experiments noted in a previous report (E. S. R. 30, p. 850), trenching about the trees and the use of lime has been found efficient in keeping the fungus from spreading.

Root disease of Para rubber caused by Sphærostilbe repens, F. T. BROOKS (*Agr. Bul. Fed. Malay States, 3 (1914), No. 2, pp. 40–43*).—The author states that during 1914 several rubber trees were found to have been attacked by the fungus *S. repens*. The trees usually show thin foliage and the branches gradually die back. If the roots are examined the disease may be readily distinguished from those caused by *Fomes semitostus* and *Hymenochæte noxia* by the absence of external mycelium and by the presence of characteristic mycelial strands or rhizomorphs between the bark and the wood. It is sometimes claimed that this fungus is saprophytic, but the author states that he has traced it into living tissues where it is undoubtedly acting as a parasite.

Planters are advised to cut out and burn all trees affected by this fungus. While there is said to be no evidence that the fungus spreads by means of subterranean strands to neighboring trees, it is recommended that trenches should be dug about the affected trees to prevent any possibility of underground infection.

Study of Bordeaux mixture, L. SICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), Nos. 33, pp. 211–217; 34, pp. 235–241; 35, pp. 263–266; 36, pp. 289–291; 37, pp. 304–309; 38, pp. 323–327*).—A report on a study of the preparation and use of Bordeaux mixture, the reactions and qualities corresponding to given compositions and to changes therein, and the practical preparation and employment of this fungicide under conditions obtaining in the vineyard.

Adherent fungicides, V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 18, pp. 561, 562*).—The authors describe two adherent fungicides, one composed of copper acetate to which gelatin is added, and the other of Bordeaux mixture containing casein.

For the preparation of the casein it is suggested that 50 gm. of powdered casein be added to 100 gm. of freshly slaked powdered lime mixed with a small amount of water in the form of a paste. After this has stood for a short period, an additional amount of water may be added until about a liter of liquid is obtained. This is then added to the Bordeaux mixture and is said to increase its adhesiveness very greatly.

In order to obtain the best results with these fungicides the authors recommend that the nozzle should be held as close to the plants as possible. In spraying grapes for downy mildew the clusters should be well covered with the fungicide.

Wetting sprays, V. VERMOREL (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 32, pp. 180–182*).—Gelatin has been found to confer upon sprays containing it an excellent spreading and wetting capacity and perfect adherence. Casein proves to be one of the best agents for increasing the wetting capacity of a spray, and to leave almost entirely intact the chemical composition of the copper precipitate, which it is adapted to distribute and fix upon the leaves.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Ninth International Congress of Zoology, held at Monaco, March 25–30, 1913 (*IX. Cong. Internat. Zool., 1913, pp. 928, figs. 178*).—The proceedings of the ninth congress are here presented, the papers being given under the following sectional headings: Comparative anatomy and physiology (pp. 137–268); cytology, general embryology, and protistology (pp. 271–433); systematic zoology and habits of animals (pp. 437–541); general zoology, paleozoology, and zoogeography (pp. 545–595); biological oceanography and plankton (pp. 599–620); applied zoology and parasitology—museums (pp. 623–696); entomology (pp. 699–812); and nomenclature (pp. 815–915).

Zoological record, D. SHARP (*Zool. Rec., 50 (1913), pp. XII+[1328]*).—This volume (E. S. R., 31, p. 56) records the zoological literature relating chiefly to the year 1913, but includes entries for 1901–1912 that were received too late for inclusion in the previous volumes.

Infection of man with Bacterium tularense, W. B. WHERRY and B. H. LAMB (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 331–340, pl. 1*).—"A case of ulcerative conjunctivitis and lymphadenitis in man is shown to be caused by a minute, capsulated bacterium in all probability identical with *B. tularense*, which was first discovered by McCoy and Chapin in a plague-like disease of the California ground squirrel] (*Citellus beecheyi*) [E. S. R., 26, p. 461]. . . . Our findings would seem to indicate that this disease is widespread among rodents. Further, we wish to call attention to the fact that this recently discovered disease of rodents is apparently sufficiently virulent for gray mice (*Mus musculus*) to warrant the presumption that it may some day take its place along with *B. pestis* as a menace to man."

A new bacterial disease of rodents transmissible to man, W. B. WHERRY (*Pub. Health Rpts. [U. S.], 29 (1914), No. 51, pp. 3387–3390*).—The plague-like disease of rodents previously described by McCoy (E. S. R., 25, p. 249), and found by McCoy and Chapin (E. S. R., 26, p. 461) to be due to a new bacillus (*Bacterium tularense*), has been discovered by the author and B. H. Lamb to be transmissible to man.

Two cases have thus far been observed, both at Cincinnati, Ohio, one a meat cutter, the other a farmer's wife. It was suspected that the disease had been transmitted from wild rabbits since they are the chief variety of wild game sold in the markets and because of reports of hunters that wild rabbits in

Indiana and Kentucky were dying in large numbers. Examinations made of two rabbits found dead on a farm near Vevay, Ind., four miles from where one of the cases came from, showed the gross lesions of the disease and were proved by guinea pig inoculations and bacteriologic examinations to be infected with *B. tularense.*

The author states that at the time of writing he is engaged in testing out rabbits from Kentucky and Ohio which are in all probability also affected with the same disease; he is inclined to conclude that this rodent disease is widely distributed and that extensive epizootics among wild rabbits occur frequently. "While the human cases on record were both individuals who had handled and dissected wild rabbits and were both cases of conjunctivitis it seems possible that infection may occur through less direct channels and that other types of infection in man may occur. On the basis of animal experiments it seems possible that ulcerative rhinitis, ulcerative or membraneous sore throat, gastro-intestinal infection, or lymphadenitis secondary to cutaneous infection may occur. Susceptible rodents may be infected by feeding and by the introduction of infectious material into the eye or nose or upon an abrasion of the skin. Experiments on transmission by contact or association have failed in the case of guinea pigs and ground squirrels but a recent experiment was successful in the case of rabbits."

It is pointed out that rodent fleas may possibly convey the infection to man since McCoy and Chapin succeeded in transmitting it among ground squirrels twice by means of 100 to 500 squirrel fleas, respectively.

Discovery of Bacterium tularense in wild rabbits and the danger of its transfer to man, W. B. Wherry and B. H. Lamb (*Jour. Amer. Med. Assoc., 63 (1914), No. 23, p. 2041*).—A detailed report of the occurrence of this plague-like disease in the two rabbits mentioned in the paper noted above.

Color key to North American birds, F. M. Chapman (*New York: D. Appleton & Co., 1912, rev. ed., pp. X+356, figs. 840*).—This work, prepared with a view to aiding in the identification of the bird in the bush, consists of an introduction, synopsis of orders and families of North American birds, color key to North American birds, and a systematic table of North American birds. An appendix contains a faunal bibliography (pp. 305–331).

Common corn insects, R. L. Webster (*Iowa Sta. Circ. 23 (1915), pp. 16, figs. 15*).—This is a popular account of the insect enemies of corn in Iowa.

Katydids injurious to oranges in California, J. R. Horton and C. E. Pemberton (*U. S. Dept. Agr. Bul. 256 (1915), pp. 24, pls. 5, figs. 16*).—This bulletin reports studies conducted with two species of katydids, the fork-tailed katydid (*Scudderia furcata*) and the angular-winged katydid (*Microcentrum rhombifolium*).

The amount of injury caused by *S. furcata* increased considerably from 1910, when it first came to attention, until 1912, when it caused a loss in several orchards of a full fourth of the crop. A single katydid may destroy several small oranges in a day, the orange once attacked being invariably rendered unfit for sale. The young katydids are on the trees and actively feeding and the injury usually begins about the time the petals are dropping. The blossom buds are sometimes attacked, a hole being gnawed through the petals to reach the pistils and ovary, which are often destroyed in a considerable number of blossoms. The injured oranges usually have been more than one-third destroyed, or have received one or more holes large enough to admit the head and thorax of the slender katydid nymphs, these holes often extending entirely through the orange. At picking time many of these damaged fruits are conspicuous owing to the clean-cut circular holes in the rind, which vary from the size of a dime to about that of a silver dollar.

The bulletin includes an account of the food plants, life history, and habits, with technical descriptions of the several stages of these katydids.

A small chalcidid belonging to the genus Anastatus is the only enemy of the egg discovered during the investigation. This parasite is much more effective in checking the angular-winged katydid than *S. furcata* in orange groves in the San Joaquin Valley.

The angular-winged katydid, while much less important, is also responsible for a certain amount of injury to orange trees. The first instar nymphs of *M. rhombifolium* feed principally, if not wholly, upon the leaf surface, removing merely a chlorophyll layer. Later stages gnaw clear through the leaves, filling them with ragged holes and destroy a larger amount of foliage in proportion to their number than does the fork-tailed katydid. It has never been observed to attack blossoms or fruit. The eggs of this species are also attacked by *Anastatus* sp., it being estimated that 80 per cent or more of all eggs deposited are destroyed.

Spraying experiments conducted and here reported have led to the recommendation of two applications of arsenite of zinc at the rate of 2 lbs. per 100 gal. of water, or two applications of arsenate of lead at the rate of 4 lbs. per 100 gal. of water. The first application should be made, at the latest, immediately after most of the petals have fallen; the second application, from 10 days to two weeks after the first. "If it seems desirable to spray for the citrus thrips also, lime-sulphur should be added to the above at the rate of 2 gal. per hundred, and a third application of lime-sulphur only, at the same dilution, should be made about two or three weeks after the second. The cost of spraying will vary somewhat according to size of trees, cost of labor, team hire, insecticides, etc., but with ordinarily good management will not exceed $5 per acre."

Control of the changa, S. S. Crossman and G. N. Wolcott (*Porto Rico Bd. Agr. Expt. Sta. Circ. 6 (1915), pp. 5*).—Experiments extending over a period of several years are said to have led to a very easy, cheap, and effective method of destroying this mole cricket (*Scapteriscus didactylus*), accounts of which by Barrett (E. S. R., 14, p. 885) and by Worsham and Reed (E. S. R., 29, p. 557) have been previously noted. This consists in the use of Paris green 2.5 to 3 lbs. to 100 lbs. of low grade flour. This mixture, when placed around the tobacco plant in a shallow trench about 1 in. deep and 3 in. from the tobacco plant at the rate of a heaping teaspoonful to the plant, results in practically 100 per cent stand. Broadcasting before planting at the rate of from 250 to 300 lbs. per acre was also effective. The cost, including labor, is said to amount to $8 to $10 per acre. This method can also be successfully employed in protecting other crops.

Aphids or plant lice attacking sugar cane in Porto Rico, T. H. Jones (*Porto Rico Bd. Agr. Expt. Sta. Bul. 11 (1915), pp. 19, pls. 2*).—This bulletin presents brief accounts of two species of plant lice that attack sugar cane in Porto Rico, namely, *Sipha flava*, to which the name "yellow sugar cane aphis" is applied; and *Aphis setariæ*, to which the name "brown sugar cane aphis" is given. *S. flava* occurs on the under surface of the cane leaves, especially those which have begun to bend over, while *A. setariæ* occurs at the junction of the leaf sheaths and leaf blades of young cane on the lower surface and on either side of the midrib.

Observations and experiments on the San José scale, S. A. Forbes (*Illinois Sta. Bul. 180 (1915), pp. 545–561, figs. 3*).—A brief note is given on the life history of the San José scale, including a diagram of annual generations descending from one hibernating female, followed by a report of tests of orchard sprays. The work is summarized as follows:

"Experiments with infested ripe apples show that the San José scale may live and reproduce freely on such fruits plucked from the tree and kept at ordinary room temperatures, and that living young may continue to be born under such conditions during a period of eight weeks. Infested apples taken from cold storage in December gave similar results, young being produced on these apples for 25 days.

"Exact breeding experiments conducted at Urbana in 1906 in a way to distinguish throughout the season the descendants of the first born from those of the last born of each generation, gave two successive generations of the last-born series in the complete year and four such generations of the first-born series. A computation based on data thus obtained yielded a possible rate of multiplication under optimum conditions of 32,791,472 to 1 for the year. This total is only the ninety-eighth part of that of other investigators, who took no account of diminished numbers of generations produced by late-born individuals.

"Spraying operations with various preparations of lime and sulphur and with two brands of miscible oils justify the usual preference for the sulphur solutions, especially because of their more prolonged effect when applied in spring. The homemade solutions were equally effective with those ready-made, requiring only dilution for use. These experiments also illustrate the great advantage of early spraying. before an orchard becomes heavily infested, and furnish evidence that spraying in spring is much more effective than spraying in fall, the ratios of benefit being some 20 per cent greater. The possibility of redeeming and restoring a badly infested orchard and maintaining it in good condition, with one or two sprayings a year, was well established by these operations."

Food plants of the gipsy moth in America, F. H. Mosher (*U. S. Dept. Agr. Bul. 250 (1915), pp. 39, pls. 6*).—This is a report upon investigations conducted during the years 1912, 1913, and 1914, with a view to determining the favorite food plants of the gipsy moth. A brief statement is given of the results secured with each plant tested. The work leads to a division of the food plants into four classes: (1) Species that are favored food for the gipsy moth; (2) species that are favored food for the gipsy moth after the early larval stages; (3) species that are not particularly favored, but upon which a small proportion of the gipsy moth larvæ may develop; and (4) species that are unfavored food for the gipsy moth. The species in the first of these classes are at present the dominant species in the woodlands in the area now infested with the gipsy moth, but the encouragement of coniferous growth is recommended, provided the class (1) trees can be eliminated.

The sugar cane moth stalk borer (Diatræa saccharalis), T. H. Jones (*Porto Rico Bd. Agr. Expt. Sta. Bul. 12 (1915), pp. 30, pls. 3, fig. 1*).—A summarized account of this borer, which is distributed throughout Porto Rico, its biology, control measures, etc. A report of investigations of the injury by this pest in Porto Rico by Van Dine has been previously noted (E. S. R., 27, p. 659).

Two parasitic enemies occur in Porto Rico, one an egg parasite (*Trichogramma minutum*), the other a tachinid fly, probably *Hypostena* sp. A parasitic fungus (*Cordyceps barberi*) attacks the larva and pupa.

"The preventive methods of control advised to reduce injury by the borer include planting of noninfested seed, simultaneous planting and harvesting of large areas of cane land, and clean cultivation before and after planting. The remedial measures of control include the collection of egg clusters and the cutting out of dead hearts. The burning of trash as a means of reducing injury is not to be recommended and the use of trap lights as a means of capturing the adults does not seem advisable. At the time of harvesting, all stalks cut in the field should be taken to the mill and ground in order that the numbers of the larvæ and pupæ be reduced."

A bibliography of 14 titles is included.

American plum borer, E. B. BLAKESLEE (*U. S. Dept. Agr. Bul. 261* (*1915*), *pp. 13, pls. 3, fig. 1*).—A report of biological studies of *Euzophera semifuneralis* conducted during 1913–14.

This lepidopterous borer appears to prefer trees that are in a somewhat weakened condition, such as those partially girdled by the disease commonly known as collar blight or mechanically injured by frost. Without injury of some sort to its host plant the borer rarely succeeds in establishing itself, and entirely healthy and uninjured trees are in little danger from its attack. Where a tree has suffered injury the work of this borer may, in many cases, considerably shorten its life. Beginning at some scar, wound, or crevice, where a bark scale offers partial protection, the larva works its way back into the living tissue, in broad, shallow, irregular galleries just beneath the bark. It has been found feeding upon plum, peach, cherry, Chinese plum (*Prunus simoni*), Kieffer pear, mountain ash, persimmon, apple, and Russian mulberry. The author has found it equally abundant on plum, cherry, peach, and apple.

The insect is known to occur in 21 different States as far separated as the District of Columbia, Arizona, and Washington. The species hibernates in the larval stage under the bark scales in a tough cocoon of white silk at the entrance of its feeding galleries. In the latitude of northern Virginia and the District of Columbia in a normal season pupation commences about April 1. In the latitude of Winchester, Va., the adults begin appearing the last of April or first of May. Oviposition commences in from one to three days after emergence, from 12 to 74 eggs having been deposited by moths kept under observation in the laboratory. At Winchester during 1913 eggs deposited the latter part of April and early May required from 8 to 14 days for incubation. Eggs of the first generation apparently begin hatching the early part of May and of the second generation about July 1. Observations at Winchester of larvæ which hatched on May 7 showed a feeding period of 34 days, a prepupal period of 2 days, and a pupal period of 10 days.

The larva has a number of parasitic and predaceous enemies. Two parasites reared at Winchester have been determined as *Idechthis* sp. and *Mesostenus thoracicus*. The former was the more common, some 13.47 per cent having been parasitized by it. *Itoplectis marginatus*, *M. gracilis*, and *Pimpla* sp. were reared from borer larvæ at Fort Valley, Ga., in 1905, and *Tenebrioides corticalis* has been taken feeding upon them.

It is thought that this borer will probably never become a pest of more than ordinary importance, except in occasional isolated cases. When the ordinary precaution of cutting away the dead bark and painting the wounded areas is followed, this may be regarded as sufficient for the control of the borer. Where the borer has established itself already, the cutting out method is the only one that can be followed.

A bibliography of 12 titles is included.

Douglas fir pitch moth, J. BRUNNER (*U. S. Dept. Agr. Bul. 255* (*1915*), *pp. 23, figs. 10*).—It has been definitely determined that in the northern Rocky Mountain and Pacific coast regions the Douglas fir pitch moth (*Sesia novaroensis*) is responsible for at least 90 per cent of that damage to Douglas fir (*Pseudotsuga taxifolia*), known as pitch seams, gum check, windshake, etc., and the same species appears to be responsible for the similar depreciation in timber that occurs in the southern Rocky Mountain district.

The loss occasioned by the work of this class of insects causes the difference in price between absolutely clear lumber and the lower grades. They work in a portion of the trunk which later clears itself of branches, hence only logs are affected which, were it not for previous infestation by them, would yield only the better grades of lumber. Douglas fir sawyers estimated a general loss in the entire Douglas fir product of between 7.5 and 15 per cent due to pitch seams. The depreciation is lowest in the Rocky Mountain region and heaviest toward the coast, evidently corresponding to the respectively slower or quicker growth of the trees in the respective localities and to the relative scarcity or abundance of the moth in these regions.

The author presents an account of its life history and habits and of the nature of its injury. A period of three years is said to be required for the development from egg to adult, 30 days being required for the incubation of the egg and a similar period for the pupa. Two generations of larvæ may be found at any time of the year.

In determining control measures readily accessible areas were selected for detailed investigations. The results of the work are said to have made it evident that to accomplish any permanent good under general forest conditions it is best to extend control over large areas. "Destruction of the larvæ is the only remedy that can be used to reduce an infestation. When the infested pitch tube is located, it should be separated from the tree, the thus exposed larva killed, and to insure cleaner healing the ragged edges of the wound should be smoothed with a knife or small ax, after which they should be painted with creosote or a similar preparation, to prevent reinfestation by insects or fungi. The enlarging of the wound by the smoothing of its edges will also leave a pitch blister in the tissues, but the ultimate result will not be nearly as disastrous as from the untreated sesiid wound, since a clean healing from the inside obviates much of the chance of its producing a circular seam. Freshly vacated wounds might be treated the same way with profit."

The Hessian fly situation in 1915, F. M. WEBSTER and E. O. G. KELLY (*U. S. Dept. Agr., Office Sec. Circ. 51 (1915), pp. 10, figs. 5*).—This circular presents diagrams which illustrate the seasonal development of the Hessian fly from egg to adult twice during the year and a map showing approximate dates in the fall, in various parts of the country, after which, under normal meteorological conditions, wheat may be sown without exposing it to serious attacks by this pest.

House flies, L. O. HOWARD and R. H. HUTCHISON (*U. S. Dept. Agr., Farmers' Bul. 679 (1915), pp. 22, figs. 15*).—This bulletin, which supersedes Farmers' Bulletin 459 (E. S. R., 25, p. 762), gives particular attention to preventive and control measures.

Further 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. 245 (1915), pp. 22, pl. 1, fig. 1*).—This is a report of work carried on in continuation of that previously noted (E. S. R., 31, p. 653).

This bulletin deals with investigations of the larvicidal efficiency of both organic (anilin, beta-naphthol, cresylic acid, para-dichlorobenzene, formaldehyde, nitrobenzene, oxalic acid, and pyridin) and inorganic (arsenical dip, chlorid of lime, Epsom salts, lime-sulphur, and sulphuric acid) substances, together with bacteriological and chemical examinations of horse manure to which many of these substances were applied. Of the inorganic substances tested arsenical dip was the only one which when used in amounts considered practical destroyed the larvæ of the house fly. Of the organic substances anilin, pyridin, and nitrobenzene, when used in certain dilutions, gave satisfactory larvicidal results, but the cost precludes their use.

The larvicidal action of plant material containing saponin (corn cockle [*Agrostemma githago*] and agave [*Agave lecheguilla*]) and alkaloids (blackleaf 40, larkspur [Delphinium], stramonium [*Datura stramonium*], and hellebore [*Veratrum album* and *V. viride*]) was tested. Other plant material tested included oxeye daisy (*Chrysanthemum leucanthemum*) and pyrethrum (*C. cinerariæfolium*). Powdered hellebore proved the most efficient and practical of all the substances tested.

"Powdered hellebore, using 0.5 lb. to 10 gal. of water and applying this to 8 bu. of manure, is also an effective larvicide and exerts no injurious action on the fertilizing value of the manure as determined by bacteriological and chemical analyses, and no injurious action on plants has been detected in any of the field tests. Hellebore is used as an insecticide and is obtainable in most cities and agricultural districts. The cost of this treatment is 0.69 ct. per bushel of manure."

Borax, which was shown in the previous bulletin to be an effective larvicide, is obtainable in all parts of the country, and the cost of treating manure at the rate of 0.62 lb. of borax per 8 bu. is 0.42 ct. per bushel. "While borax may be applied to manure at the foregoing rate and the treated manure may be added to the soil at the rate of 15 tons to the acre without injuring vegetation, nevertheless excessive quantities of borax may be applied to manure through carelessness, and injury to vegetation may in consequence result. In the light of this year's experiments it seems advisable to recommend borax as a larvicide for the treatment of outhouses, refuse piles, and all other places where flies may deposit eggs. However, on account of the possible carelessness previously mentioned, and because large quantities of manure are sometimes used by truck growers, it seems best to guard against possible injury to vegetation by recommending powdered hellebore for the treatment of manure, since no injury can arise from the use of excessive quantities, as it is entirely decomposed in the course of the fermentation of the manure."

Plague and plague-like disease.—A report on their transmission by Stomoxys calcitrans and Musca domestica, N. E. Wayson (*Pub. Health Rpts.* [*U. S.*], *29* (*1914*), *No. 51, pp. 3390–3393*).—The author reports that the transmission of *Bacterium tularense* by bites of stable flies occurs, apparently, only from those animals having an advanced stage of the bacteremia. In two experiments where stable flies were allowed to bite the infected animal four times and the healthy animal four times death did not occur, but in two experiments where stable flies were allowed to bite an infected animal eight times and to bite a healthy animal eight times death resulted. Experiments are being conducted to determine the length of time that flies remain infective, the results thus far having been negative after 24 hours from the time of feeding. House flies fed on 48-hour-old viscera of an animal dead of the disease were found to convey the infection.

The cranberry rootworm, H. B. Scammell (*U. S. Dept. Agr. Bul. 263* (*1915*), *pp. 8, pls. 2*).—The cranberry rootworm (*Rhabdopterus picipes*) is the larva of a small brown chrysomelid beetle which has recently become a source of injury to the cranberry in New Jersey. Observations continued through a period of two years indicate that at the present time it is not a pest of prime importance on cranberry bogs, and that its ravages are not to be compared in severity to those of the cranberry girdler (*Crambus hortuellus*).

The chief injury is caused by the feeding of the larvæ on the roots and runners where the latter come in contact with the ground. As a rule only the bark is eaten from the large and secondary roots, the wood occasionally being attacked while the fibrous roots, which are so numerous as to form a dense mat an inch or more in thickness, are completely devoured. The beetles feed on the foliage and fruit. Although it is widely distributed throughout the United States, having also been recorded from wild grape, myrtle, and basswood, and observed by the author on blueberry and inkberry, previous to its discovery on cranberry it was not regarded as of economic importance. The injury occurs mainly on sandy lands or savannas, where the root system of the vines is not so extensive as on muck or peat bottoms.

"The beetles appear in numbers about the end of June, deposit eggs in the soil, and die before fall. The larvæ feed on the fibrous roots and bark of the larger roots until late fall, when they hibernate in cells formed in the soil. Some spring feeding of the larvæ occurs. Pupation commences early in June, the average duration of the stage being 14.5 days.

"No satisfactory practice in the use of the winter flowage or the spring reflowage to exterminate an infestation of larvæ or pupæ has been developed. Invigorating the vines by the application of fertilizers or sand promises excellent results."

A list of eight references to the literature is included.

The Calosoma beetle (Calosoma sycophanta) in New England, A. F. BURGESS and C. W. COLLINS (*U. S. Dept. Agr. Bul. 251* (*1915*), *pp. 40, pls. 8, figs. 3*).—This account is supplementary to that by Burgess, previously noted (E. S. R., 26, p. 350). Among the phases considered are methods of packing beetles for shipment, the native home of *C. sycophanta* and hosts attacked, equipment used for rearing predaceous beetles, data relating to the life history of *C. sycophanta*, natural enemies, colonization, dispersion, etc. This predaceous beetle has now become firmly established in New England and has already demonstrated that it is a very important factor in the control of the gipsy moth by natural enemies. The results of 1914 indicate that it is the most important single natural enemy of the gipsy moth. It continues to spread each year and in all probability will soon be present throughout the entire territory where the gipsy moth is known to occur.

The Parandra borer as an orchard enemy, F. E. BROOKS (*U. S. Dept. Agr. Bul. 262* (*1915*), *pp. 7, pls. 4*).—This paper relates to *Parandra brunnea*, a cerambycid which has attracted considerable attention during the past few years as an enemy of trees of several widely separated species and of chestnut telephone and telegraph poles. An account of its injury to telephone and telegraph poles by Snyder has been previously noted (E. S. R., 25, p. 51).

The characteristic injury of the insect to trees is in the form of a multitude of tortuous larval galleries extending through a more or less restricted portion of the trunk or larger branches. Its most destructive attacks usually occur in the trunk within a few feet of the ground, the work being followed quickly by decay of the affected wood and frequently by the breaking down of the tree at the point of greatest injury. Cultivated fruit trees are often injured, old apple, pear, and cherry trees being especially liable to attack. Hollow bases and decaying areas and cavities in the trunk and the consequent breaking and falling of weakened trees under the pressure of wind and snow are conditions quite commonly due in a large measure to the work of this insect.

Records indicate that it may be found over the greater part of temperate North America. It is one of several species of borers from which trees are in very little danger of injury as long as they are kept in sound and vigorous condition. It enters the wood from dead or decaying places on the surface and is probably never found in trees whose trunks and larger branches are entirely covered with healthy bark.

The eggs, which are placed in small punctures in the surface wood of dead spots, hatch in from two to three weeks. The larvæ mine throughout the wood for a period of probably three years, extending their galleries upward more frequently than downward. At French Creek, W. Va., in 1913 and 1914, pupation took place during the last of June and the first of July, from ten days to two weeks being required for transformation to adults.

The author has found the parasite *Odontomerus mellipes* to attack this borer in West Virginia. The first and most important consideration relative to preventing injury by this borer is the keeping of the trees in such condition of soundness that the beetles will not deposit eggs in them. Whenever the borers of this species gain entrance to a tree there is only one practicable way of removing them and that is to gouge or chisel out all the wood through which the burrows extend. After removing all the punctured wood and all the wood soaked with water or affected by decay or disease, the cavity should be sterilized by the application of creosote and filled compactly with a mortar made of one part of a good grade of Portland cement and three parts of clean, sharp sand.

The sugar cane weevil root borer (Diaprepes spengleri), T. H. Jones (*Porto Rico Bd. Agr. Expt. Sta. Bul. 14* (*1915*), *pp. 19, pls. 3*).—While this weevil root borer appears to be generally distributed throughout the island, the larvæ seem to cause most serious injury to cane in the lands on the south coast between Guánica and Aguirre. Injury is caused to the root system of sugar cane through pruning off the small roots and by tunneling into the root stocks, which stunts the growth and in cases of severe infestation results in the death of the plants.

"The eggs are laid in clusters between parts of the same leaf or of two leaves, the surfaces about the eggs being held together by an adhesive substance. In the field the eggs, for the most part, seem to be placed on sugar cane and various grasses. The larva or grub enters the soil immediately after issuing from the egg, and it is in this stage that the insect injures the root system of the cane. The pupa, the quiescent stage between larva and adult, occurs in an earthen cell in the soil. Notes on the length of time passed by the root borer in the soil as larva, pupa, and adult are not complete, but it appears that the beetles which develop from eggs laid at any one time are not themselves ready to deposit eggs until about a year later. Apparently there is an overlapping of generations. The beetles live for a considerable time, the females apparently longer than the males. One female collected in the field and kept in confinement remained alive from July 29 to November 8; another from August 15 to November 7. During this time the latter individual deposited 400 eggs."

The collection and destruction of the beetles and grubs is recommended as the best method of control thus far developed.

A brief account of this weevil by Van Dine has been previously noted (E. S. R., 30, p. 355), as has a systematic study by Pierce (E. S. R., 33, p. 360).

Cone beetles: Injury to sugar pine and western yellow pine, J. M. Miller (*U. S. Dept. Agr. Bul. 243* (*1915*), *pp. 12, pls. 5, fig. 1*).—Injury to seed of sugar pine throughout California and Oregon and of western yellow pine in the Pacific coast and southern Rocky Mountain regions, termed "blighted cones" and distinguished by the dying of immature cones soon after the starting of the second year's growth, is caused in large part by small scolytid beetles of the genus Conophthorus, particularly the sugar pine beetle (*C. lambertianæ*) and the western yellow pine cone beetle (*C. ponderosæ*). Accounts are given of these two beetles with observations of their biology and the nature and extent of their injury.

Observations indicate that from the last of August until the following May all the infestations within an area will consist of the broods of new adults which are overwintering within the blighted cones. Thus it is evident that if fallen infested cones from the trees which seed in a burned or cut-over area could be raked up and burned between September 1 and May 1, a very appreciable reduction of the infestation and damage might result. "In the case of sugar pine all infested cones will be found on the ground under the trees during this period and, when the conditions seem to warrant it, burning may be done without great expense. September, October, and November would be the more favorable months for the work, as winter snow and unfavorable conditions for burning will probably be found during the winter and spring.

"Seed collectors in locating areas for collecting may estimate the amount of cone-beetle damage on the trees by July 15, in some situations a month sooner, as the blighted cones by that time begin to stand out conspicuously on the trees. From these estimates the collector may determine whether or not the seed crop of the current year is too badly damaged to be profitably collected."

Porto Rican beekeeping, E. F. Phillips (*Porto Rico Sta. Bul. 15* (*1915*), *Spanish ed., pp. 28, pls. 2*).—A Spanish edition of the bulletin previously noted (E. S. R., 31, p. 354).

The silverfish; an injurious household insect, C. L. Marlatt (*U. S. Dept. Agr., Farmers' Bul. 681* (*1915*), *pp. 4, figs. 2*).—A revision of Circular 49 of the Bureau of Entomology, previously noted (E. S. R., 14, 374).

The entomogenous fungi of Porto Rico, J. R. Johnston (*Porto Rico Bd. Agr. Expt. Sta. Bul. 10* (*1915*), *pp. 33, pls. 9, fig. 1*).—The author here presents descriptions of the known entomogenous fungi of Porto Rico, based upon collections and observations commenced in 1910. These thus described are the aphis fungus (*Acrostalagmus albus*); the brown fungus (*Ægerita webberi*); the Aschersonia group, including the red fungus of the white fly (*A. aleyrodis*), the top-shaped Aschersonia (*A. turbinata*), the lemon-yellow fungus of the white fly (*A. flavo-citrina* and *Aschersonia* sp.); the mealy bug fungus (*Aspergillus flavus*); the green fungus of the grass worm (*Botrytis rileyi*); the shield scale fungus (*Cephalosporium lecanii*); the Cordyceps group; the Entomophthora group, including the brown-tail moth fungus (*E. aulicæ*), Empusa on mealy bugs (*Empusa fresenii*), and Empusa on the grass worm (*Empusa* sp.); the Gibellula spider fungus (*Gibellula arachnophila*); the Isaria group, including *Cordyceps barberi* and the white mealy bug fungus (*Isaria* sp.); the green muscardine (*Metarrhizium anisopliæ*); the black fungus of scale insects (*Myriangium duriæi*); the white headed fungus on scales (*Scoleconectria coccicola*); the red headed fungus on scales (*Sphærostilbe coccophila*); and the cinnamon fungus (*Verticillium heterocladum*).

A bibliography of ten titles relating to the subject is included.

Variation in Oxyurias: Its bearing on the value of a nematode formula, S. B. Fracker (*Jour. Parasitology, 1* (*1914*), *No. 1, pp. 22–30, fig. 1*).—The author finds that the proportionate size of the organs in Nematoda is an important factor in their identification and emphasizes the importance of stating it in the description of new species.

"The locations of the cephalic parts of the alimentary canal tend to vary from 1 to 4 per cent, about one-third of the maximum, in *Oxyurias vermicularis*. The location of the vulva probably varies at least 15 per cent in a long series of individuals. The location of the anus varies over 7 per cent, or about one-third of the length of the tail. Variations in width are so great that some individuals are over twice as wide as others. The length of the body of some individuals is one-third greater than that of others. The use of the formula is likely to yield more confusion than assistance. It is impossible to indicate the observed range, and without that the numbers are meaningless. Carrying the measurement to 0.1 per cent gives an appearance of accuracy which does not exist. The formula is likely to result in the multiplication of so-called species without a proper basis for their separation.

"A species should not be described as new on account of a deviation from the proportions of known species unless that deviation is great and fundamental. The space occupied by the reproductive organs should not be considered, and little dependence should be placed on the width of the body. From four to ten individuals should always be studied and the observed range recorded. In this way the varying proportions of the different species can be used in the identification of collected specimens. An individual should never be identified, however, on the basis of the formula alone or of the proportions alone."

FOODS—HUMAN NUTRITION.

Contribution to the knowledge of the ripening of meat, H. Kren (*Wiener Tierärztl. Monatsschr., 1 (1914), No. 12, pp. 585–589*).—Analytical data are reported regarding samples of meat kept in cold storage from 1 to 8 days. The results indicate, in the author's opinion, that the ripening of meat depends upon the hydrolytic cleavage of the protein.

Studies on the digestibility of milk and means of increasing it, L. Gaucher (*Bul. Gén. Thér. Méd. et Chirurg., 167 (1914), No. 14, pp. 371–381; abs. in Zentbl. Biochem. u. Biophys., 17 (1914), No. 1–2, pp. 29, 30*).—In the opinion of the author the difficulty experienced by individuals in digesting cows' milk is due to the coagulation of the casein in the stomach in large masses rather than in finely divided particles. He recommends that antirennet of calf or horse serum be added to the milk to secure the formation of a finely divided curd in the stomach, as the casein in this condition passes readily into the intestines for digestion.

The influence of milk feeding on mortality and growth, and on the character of the intestinal flora, L. F. Rettger (*Jour. Expt. Med., 21 (1915), No. 4, pp. 365–388*).—This paper reports a large number of feeding experiments with laboratory animals (chicks and rats), some of which have been previously noted (E. S. R., 33, p. 273).

No difference was observed in the relative value of ordinary sour milk and of the so-called bulgaricus product. The milk and lactose diet exerted a great influence upon the character of the intestinal bacteria in the case of both white rats and chicks which is attributed to the lactose contained in the milk, as other carbohydrates than lactose failed to exert this influence.

"The ingestion of foreign bacteria, even in large numbers, does not of itself bring about an elimination or displacement of the common intestinal microorganisms. Vastly more important is the influence of diet, especially milk and lactose. The feeding of Bulgara tablets or other preparations which contain as the supposedly active agent the bacillus of Metchnikoff and Mazé, without due regard to the use of milk, can, therefore, be of little, if indeed of any, value. The beneficial effects which it is claimed have been derived from the use of yoghourt, and other oriental sour milk products have in all probability been due to the milk as such, rather than to the bacteria which they contained."

The germicidal effect of lactic acid in milk, P. G. Heinemann (*Jour. Infect. Diseases, 16 (1915), No. 3, pp. 479–486*).—In the experiments here reported samples of sterile milk containing different concentrations of lactic acid were inoculated with *Bacillus coli*, *B. dysenteriæ*, *B. typhosus*, and *B. paratyphosus B*, and incubated. Bacteriological examinations of these samples were then made to determine the growth of the organisms.

From the results of these experiments the author concludes that, although resistant strains may survive, the growth of pathogenic bacteria in milk is unlikely in the presence of 0.6 per cent of lactic acid. "The smaller the initial amount of lactic acid, the more likely is the growth of acid-tolerant strains.

Consequently, the slower milk sours, the greater is the danger of pathogenic bacteria surviving."

The use of saccharose and invert sugar in the preparation of bread, J. JELÍNEK (*Ztschr. Zuckerindus. Böhmen, 39 (1915), No. 7, pp. 281–283*).—In this series of baking tests it was found that from 5 to 6.25 per cent of sugar may be satisfactorily incorporated in the dough for bread making, and that invert sugar may be used to as good advantage as cane sugar.

Wild plants used as food, K. KRAUSE (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 21, pp. 315–319*).—A number of species of plants used for greens, salad, and other table purposes are described.

Jams, A. McGILL (*Lab. Inland Rev. Dept. Canada Bul. 309 (1915), pp. 33*).—This bulletin reports the results of the analyses of 227 samples of jams purchased in various provinces of Canada. A discussion of the general character and adulteration of the samples is included.

Baking powders, A. McGILL (*Lab. Inland Rev. Dept. Canada Bul. 308 (1915), pp. 33*).—This bulletin contains the results of chemical analyses of 251 samples of baking powders purchased in various parts of Canada during the last three months of the year 1914. These results would indicate that cream of tartar baking powders are gradually being replaced by powders made with dried alum and calcium acid phosphate.

[Food inspection and analysis], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 3 (1915), No. 18, pp. 305–320*).—General information regarding pure food topics is given, together with specific information regarding a number of samples of different foods analyzed.

The electric cooking problem, R. E. FRICKEY (*Jour. Electricity, 34 (1915), No. 23, pp. 475–478, figs. 4*).—In this article is described a thermal storage cooker, the essential parts of which consist of a heat chamber, containing cast-iron radiators surrounded by the heating element, and above this a cooking chamber. Both chambers are surrounded by a heat insulating medium and a water jacket, suitably insulated, which acts as a hot-water reservoir. This reservoir is provided with an immersion water heater arranged for use as desired. Cost data are given for the preparation of standard daily menus, and compared with the results of a similar test with an ordinary range.

Electric cooking, mainly from the consumer's point of view, W. R. COOPER (*Inst. Elect. Engin. Jour., 53 (1915), No. 245, pp. 473–497; rev. in Elect. World, 65 (1915), No. 14, pp. 842, 843*).—The author, an electrical engineer, reports in detail the results of experience with electric cooking in his own home. Descriptions of the apparatus, recommendations as to improvements, and cost data are given. It is stated that the cost of electric cooking was about one-third greater than in years when coal was used. The paper is followed by a discussion.

Electric cooking and heating in private houses, W. A. GILLOTT (*Jour. Inst. Elect. Engin. [London], 53 (1914), No. 237, pp. 42–53; abs. in Sci. Abs., Sect. B—Elect. Engin., 18 (1915), No. 205, I, pp. 15, 16*).—Different types of apparatus are described and cost data and general information are given regarding each. The paper is followed by a discussion.

Retail prices, 1907 to December, 1914 (*U. S. Dept. Labor, Bur. Labor Statis. Bul. 156 (1915), pp. 397*).—This bulletin, which is Publication No. 14 of the Retail Prices and Cost of Living Series, consists of a compilation of statistical data regarding the relative prices of 15 articles of food in a number of different cities, for the years from 1907 to 1914, inclusive. Data are also given regarding bread weights and the prices of coal and gas for household use. A part of this data has been noted from another source (E. S. R., 31, p. 558).

Roman cooks, CORNELIA G. HARCUM (*Dissertation, Johns Hopkins Univ., 1913, pp. 84*).—Much interesting information is given regarding cooks and cooking during the early history of Rome. A bibliography is appended.

The food supply of the Germans during the war, edited by P. ELTZBACHER (*Die Deutsche Volksernährung und der Englische Aushungerungsplan. Brunswick: F. Vieweg & Son, 1914, pp. VII+196; rev. in Lancet* [*London*], *1915, I, No. 8, pp. 389–399*).—This article presents statistical data regarding the total available food supply and the actual food requirements of the German people, and outlines various methods proposed for meeting these food requirements if the country should be isolated by blockade. Detailed descriptions are given of the proposed increased utilization of agricultural products and the necessary alteration in living conditions.

Soup kitchens, M. RUBNER (*Hyg. Rundschau, 25* (*1915*), *No. 9, pp. 309–315*).—Descriptions are given of the nutritive and energy values of some dietaries commonly furnished poor people at small cost.

Nutrition and growth, L. B. MENDEL (*Jour. Amer. Med. Assoc., 64* (*1915*), *No. 19, pp. 1539–1547, figs. 5*).—Important data, including both those resulting from the author's own experiments (E. S. R., 32, p. 460) and the results obtained by other investigators, are brought together in this lecture, which considers protein, carbohydrates, fats, lipoids, and accessory diet constituents ("vitamins"), as factors influencing nutrition and growth.

The "central-normal" nutrition of adults, G. OEDER (*Berlin. Klin. Wchnschr., 52* (*1915*), *Nos. 17, pp. 433–438; 18, pp. 466–470*).—Physical measurements of 132 men and 149 women are reported, which include that of the "central-normal" body weight (the weight associated with "central-normal" nutrition, a condition said to exist when the physical measurements conform to an arithmetical mean). The author concludes that the condition of nutrition is normal provided the measured body weight equals that indicated by the average of a large number of standard values, the index of the thickness of the abdominal fat layer lies between 2.48 and 2.69 cm., and the examination reveals no abnormal features.

The influence of drinking water on the digestibility of solid substances, F. GRÖBBELS (*Hoppe-Seyler's Ztschr. Physiol. Chem., 89* (*1914*), *No. 1–2, pp. 1–21, figs. 3; abs. in Hyg. Rundschau, 25* (*1915*), *No. 9, p. 329*).—The following results of experiments were noted:

Pure water left the stomach more rapidly than did bread and water mixtures. Bread eaten five minutes after drinking a moderate amount of water required twice the time for leaving the stomach as did water alone. When water was taken five minutes after eating bread, the time required for it to leave the stomach was shorter than for bread eaten alone. A mixture of bread and water remained in the stomach a longer time than did bread and water taken separately.

The influence of protein intake upon the formation of uric acid, A. E. TAYLOR and W. C. ROSE (*Jour. Biol. Chem., 18* (*1914*), *No. 3, pp. 519, 520; abs. in Zentbl. Physiol., 29* (*1914*), *No. 12, p. 575*).—The ingestion of abnormally large amounts of protein, following a preliminary period during which the subject received a purin-free ration, produced a very considerable increase in uric acid excretion. This may be explained by an unusual production of nuclear material from the excess of amino acids, or by an exceptional cell activity.

The creatinin excretion remained approximately constant.

The metabolism of organic and inorganic compounds of phosphorus, E. B. FORBES ET AL. (*Ohio Sta. Tech. Bul. 6* (*1914*), *pp. 80, pls. 13*).—This bulletin reports in detail the results of a series of feeding experiments with pigs, to compare the nutritive value of representative phosphorus compounds, including phosphates, hypophosphites, nucleic acid, phytin, and glycerophosphates. The pigs were given a basal ration low in phosphorus, consisting of pearl hominy, blood albumin, wheat gluten, and salt, to which were added the phosphorus compounds studied. In some experiments corn bran and small amounts of other substances were added to the ration to relieve feeding difficulties.

Detailed tabulated data are given regarding the gain in weight of the animals in relation to food consumed; the weight and composition of various tissues and organs of the slaughtered animals; the development and strength of the bones; the chemical balance of mineral elements; the digestibility coefficients of the proximate food constitutes; and the determination of nitrogen, ammonia, and creatinin in the urine.

In the discussion of the results of these experiments the authors bring out the following facts: The results of one series of experiments indicated that "phosphorus from orthophosphates, hypophosphites, and yeast nucleic acid, when added in the pure form to rations low in phosphorus but capable of maintaining phosphorus equilibrium, may all be absorbed by swine, and may be retained in considerable quantity for at least 10 days", and although not proved, it seems possible that this retention may be permanent. Analyses of slaughtered animals showed that the mineral constituents and ether extract of the blood, as well as the relative proportions of the bone salts, varied consistently as affected by the food.

There was no evidence for the belief that phosphates and glycerophosphates have different effects upon the gross composition, growth, and metabolism of the animals. Glycerophosphates, however, are much better tolerated than are phosphates. These experiments show that "with a low-phosphorus ration it seems to be impossible to make up the deficiency of phosphorus by the addition of readily soluble phosphates in the pure form."

The phosphorus compounds studied are rated in the order of their decreasing acceptability to swine when in amounts supplying equal quantities of phosphorus as follows: Glycerophosphates, phosphates, phytin, nucleic acid, and hypophosphites.

From difficulties encountered in feeding yeast nucleic acid, commercial phytin, and the related compounds of wheat bran, the authors conclude that the isolation of such compounds changes their therapeutic effects so that it is impossible to determine from the experimental feeding of the pure compounds what is the nutritive value of these substances as they occur naturally in foods.

These experiments do not show that the organic phosphorus compounds studied (nucleic acid, phytin, and glycerophosphates) are superior to the inorganic compounds (orthophosphates and hypophosphites) as regards nutritive value. "It would seem, therefore, that for purposes of growth, the usual diet of animals must contain a sufficiently large proportion of organic to inorganic phosphorus. In this relation, then the important consideration is simply one of the total phosphorus of the ration, and any such supplemental phosphorus as is to be added to the diet of the healthy, growing animal may be added as inorganic phosphate.

"It seems unlikely that, with grown or growing animals, any ration composed from natural foods, and supplying the nitrogen requirement, will fail to furnish enough total phosphorus to maintain phosphorus equilibrium. That many rations compounded from common foods are lacking in the amount of phosphorus essential to maximum retention and growth, however, is as certainly true." . . .

"The addition of comparatively small amounts of corn to rations compounded from simple manufactured products of plant and animal origin may enhance the nutritive value of such rations to an extent out of proportion to the amount of corn added, the particular constituent of the corn responsible for the improvement being as yet unknown, but quite possibly a vitamin."

In explanation of the low calcium content of the rations fed, the authors state that "it appears to be impossible to add to a ration low in phosphorus any considerable amount of calcium carbonate without causing profound digestion disturbance. . . . No such result follows the administration of calcium carbonate in a ration of natural foods having normal phosphorus content."

The organic phosphorus compounds of wheat bran, C. J. ROBINSON and J. H. MUELLER (*Biochem. Bul., 4 (1915), No. 13, pp. 100–117*).—A controversial article. Analytical data are reported, the results of which are in disagreement with the work of Anderson (E. S. R., 33, p. 11).

The maize feeding of normal individuals and pellagrins, P. ALBERTONI and P. TULLIO (*Arch. Ital. Biol., 62 (1914), No. 3, pp. 305–325*).—From data derived from a number of physiological experiments in which was studied the effect of consuming a diet consisting of maize alone and of maize to which was added protein from other sources, the authors conclude that pellagra is a "deficiency disease" produced by subsisting on a diet deficient in animal protein.

The action of caffein substances, G. VINCI (*Arch. Ital. Biol., 61 (1914), No. 3, pp. 401–439; abs. in Zentbl. Physiol., 30 (1915), No. 1, pp. 28, 29*).—Following a series of experiments in which various quantities of caffein were administered to dogs, it is concluded that as much as 10 mg. of caffein per kilogram of body weight (which the author states is much greater than the amount ordinarily ingested by drinking coffee) is without injurious action on the kidneys.

The rational apportionment of the dietary during the 24-hour cycle, BERGONIÉ (*Rev. Sci. [Paris], 53 (1915), I, No. 9, pp. 138–145, figs. 4*).—A summary and digest of data, including a number of curves showing the distribution of the heat production during the 24-hour cycle. The relative advantages of eating two and three meals a day at different times are considered by comparing the amount and distribution of energy furnished in each case with the amount of energy required by the body throughout the day.

Studies on tissues of fasting animals, S. MORGULIS, P. E. HOWE, and P. B. HAWK (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 28 (1915), No. 6, pp. 397–406, pl. 1*).—Detailed descriptions are given of the changes occurring in the structure of the tissues of fasting animals, as shown by a histological study of several laboratory animals which had died of protracted inanition. A short bibliography is included.

Muscular work and the respiratory quotient, S. MORGULIS (*Biochem. Bul., 3 (1914), No. 11–12, pp. 435–439*).—The author observes that the value for the respiratory quotient during muscular work, as frequently determined by others, is extremely high, and suggests that this is due to incomplete removal of water vapor from the ventilating air current by the sulphuric acid absorbers, a part of the water thus being weighed as CO_2. He supports the hypothesis of Zuntz that all food materials are sources of energy for muscular work.

The energy metabolism of infants in relation to age and nutritive condition, J. R. MURLIN (*Proc. Soc. Expt. Biol. and Med., 12 (1914), No. 1, pp. 15, 16; abs. in Zentbl. Physiol., 29 (1914), No. 12, p. 567*).—Determinations are recorded of the energy metabolism of children up to 1 year of age. The average value for newly born children, during sleep, was found to be 1.87 calories per hour per kilogram of body weight; 2.38 calories for those of 2 to 4 months; and 2.45 calories for those 6 to 12 months old. Related to the area of body surface, the energy metabolism for the infants of the three different ages was 25, 35, and 42 calories per hour. For poorly nourished children and those under weight the heat output was somewhat greater, and for heavy infants a little less than the average metabolism of 2½ calories per hour per kilogram of body weight.

ANIMAL PRODUCTION.

Nutrition with purified food substances, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 20 (1915), No. 4, pp. 641–658, figs. 9*).—In continuation of previous work (E. S. R., 32, p. 360), the authors report results of additional feeding experiments.

Laboratory animals (rats) were maintained upon a basal ration of pure casein, dextrin, lactose, agar-agar, and chemically pure salt, to which were added different food materials. The basal diet was incomplete, the rats showing normal growth for a period of about 6 months and then rapidly losing weight. The addition of olive oil to the basal ration did not prolong the growth period, as did the addition of butter fat or the ether extract of cod testicle or pig kidney. When maintained upon a diet to which butter had been added, rats gave birth to young, some of which were maintained for a long period of time on the same diet as the mother. The results of feeding experiments by Osborne and Mendel (E. S. R., 31, p. 560) are discussed in relation to the results obtained by the authors.

The influence of certain vegetable fats on growth, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 21 (1915), No. 1, pp. 179–182, pls. 9*).—In continuation of the work reviewed above, experiments are reported in which laboratory animals (rats) were maintained upon a fat-free diet of casein, milk sugar, dextrin, agar-agar, and pure salt until a loss of weight and enfeebled condition of the animals resulted. Fifty per cent of this fat-free diet was then replaced by various vegetable substances containing fat, such as corn, wheat embryo, rye, and rolled oats, and in some experiments by dried pig heart and kidney.

When the corn or wheat embryo was added to the diet the animals showed an increase in weight and a normal appearance. Less favorable results were obtained by the addition of the same amount of the entire wheat kernel, rye, or rolled oats to the diet.

The results of these experiments showed that "50 per cent of corn added to the fat-free diet is vastly superior to 5 per cent butter fat when the animals have been brought to a point near which failure of nutrition would set in. The addition of 5 per cent wheat or 5 per cent corn meal is not sufficient to prevent decline and death on the fat-free diet."

The authors state that "the effects of wheat, rye, and oats seem to suggest that the differences observed in their effects on depleted animals may well be due to quantitive differences in the yield of the unknown accessory substances under consideration rather than to an entire absence of the same. This viewpoint is strongly supported in the case of the wheat kernel as compared with wheat embryo."

The value of the proteins of the cereal grains and of milk for growth in the pig, and the influence of the plane of protein intake on growth, E. V. McCollum (*Jour. Biol. Chem., 19 (1914), No. 3, pp. 323–333*).—In metabolism experiments with young pigs fed on rations made up of purified feedstuffs, the principal sources of protein being oats, wheat, corn, wheat gluten, casein, and skim milk, supplied at different planes, it was found that "with moderately low protein intake (6.6 to 10 per cent) the rate of nitrogen retention is influenced by the amount of food protein in proportion to the metabolizing tissues of the body and apparently in some degree by the excess of total energy consumed over the maintenance needs of the animal. When the energy supply is generous (100 calories per kilogram or more) the rate of nitrogen retention as expressed in percentage of ingested nitrogen is not much influenced by the plane of protein intake at levels above 10 per cent of the ration. In experiments in which the protein amounted to 41 to 57.86 per cent of the ration the maximum possible percentage of the ingested nitrogen continues to be retained for growth." It is concluded that "in the young pig the growth impulse is so great that the synthesis of body protein is effected at the maximum rate possible with the particular mixture of amino acids yielded by the food proteins."

Figures are given for the percentage of the absorbed nitrogen retained for new growth and indicate the degree to which the amino acids of the food can be recombined into tissue proteins. There was little difference in the value for growth of the protein mixture contained in the three cereal grains, wheat, oats, and corn kernels. A maximum of from 23 to 24 per cent of the ingested nitrogen from one of these sources apparently can be retained for growth.

It is further concluded that "the rate of retention of nitrogen, in all cases where a sufficiently high plane of protein intake was fed, was limited by the chemical make-up of the food proteins, and not by the physiological capacity of the animals to grow."

While these experiments were of short duration, it was observed that toward the close of the experiment there was a tendency for the rate of nitrogen retention to fall slightly, indicating that in a long-continued experiment on a single grain ration a steady decline in the rate of growth ultimately sets in.

See also previous notes (E. S. R., 29, p. 64; 33, p. 367).

The nutritive value of old and new corn, J. J. Nitzesco (*Compt. Rend. Soc. Biol. [Paris], 77 (1914), No. 33, pp. 583–586*).—In experiments with chickens and rats it was found that new corn was less completely digested than old corn, and that greater gains in live weight were obtained when old corn was fed.

A study of grazing conditions in the Wenaha National Forest, H. T. Darlington (*Washington Sta. Bul. 122 (1915), pp. 3–18, pls. 7*).—The purpose of this study was to determine the character and carrying capacity of the grazing areas contained in the Wenaha National Forest, situated in the southeastern part of Washington and the northeastern part of Oregon.

It was found that the principal forage plants of the higher portions are perennial in character, consisting principally of shrubs. There appears to have been no appreciable deterioration in the grazing areas. On account of snow, the range is limited to about five months' grazing, a fact which will insure permanency of the grazing area. The full carrying capacity of the range is not being utilized. It is said that so far as the regulation of the sheep industry and the enforcement of law and order are concerned, government leasing to single individuals has been a marked success in the Wenaha National Forest. A bibliography on range management and improvement is appended.

Chemical analyses of forage plants of Spain, R. Suárez y Bermúdez (*Análisis Químico de las Plantas Esteparias de España. Madrid: Langa y Compañia, 1912, pp. 94*).—Analyses are given of *Brachypodium pinnatum*, *Phragmites gigantea*, *Bromus rubens*, *Aphyllantes monspeliensis*, *Crocus sativus*, *Urtica urens*, *Arthrocnemon macrostachyum*, *Chenopodium album*, *Salsola vermiculata*, *Atriplex halimus*, *A. rosea*, *Kochia prostrata*, *Amaranthus albus*, *Rœmeria hybrida*, *Glaucium corniculatum*, *Moricandia arvensis*, *Carrichtera velle*, *Malcomia africana*, *Biscutella lævigata*, *Conringia orientalis*, *Anthylis cytisoides*, *Ononis tridentata*, *O. viscosa*, *Hedysarum humile*, *Onobrychis saxatilis*, *O. eriophora*, *Coronilla minima*, *Lupinus angustifolius*, *Vicia cracca*, *Zygophyllum tobago*, *Tribulus terrestris*, *Lithospermum fruticosum*, *Teucrium chamæpitys*, *Crucianella maritima*, *Xanthium strumarium*, *Silybum marianum*, *Andryala ragusina*, *Sonchus crassifolius*, *Artemisia herba-alba*, and *A. glutinosa*.

The influence of temperature on the microflora of hay: Lactic and butyric hays, C. GORINI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5 ser., 23 (1914), I, No. 12, pp. 984–988; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1626, 1627*).—In a zymoscopic and bacteriological examination made of hay during its various stages of fermentation, it was found that during the first three to five days the fermentation with a temperature of 50 to 55° C. (122 to 131° F.) was prevailingly lactic, while as the temperature gradually rose to 60 to 65° and beyond, the mass tended to become more of the butyric type, which renders it less desirable for feeding purposes. Lactic acid fermented hay may be obtained by expelling as much air as possible and maintaining a temperature of about 50°.

Sugar as a feeding stuff, NEUBAUER (*Landw. Ztschr. Rheinprovinz, 16 (1915), No. 12; pp. 197–200*).—A general review of experiments in feeding sugar to horses, cattle, and swine, in which it has proved to be a desirable feed.

The value of dried brewers' grains as a feeding material, E. T. HALNAN (*Jour. Bd. Agr. [London], 21 (1914), No. 9, pp. 821–825*).—A résumé of the results obtained by various investigators on the feeding value of dried brewers' grains, previously reported from other sources.

Dried yeast as food for farm stock, C. CROWTHER (*Jour. Bd. Agr. [London], 22 (1915), No. 1, pp. 1–10*).—Dried yeast is described as a material of powdery to flaky consistency, varying in color from light to medium brown. It has an agreeable smell, but a rather bitter taste, arising presumably from the presence of hop residues with which the yeast is contaminated, which is disliked by cows but is not objected to by pigs and calves. The average composition is given as moisture 4.3 per cent, protein 48.5, fat 0.5, soluble carbohydrates 35.5, fiber 0.5, and ash 10.7.

From feeding trials at Garforth, it appears that dried yeast is a desirable feed for cows if they can be induced to eat it, but it is thought that until some means of depriving it of its bitter taste has been devised dried yeast will never come into general use as feed for cows. In trials with 12-weeks-old pigs fed 15 weeks, dried yeast proved to be a good feed, giving better results than those obtained with an equal weight of middlings. It proved to be a safe feed for calves, although no tests were made of its comparative feeding value.

It is said that dried yeast keeps well and on mixing with other meals and water may be kept for some time without objectionable fermentation. It is not thought that it possesses any special medicinal or dietetic virtues other than those to be expected in any highly digestible feed rich in protein.

Ensiling feed materials with the aid of a lactic acid bacteria culture, B. HEINZE (*Jahresber. Ver. Angew. Bot., 11 (1913), No. 2, pp. 142–167*).—This is a résumé of information on methods of inoculating silage with a lactic acid bacteria culture.

Studies on the preparation of silage, F. SAMARANI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 12 (1913), No. 8–12, pp. 87–103; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1625, 1626*).—In reviewing his experiments in making silage, the author states that acetic and lactic fermentations take place. The first is an intracellular process through which the sugars of the cell substance are transformed in the almost complete absence of oxygen, first into alcohol and carbonic acid, and later by chemical action into acetic acid. The second process is an ordinary lactic acid fermentation, due to bacterial action. Of the total free acid content of normal silage, 70 per cent is acetic acid, 20 per cent lactic acid, and about 10 per cent butyric acid.

In order to make the best silage it is necessary to avoid overheating the fodder in order to limit the acetic fermentation and thus to leave the decomposition of the sugar chiefly to the lactic fermentation process. Lactic fermentation may be promoted by the addition to the silage of a solution of milk sugar. In experiments with mechanical pressure applied immediately after the required amount of fodder has been put in, it has been found possible to exclude the air, lower the temperature, and thus promote lactic fermentation at the expense of the acetic fermentation. Where mechanical pressure is applied, the silage contains less free acid and consequently smells less strongly.

In ensiling beet slices it was found necessary to remove all the air from the silo, which was best effected by means of heavy pressure.

Silage and grains for steers, J. W. Wilson (*South Dakota Sta. Bul. 160 (1915), pp. 197–223, figs. 10*).—The object of these experiments was to determine the relative value of sorghum silage and corn silage, both with and without oil meal for the preliminary gain; the value of feeding the leguminous hays with silage for the preliminary gain; the relative feeding value of the commonly grown grains with corn silage as the sole roughage ration for fattening cattle; and to show how these big cheap gains with silage during the preliminary period could be maintained after the steers were put on a full feed of grain.

Five lots of four grade Hereford steers each, weighing approximately 675 lbs. each, were fed during a preliminary period of 55 days as follows: Lot 1, 37 lbs. of corn silage per head per day; lot 2, 48 lbs. of corn silage and 2.9 lbs. of oil meal; lot 3, 42 lbs. of corn silage and 3.8 lbs. of oil meal; lot 4, 40 lbs. of sorghum silage; lot 5, 47 lbs. of sorghum silage and 2.9 lbs. of oil meal. They made average daily gains per head of 1.55, 3.36, 3.12, 0.74, and 1.85 lbs., costing 3.7, 3.55, 4.27, 8.14, and 6.64 cts. per pound of gain for the respective lots.

These steers were redivided and five lots of four steers each were fed during a 115-day fattening period as follows: Lot 1, 11 lbs. of corn silage, 18 lbs. of ground corn, and 1.8 lbs. of oil meal per head per day; lot 2, 41 lbs. of corn silage and 3 lbs. of oil meal; lot 3, 11 lbs. of corn silage, 15 lbs. of ground oats, and 1.5 lbs. of oil meal; lot 4, 11 lbs. of corn silage, 13 lbs. of barley, and 1.3 lbs. of oil meal; lot 5, 11 lbs. of corn silage, 17.6 lbs. of spelt, and 1.8 lbs. of oil meal. These steers made an average daily gain per head of 2.13, 1.46, 2.19, 1.9, and 2.17 lbs. for the respective lots.

In a second experiment five lots of four grade Aberdeen Angus steers each, weighing approximately 775 lbs. each, were fed during a preliminary period of 91 days as follows: Lot 1, 59 lbs. of corn silage and 2 lbs. of red clover hay per head per day; lot 2, corn silage ad libitum (an average of about 62 lbs. per head per day); lot 3, 58 lbs. of corn silage and 3.84 lbs. of sweet clover hay; lot 4, 58 lbs. of corn silage and 16 lbs. of alfalfa hay; and lot 5, 58 lbs. of corn silage and 12 lbs. of prairie hay. These steers made an average daily gain per head of 2.29, 2.32, 2.45, 2.49, and 2.01 lbs., costing 4.55, 4.03, 4.34, 4.3, and 4.79 cts. per pound of gain for the respective lots. These same lots were then fed during a 101-day fattening period as follows: Lot 1, 17.4 lbs. of corn silage, 15.7 lbs. of ground corn, and 1.5 lbs. of oil meal per head per day; lot 2, 56 lbs. of corn silage and 2.93 lbs. of oil meal; lot 3, 17 lbs. of corn silage, 15 lbs. of ground oats, and 1.5 lbs. of oil meal; lot 4, 17.4 lbs. of corn silage and 16.5 lbs. of barley; lot 5, 17 lbs. of corn silage, 16 lbs. of ground spelt, and 1.7 lbs. of oil meal. These steers made average daily gains of 2.26, 2.24, 1.78, 2.28, and 2.24 lbs., costing 9.37, 6.1, 11.65, 9.65, and 9.47 cts. per pound of gain. For the entire 192 days' feeding period, the costs were 7.2, 5.1, 7.6, 7, and 7.38 cts. per pound of gain for the respective lots.

It is concluded that a preliminary feeding period is one of the best methods to follow in fattening cattle for market. Corn silage was preferable to sorghum silage. The addition of 3 lbs. of oil meal to both the sorghum and corn silage rations increased the gains and reduced the cost of production. The large gains secured during the preliminary period were maintained during the fattening period. The addition of leguminous hays to the silage ration increased the gains but did not reduce the cost. Alfalfa hay was found the best of the legumes to feed with corn silage for a large gain. Corn silage as the sole roughage with the grains during the fattening period proved to be a suitable substitute for hay. Prairie hay did not prove to be of as much value when fed with corn silage during the preliminary period, in producing a large gain, as did the hays made from the legumes. Sweet clover, when made into hay before the stems became too woody and the hay run through a cutter, proved to be nearly as valuable for feeding with corn silage during the preliminary period as alfalfa hay.

Analyses are given of wild hay, alfalfa hay, corn silage, clover hay, and sweet clover hay.

The use of mineral phosphates in calf rearing, A. H. Fairbairn and C. Hutchinson (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 170–174*).—Calves receiving the addition of a mineral phosphate gave no marked increase in the rate of progress as compared with calves receiving an ordinary ration.

Estimating the age of calves, J. Schwarz (*Ztschr. Tiermed., 18 (1915), No. 11–12, pp. 476–502, figs. 8*).—The author concludes from his studies of the appearance of the calf's hoof during the first few weeks after birth that the character of the sole cushion is not indicative of the age of the calf, but that the rings of the horny wall are indicative of the age. A calf having the first hoof ring is between 5 and 14 days old; the second hoof ring, between 4 and 5 weeks old.

The estimation of condition in cattle, J. A. Murray (*Reading, Pa.: Charles Elsbury, 1914, pp. 11*).—The author is of the opinion that the terms used by farmers to denote the "condition" of cattle are vague and indefinite, and that some more exact method is needed. A formula is arrived at by which the condition may be found from the live weight, girth, and length.

Origin of cattle, G. Laurer (*Deut. Landw. Tierzucht., 18 (1914), Ausgabe A, Nos. 48, pp. 513–516; 49, pp. 521–523, figs. 4*).—This is a contribution on the origin and development of our modern breeds of cattle.

The cattle of Brazil, J. Maria dos Reis (*Jour. Heredity, 6 (1915), No. 5, pp. 203–211, figs. 4*).—The author describes the native stock of Brazil as among the finest in the world, but ruined by indiscriminate cross-breeding. It is stated that the introduction of the zebu is jeopardizing the live-stock industry, as the hybrids are generally wild and degenerate, poor milkers, and unable to raise their own offspring.

Zebu cattle in Brazil, B. H. Hunnicutt (*Jour. Heredity, 6 (1915), No. 5, pp. 195–201, pl. 1, figs. 4*).—An account of the introduction and development of the zebu in Brazil. The crosses on the native stock are described as being popular with ranchers, hardy, disease-resistant, and fairly good milkers.

Zebu crosses in Tunisia, M. Roederer (*Jour. Heredity, 6 (1915), No. 5, pp. 201, 202*).—Zebu crosses with Arab cattle are described as being of good size, good butcher quality, easily kept in condition, hardy, and excellent as draft animals. The Asiatic race of zebu is preferred for crossing purposes.

Measurement of the Formosan buffalo, H. Yanagawa (*Trans. Sapporo Nat. Hist. Soc., 5 (1915), No. 3, pp. 143–145*).—Measurements are given of the Formosan buffalo, which is described as being similar to the carabao or water buffalo of the Philippine Islands.

Seventh annual report of the American Bison Society (*Ann. Rpt. Amer. Bison Soc., 7 (1914), pp. 72, figs. 23*).—It is said that there has been an increase of 546, or 19 per cent, in the number of buffaloes in North America within the past year, and that owing to the increased interest in this animal its preservation is assured. See also a previous note (E. S. R., 30, p. 469).

Practical assistance to wool growers in the marketing of their wool clips (*Canada Dept. Agr., Live Stock Branch Pamphlet 7 (1914), pp. 18*).—General information on the production of wool of good quality and condition, together with suggested plans for use in organizing a wool growers' association, is presented.

The Grenada goat, L. Gimenez (*Indus. Pecuaria, 15 (1914), No. 462, pp. 377, 378, figs. 2; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 1, p. 116*).—This breed of goats is described as being hornless and of average size. The color is chestnut or black, and the udder is large and well developed. The she-goats become serviceable at 6 months and may continue to breed to the age of 9 or 10 years. They mostly give birth to twins and sometimes triplets. The yield of milk is generally from 2.6 to 3.5 lbs. per day after the first parturition, the quantity increasing with subsequent lactations until the fifth, when it reaches its maximum of from 13.2 to 14.1 lbs. The milk is said to be excellent and without the characteristic odor of that of other breeds of goats. The flesh is also of good quality.

[Pork production], M. Herter and G. Wilsdorf (*Arb. Deut. Landw. Gesell., No. 270 (1914), pp. 1–38, figs. 15*).—A discussion of the comparative value of the Berkshire, Yorkshire, and native German breeds of hogs for pork production, and of the methods of swine feeding.

Swine feeding experiment comparing skim milk with fat-freed fish meal and dried yeast, Klein (*Milchw. Zentbl., 43 (1914), No. 17, pp. 452–458*).—In experiments with young pigs fed a basal ration of potato flakes and barley, it was found that ½ lb. of fat-freed fish meal or 1 lb. of yeast was equivalent for feeding purposes to 1 gal. of skimmed milk. These feeds, especially the yeast, gave better results with older than with younger pigs.

The valuation of the manurial residues obtained from the consumption of foods by growing pigs, C. Crowther and A. G. Ruston (*Jour. Bd. Agr. [London], 21 (1914), No. 9, pp. 789–800*).—With a view to determining the manurial value of pig offal, ten 2-month-old Yorkshire pigs were fed for 23 weeks on rations composed of bran, middlings, pea meal, and barley meal, and collections and analyses made of the urine and feces. The percentage of the food nitrogen recovered ranged from 44 in the earlier stages to 68 in the later stages, with an average of 56; phosphoric acid, 45 to 71 with an average of 58; potash from 67 to 98 with an average of 87; and lime from 30 to 75 with an average of 65. The distribution of the manurial ingredients recovered between solid and liquid excreta was found to be as follows: Nitrogen 35 per cent in the solid, 75 per cent in the liquid; phosphoric acid 77 and 23; potash 18 and 82; and lime 92 and 8, respectively. These values are lower than those given by Voelcker and Hall (E. S. R., 14, p. 1057).

Sex-linked factors in the inheritance of rudimentary mammæ in swine, E. N. Wentworth (*Proc. Iowa Acad. Sci., 21 (1914), pp. 265–268*).—The author presents evidence tending to show that the inheritance of rudimentary mammæ in swine is a combination of the sex-linked and sex-limited types. It appears sex-linked in so far as the transmission of the genetic factor for rudimentaries is concerned, and sex-limited in so far as there is apparent repression somatically of the rudimentaries of the female sex when they are in a simplex condition.

Polygamous Mendelian factors, J. Wilson (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 22, pp. 302–312*).—Data are presented which tend to show that the various colors in horses are the result of single polygamous factors.

Annual report on the administration of the grant for the encouragement and improvement of the light horse-breeding industry for the year 1913–14 (*Bd. Agr. and Fisheries* [*London*], *Ann. Rpt. Light Horse-Breeding Indus., 1913–14, pp. 56*).—This outlines the general plan for the encouragement and improvement of light horse breeding in England, which consists in the subsidizing of stallions to travel at low fees, the providing of brood mares for farmers at a small rental, and the elimination of unsound stallions.

Growth of the horse, R. Motloch (*Deut. Landw. Tierzucht., 18 (1914), Ausgabe A., Nos. 50, pp. 529–532; 51, pp. 537, 538, figs. 3*).—This is a contribution on the growth and body development of the horse from birth to five years of age.

Feeding roots to work horses, N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 98 (1914), pp. 16, figs. 2*).—Successful experiments are reported in which an average of 13.5 kg. of sugar beets per head per day was fed to work horses for from 50 to 89 days with a resulting average daily gain of 0.03 kg. per head. Horses receiving 1.5 kg. of grain mixture per head per day under the same conditions lost 0.07 kg. in weight.

Mendelian inheritance of fecundity in the domestic fowl, and average flock production, R. Pearl (*Amer. Nat., 49 (1915), No. 581, pp. 306–317, fig. 1*).—The author summarizes the material presented in this paper as follows:

"There is a marked difference in average egg production per bird of Barred Plymouth Rock pullets of the Maine Station strain at the present time as compared with what obtained during the period of simple mass selection for this character. This difference is in the direction of a substantially higher mean production at the present time, when tested on flocks of large size. The increase in flock average productivity is most pronounced in respect to winter production, which is the laying cycle to which especial attention has been given in the breeding. The cause of this increase in flock productivity appears, with a degree of probability which is very high and amounts nearly to certainty, to be that the method of breeding the stock now followed is more closely in accord with the mode of inheritance of fecundity than was the simple mass selection practiced in the earlier period. The result announced in earlier papers that high fecundity is a sex-linked character, for which the female is heterozygous, has been confirmed by practical poultrymen in their breeding operations."

Previous work has been noted (E. S. R., 24, p. 675; 28, p. 576).

Xenia in fowls (*Jour. Heredity, 6 (1915), No. 5, pp. 212–218, figs. 2*).—This is a review of recent German work to determine whether a cock has any influence on the color and form of eggs laid by hens to which he is mated. The work of Walther (E. S. R., 32, p. 263) is cited to show that this theory is without solid foundation.

Studies on the physiology of reproduction in the domestic fowl.—XII, On an abnormality of the oviduct and its effect upon reproduction, Maynie R. Curtis (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 28 (1915), No. 3, pp. 154–162, pls. 2*).—This is a description of an abnormality of the oviduct of a year and a half old Rhode Island Red hen at the Maine Experiment Station.

Every possible stage of absorption of the egg from a normal membrane shelled fresh egg to collapsed empty membranes was found. "Some of the eggs and some of the empty membranes were free in the body cavity. Some were partly or entirely inclosed by peritoneum. In several instances two eggs or an egg and a bunch of membranes were walled off together. These peritoneal covered masses were attached by suspending strings or folds of peritoneum. One was a normal fresh egg in a single egg membrane. Ten had evidently been normal eggs but at the time of autopsy they contained a homogeneous mixture of yolk and albumin which had lost the gelatinous character of fresh egg albumin. Each of these eggs was inclosed in a single egg membrane. The other four eggs were double eggs."

"The most probable explanation of the abnormality of the oviduct found in the case described is that in early embryonic development (probably on the sixth or seventh day of incubation) the backward growth of the primordial oviduct stopped permanently, while the differentiation of the part already formed continued in the normal manner.

"As in other cases where the passage of the egg is prevented the sex organs passed through their normal reproductive cycles; the oviduct functioned as far as the point where the passage was interrupted; the eggs were then returned to the body cavity and resorbed. The number of eggs and empty egg membranes found in this fowl, which was apparently in a perfectly normal physical condition, show that a bird possesses very great power of resorption of its own proteins from the peritoneal cavity. Such resorption does not necessarily cause metabolic disturbances."

Studies on the physiology of reproduction in the domestic fowl.—XIII, On the failure of extract of pituitary body (anterior lobe) to activate the resting ovary, R. PEARL and F. M. SURFACE (*Jour. Biol. Chem., 21 (1915), No. 1, pp. 95–101*).—In an earlier paper (E. S. R., 32, p. 671) it was shown that the substance of the corpora lutea of the cow has the power to inhibit ovulation in an actively laying fowl. The purpose of this study was to determine whether there is any chemical substance which will activate the resting ovary.

It was found that "the substance of the anterior lobe of the pituitary body of the cow, when injected into the abdominal cavity of hens in which the ovary is in a completely resting condition, does not cause an activation of the ovary, in the sense of inducing ovulation at an earlier date than that at which it would normally occur."

The cholesterol metabolism of the hen's egg during incubation, J. H. MUELLER (*Jour. Biol. Chem., 21 (1915), No. 1, pp. 23–28*).—As a result of his studies the author concludes that "the cholesterol of the newly laid hen's egg is practically all in the free condition. During the period of incubation this condition obtains until about the thirteenth day, from which time there is a gradual esterification until, at the time of hatching, over 40 per cent of the cholesterol present is in the form of esters. The esterifying cholesterol may function as a detoxifying substance, with which the toxic fatty acids, set free from lecithin during the latter stage of embryonic development, combine to form harmless esters."

Studies on the energy metabolism of the domestic fowl, H. GERHARTZ (*Landw. Jahrb., 46 (1914), No. 5, pp. 797–814; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1623, 1624*).—The author reviews the work of a number of earlier investigators, and gives the results of his own studies in determining the amount of energy required daily by hens per kilogram of live weight and per 1,000 sq. cm. of body surface during the molting, laying, and resting periods.

The minimum requirement amounted to 58.37 calories per 1,000 sq. cm. of body surface per day for the normal fasting fowl; 62.15 calories for the same bird that had been fed; and 71.78 calories for the brooding hen after feeding. This is a somewhat lower requirement than that of other animals, it appearing that fowls in a state of absolute repose have a relatively low transformation of energy. During the molting period the transformation was slightly increased. There was an increase in the energy transformation during the egg-laying period, from 24.8 to 26.2 calories per 1,000 sq. cm. of body surface per day being utilized in the formation of the egg.

Poultry for profit, JEAN A. KOETHEN (*Los Angeles, Cal.: Cultivator Publishing Co., 1915, pp. 229, pls. 17, figs. 17*).—A general treatise on the feeding, care, and management of poultry.

A simple trap nest for poultry, A. R. LEE (*U. S. Dept. Agr., Farmers' Bul. 682* (*1915*), *pp. 3, figs. 2*).—Full directions are given for making a trap nest.

DAIRY FARMING—DAIRYING.

Difficulties encountered in making high-grade milk, and their practical solution, J. R. WILLIAMS (*N. Y. Dept. Agr. Bul. 68* (*1915*), *pp. 1021–1032, pls. 4*).—The author reports experiments undertaken to determine the effects of brushing and washing the udder on the bacterial content of the surface of the teats; also to determine the value of disinfectants in the cleaning of the udders.

The results while not conclusive, suggest that "perfunctory washing loosens or frees from the epithelial layers of the teats more bacteria than it removes, so that more germs may be readily removed in the handling of the teat after the washing than before. Washing from a common pail may carry germs from one cow to another so that the process of washing instead of removing may add enormous numbers of germs to the teats. In this way cows with infected udders may be the source of infection for all other cows in the same group.

"Antiseptics apparently reduce the number of viable germs on the teats. It is uncertain, however, whether or not they are destroyed or their growth on the test plate merely inhibited.

"By far the best way to prepare a cow for milking is to wash each udder with a pail of clean water and wipe the teats with a piece of sterile cloth. It is a serious question whether or not any other method of preparation for milking is of value. Unfortunately, this method requires more labor and the extravagant use of water and sterilized cloths."

Process of sterilizing milk and cream, A. RUTTER (*English Patent 216, Jan. 3, 1914; abs. in Jour. Soc. Chem. Indus., 34* (*1915*), *No. 9, p. 507*).—"Milk or cream is treated with from 0.05 to 0.15 per cent of its weight of an alkali peroxid, e. g., sodium peroxid, a quantity of citric acid sufficient to neutralize the alkalinity due to the peroxid is added, and the whole is then heated to 30 to 52° C. for 30 minutes or more."

The pasteurization of cream for butter making (*Iowa Sta. Bul. 156* (*1914*), *pp. 3–40*).—This bulletin consists of two parts.

I, *Effect on quality and chemical composition*, by M. Mortensen, W. G. Gaessler, and W. H. Cooper (pp. 3–26).—In experiments conducted to determine the value of pasteurization in the manufacture of butter, the effect on the flavor of the butter, on the keeping quality, on the body, on the chemical composition, and on the mechanical losses was considered and an effort was made to determine the relative merits of the various methods of pasteurization.

Sour cream was pasteurized by the continuous and vat methods, and the continuous method using a forewarmer. Fairly satisfactory results were obtained by the continuous method of pasteurization during the summer season, but during the winter season, when the cream had to be heated from a low temperature to a high pasteurizing temperature, a metallic flavor often resulted. The amount of fat lost in the buttermilk was greater in the buttermilk obtained from pasteurized cream.

In vat pasteurization the body of the butter was somewhat inferior to that of both the raw cream butter and that from the cream pasteurized by the continuous method, in that it was not so clear and appeared a trifle sticky. The butter from pasteurized cream, either sweet or sour, scored higher on flavor, both when fresh and after storage, than from raw cream. Vat pasteurization appeared to be the most efficient method of sour-cream pasteurization for improvement of flavor, although the average fat content of the buttermilk from vat-pasteurized cream was 0.23 per cent, as against 0.115 per cent for buttermilk from cream pasteurized by the continuous method.

An effort was made to combine the two methods. The cream was heated by flash heat in a continuous pasteurizer used as a forewarmer to about 125° F., passed through a retarder, requiring about 20 minutes, and finally admitted to another continuous pasteurizer and heated to from 180 to 185°. This method was compared with the continuous method, the exposure varying from 180 to 185°. The body of the butter was practically the same with each of these two methods, and clearer and more perfect than with vat-pasteurized cream. The flavor for both fresh and stored butter produced from cream pasteurized by the vat method scored higher than that of butter produced from cream pasteurized by the continuous method after forewarming, and this in turn was higher than with continuous pasteurzation without forewarming. The average fat test of the buttermilk for the cream pasteurized by the continuous method was the same with or without forewarming, and lower than for the vat-pasteurized cream. A high churning temperature resulted in a great loss of fat in the buttermilk.

An effort was made to remove undesirable odors from the butter by aerating the cream. The cream, after being treated with the blower, was a trifle more mealy than cream pasteurized by the vat method without aeration. The butter manufactured from aerated cream scored higher on flavor than that from cream not aerated. The loss of fat in the buttermilk was practically the same in both cases.

Butter manufactured from raw cream had a higher moisture content than butter manufactured from cream pasteurized by the flash method. Prolonged heating of sour cream produced a higher moisture content in the resulting butter. The percentage protein content of the resulting butter was not influenced by the pasteurization of sweet cream, but was decreased by pasteurization of sour cream.

II, *Bacteriological studies*, by B. W. Hammer (pp. 27–40).—In these studies of the bacteriological effects of pasteurization it was found that "the method of vat pasteurization of sour cream at temperatures of from 140 to 145° F. for 20 minutes sometimes left large numbers of living bacteria present, although the percentage killed was high. After pasteurizing sour cream with the flash method at from 180 to 185°, only small numbers of bacteria were found in a living condition. The use of the retarder on sour cream resulted in the destruction of a great many of the contained bacteria. From the small amount of data available, it appears, as would be expected, that the efficiency obtained approximates vat pasteurization more nearly than flash pasteurization as carried out in this work. With the use of double pasteurization on sour cream, a very high efficiency was secured and only very small numbers of organisms remained in the cream in a living condition; the results on bacterial efficiency approximate those obtained by the flash method.

"The method of blowing air through cream during the pasteurization process was found to increase the number of bacteria in the pasteurized cream in the majority of cases. Flashing sour cream at temperatures as low as 120° resulted in the destruction of considerable numbers of bacteria, although the numbers remaining were very high.

"The results bear out the conclusions of various investigators that there is no exact relation between the number of living bacteria contained and the acidity of sour cream. There was no relationship between the acidity of the cream and the number of organisms remaining in the cream after pasteurization.

"Butter made from raw cream had practically as good keeping qualities as butter made from pasteurized cream. But slight differences were encountered when the deterioration of butter made from cream pasteurized by various methods was compared. The presence of foreign bacteria in cream did not cause a more rapid deterioration of the butter made therefrom."

Smith's butter fat computer, J. F. SMITH (*Pleasanton, Kans.: Author, 1915, pp. 64*).—These tables are designed for the cream buyer in determining the amount and value of milk fat in cream and whole milk of various percentages and at various prices.

Experiments with cheese made from milk mixtures of different fat content, N. O. HOFMAN-BANG ET AL. (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *86* (*1914*), *pp. 5–47*).—The main objects of these experiments, which were conducted at five creameries, covering a period of four years, and 150 cheeses, were to determine the relation between the fat and the casein in both fresh and cured cheese made from milk of different fat contents, and to ascertain whether it was possible to work out a table which will show the ratio between the fat and casein in the finished cheese if the relation of these constituents is known in the milk, and vice versa. Twenty-five cheeses were made of each of the following classes: Skim milk, 15 per cent whole milk, ¼ whole, ½ whole, and whole milk, all being from the milk from Red Danish cows. Another class consisted of cheeses made from whole milk from Jersey cows.

It is concluded that the figures expressing the relation between the fat and the casein in the finished cheese can, with fair certainty, be calculated from the percentage of fat in the milk and vice versa.

The ratio figures for whole milk, ½ whole, ¼ whole, 15 per cent, and skim milk cheese were so different that these figures may be used in identifying the different classes of cheese. The experiments showed that in spite of variations in the figures the minimum figures for whole milk cheese were higher than the maximum figures for ½ whole milk cheese, and the minimum figures for ½ whole were higher than the maximum figures for ¼ whole, etc. These ratio figures are given in the following table:

Ratio figures in cheese from various milk mixtures.

	Ratio figures in cheese from milk mixtures with the following content of whole milk.					Percentage of fat in milk mixtures with the following content of whole milk.				
	100 per cent.	50 per cent.	25 per cent.	15 per cent.	0 per cent.	100 per cent.	50 per cent.	25 per cent.	15 per cent.	0 per cent.
Average of all experiments	128.0	65.8	34.8	21.4	3.3	3.41	1.78	0.94	0.59	0.13
Maximum	141.3	75.6	39.6	26.1	4.8	3.82	2.14	1.06	.69	.20
Minimum	107.2	55.4	27.1	16.5	2.2	2.79	1.53	.80	.50	.08

The constant, i. e., the figure which by division into the ratio figures gives the fat content of the milk mixture, is 37.3.

The pasteurizing of the milk and stirring the cheese, fine or coarse, did not disturb these ratio figures appreciably. They were also the same whether the cheese was analyzed in the fresh or cured condition and regardless of the method of storing. Attention is called to the fact that these ratio figures are purely experimental and should not be accepted as absolute standards, but can be used as guides for the choosing of such standards. The yield of cheese can be calculated in round numbers when the fat content and casein of the milk are known.

The Jersey milk gave higher ratio figures than milk from the ordinary Danish cows. These figures, however, were comparatively too low on account of the greater casein content of Jersey milk. For Jersey milk the constant 30 should be used. Jersey milk gave a greater yield of cheese than ordinary milk, due to its higher fat and casein content. The quality of cheese from Jersey milk was no different than that from Red Danish cows.

A given milk for cheese can, by the addition of skim milk, or whole milk, be so changed in its composition that a previously desired ratio between the fat and casein in the finished cheese can be assured.

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, 17 (1915), pt. 2, pp. VII+981*).—The contents of this volume include the following articles: Pathology of the Circulatory System of Animals, by H. Rievel (pp. 1–89); Pathology of the Circulatory Organs of Man, by C. Thorel (pp. 90–718); and Relations between the Liver, Bile Ducts and Infectious Diseases, by A. Posselt (pp. 719–937). To each article is appended a large bibliography.

Infection, immunity, and specific therapy, J. A. Kolmer (*Philadelphia: W. B. Saunders Co., 1915, pp. 899, pls. 31, figs. 100*).—This book has special reference to immunologic technique, but also includes some data and methods on chemotherapy. It is divided into five parts: (1) General immunologic technique; (2) principles of infection; (3) principles of immunity and special immunologic technique; (4) applied immunity in the prophylaxis, diagnosis, and treatment of disease—specific therapy; and (5) experimental infection and immunity. Part five may be used as an experimental course for the study of infection and immunity.

About the detection and significance of leucocyte-attracting substances during infection, M. Bürger and H. Dold (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 21 (1914), No. 1–5, pp. 378–409*).—For studying leucotactic processes in the animal body, the knee-joint method (on the rabbit) is recommended.

Comparative investigations of the leucotactic activity of uniform sterile filtered sodium chlorid bacterial extracts, inactive bacterial serum extracts, and active bacterial serum extracts showed that the untreated serum in bacterial extracts was the most active. Leucocyte-attracting properties apparently are not only confined to foreign proteins (bacterial proteins) but also to homologous proteins (even body proteins) denatured by coagulation. The proteins after contact with complement-containing body fluids showed an increase of leucotactic properties. This is believed to be due to the formation of leucotactic cleavage products from less active higher complexes brought about by thermolabile serum ferments. The leucotactic effect is said to be proportional to the leucocyte-attracting substances. The multilocular injection of uniform amounts of these substances, provided certain experimental conditions are maintained, does not stimulate the mobilization of leucocytes.

The relation which leucotactic substances bear to immunity and processes of inflammation in which leucocytes play a part are discussed.

Further researches on combined vaccines, A. CASTELLANI (*Reprinted in Jour. Trop. Med. and Hyg.* [*London*], *17* (*1914*), *No. 21, pp. 326–333*).—Work is reported with mixed vaccines which is said to be confirmatory of earlier results. The combined vaccines studied were typhoid, paratyphoid A, and paratyphoid B; cholera and plague; typhoid, paratyphoid A, paratyphoid B, plague, and cholera; typhoid and Malta fever; typhoid, paratyphoid B, paratyphoid A, and Malta fever; typhoid, paratyphoid A, paratyphoid B, *Bacillus columbensis*, and *B. asiaticus;* typhoid, paratyphoid A, paratyphoid B, *Micrococcus melitensis*, *B. columbensis*, and *B. asiaticus;* dysentery, typhoid, and paratyphoid; and cholera, plague, typhoid, paratyphoid A, paratyphoid B, and Malta fever.

The use of combined vaccines made from carbolized emulsions of agar cultures in normal salt solutions which are not heated is deemed feasible, and when given to man the reaction is not severe and is less painful than when the bacteria are killed by heat. "The individuals inoculated with the above-mentioned combined vaccines generally produce agglutinins for each species of bacteria, and the amount for each species is not much less than control individuals inoculated with simple 'one disease' vaccines. The only exception, though only to a certain extent, seems to have been in the case of the typhoid-dysentery vaccines. Combined vaccines, when efficient, are of practical advantage, saving a great deal of time and rendering possible a contemporaneous vaccination for several different maladies."

The theoretical principles of employing specifically standardized ferments as a therapeutic measure, E. ABDERHALDEN (*Fermentforsch.*, *1* (*1915*), *No. 2, pp. 99–104*).—It is found that tumor-bearing animals treated with the serum taken from a healthy animal pretreated parentally with tumor substratum will show a marked improvement and a recession of the tumorous growth. This principle is being tested with other diseases.

Serum reaction in pregnancy and cancer by the coagulation method, W. W. KING (*Jour. Obstet. and Gynecol. British Empire, 24* (*1913*), *No. 6, pp. 296–303; abs. in Jour. Amer. Med. Assoc.*, *62* (*1914*), *No. 8, p. 650*).—The serum from pregnant subjects was tested against various tissues. Albumin obtained from the urine of a pregnant subject was not digested by the serum from that subject, but was decomposed by the serum of three other pregnant subjects.

"Carcinoma tissue was obtained from a case of advanced carcinoma of the cervix, and both this and the albumin were prepared exactly in the same way as the placental albumin. Out of 9 pregnant sera, 6 digested other albumins besides placenta, thus demonstrating that the ferments of pregnancy are not limited in their power of digesting albumin. Of 8 cases of malignant disease, 3 digested placental tissue. These 3 cases included one of sarcoma of the knee. . . . Urinary albumin was not digested by this serum, though a case of epithelioma of the tongue reacted strongly to it. Three sarcomas were negative to carcinoma tissue. Thus out of 17 cases of pregnancy and malignant disease, 9 sera digested albumins of a different type from that against which, ex hypothesi, they were produced."

If these observations are accurate, therefore, the ferments are not specific.

Bacterial vaccines—their use and abuse, A. T. FERGUSON (*Amer. Vet. Rev.*, *46* (*1915*), *No. 4, pp. 437, 438*).—The author deplores the fact that vaccines are used by the laity.

Autolactotherapy. A new system of therapeutics, C. H. DUNCAN (*Amer. Vet. Rev.*, *46* (*1915*), *No. 5, pp. 510–525*).—This method depends on the immunization of the child through the agency of the mother's milk. The subject may also be immunized by drinking the milk of animals immunized with the micro-organisms and possibly against plant poisons, such as poison ivy. The value of the method for protecting a community against typhoid infection is pointed out.

Studies on changes in the degree of oxidation of arsenic in arsenical dipping baths, R. M. Chapin (*U. S. Dept. Agr. Bul. 259 (1915), pp. 12, figs. 2*).—This bulletin reports upon field and laboratory experiments which have been briefly summarized as follows:

"All used arsenical dipping baths may be expected to contain (a) oxidizing organisms which work slowly, but steadily and persistently, and (b) reducing organisms which work very rapidly at times, but spasmodically. The reducing organisms exert an appreciable effect only in vats which are used at frequent intervals for dipping large numbers of cattle. The ordinary vat, used once a fortnight, is likely to show only a slow, steadily progressing oxidation of the arsenic, and periodical analyses or tests must be made if proper dipping strength is to be maintained.

"Formaldehyde solution (37 per cent), used in the proportion of 1 gal. to every 1,500 gal. (8.5 fluid ounces to 100 gal.) of liquid introduced into the vat, appears a safe and effective means for reducing oxidation to a low figure. But since there seems to be no evidence that under ordinary conditions oxidation is ever likely to progress so far as to result in the use of baths injurious to cattle, the question of the use of formaldehyde is purely economic. The writer believes that in most cases it will be cheaper to let some of the arsenic go to waste through oxidation. When the cost of a gallon of formaldehyde about equals the cost of all the materials necessary to make 500 gal. of dipping bath, there will probably be little financial gain either way, while there may be some real profit in its use through saving of labor in preparing [the] dip and through the reduction of offensive odor from the bath by keeping it under antiseptic conditions."

Contribution to the study of "marginal points" of the blood of mammals, A. Laveran and G. Franchini (*Bul. Soc. Path. Exot., 7 (1914), No. 7, pp. 580–584*).—This is in large part a review of the subject with references to the literature.

The protection of parasites in the digestive tract against the action of the digestive enzyms, W. E. and E. L. Burge (*Jour. Parasitology, 1 (1915), No. 4, pp. 179–183, figs. 3*).—"Tapeworms and roundworms from the intestine of the dog are not digested when introduced into activated pancreatic juice so long as they remain alive, but are digested when dead. If any part of them be killed this part is digested. A dead roundworm which is ordinarily digested when introduced into activated pancreatic juice can be prevented from being digested by keeping the dead body wall constantly permeated with nascent oxygen. The oxidative processes of the living parasites enable them to withstand the action of the digestive juices by oxidizing the enzym solution immediately in contact with them."

Experimental drug treatment of East Coast fever of cattle, G. H. F. Nuttall (*Parasitology, 8 (1915), No. 1, pp. 56–87, fig. 1*).—The experiments here reported have been summarized by the author as follows:

"No drug has been found which will influence the fatal course of East Coast fever or retard the multiplication of *Theileria parva* in the blood of the affected cattle. The drugs which were tried with negative results were trypanblue, Congo red, tryposafrol, creosote and oleum copaivæ, arsacetin, soamin, 606, emetin hydrochlorid, mercury salicylate, mercury succinimid, quinin bihydrochlorid and hydrochlorid, ethylhydrocuprein, ammonium fluorid, potassium iodid, sodium salicylate, calcium lactate, and nuclein.

"All of our animals died, 18 treated and 3 untreated, and showed typical lesions at autopsy. They were all infected by means of ticks (*Rhipicephalus appendiculatus*) which had fed on infected cattle as larvæ and nymphs and been placed on the experimental animals as nymphs and adults, respectively.

"The increase in the number of parasitized red blood corpuscles, but for slight irregularities, proceeds continuously night and day until the animal dies. We have not as yet observed a case ending in recovery."

A table is included which gives a summary of data relating to each experimental animal, except one, the number and kind of ticks which produced infection, the incubation period, the time when the parasites appeared in the peripheral blood, the time when the animals died, and the maximum percentage of parasitized blood corpuscles observed during the course of the disease.

The serological detection of glanders in asses and mules, SCHÜTZ and O. WALDMANN (*Arch. Wiss. u. Prakt. Tierheilk., 40* (*1914*), *No. 6, pp. 503–515*).—The sera of healthy asses and mules contain anticomplementary substances which make difficult the diagnosis of glanders in such animals with the usual complement fixation test. The agglutination values of all of the animal sera were low, which indicates the absence of glanders, save that it is well known that old chronic cases of glanders also have a low titer. By changing the hemolytic system so that it consists of horse serum complement, inactivated bovine serum as amboceptor, and red blood corpuscles of the guinea pig better results can be obtained.

From the results of an infection experiment it was found that the formation of specific antibodies took place in asses and mules from the sixth day on and reached considerable height during the course of the disease. With the complement deviation procedure a stronger fixation can be noted on the eight or ninth day post infection, which points to the formation of specific antibodies in the blood of asses and mules. The presence of specific deviating substances in the blood of these animals can be detected with certainty by the modified complement fixation test.

Some tests with the modified method were also conducted with the sera of horses and asses suspected of being infected with glanders. The serum of horses, contrary to that of asses and mules, contains no anticomplementary substances and can be adsorbed by guinea pig serum. The phylogenetic importance of this finding is pointed out.

About the reaction of mallein on sound horses and the significance of the conglutination reaction for diagnosing glanders, W. PFEILER and G. WEBER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15* (*1914*), *No. 3–4, pp. 209–227*).—The authors examined daily the sera of horses coming into Germany from Russia, where the subcutaneous mallein test is employed, and studied the effect of malleinization upon the outcome of a subsequent conglutination test.

Sound horses treated subcutaneously or conjunctivally with dried mallein after the fifth day showed an increase in the agglutination. In the horses tested by the conjunctival route the increase in agglutination titer was only 100 units. The agglutinants gradually disappeared in the animals so treated, but at various times. Complement deviating substances were found in three out of six horses after five days (malleinization) and on the sixth day they were markedly present. Eight days were required in one case for the appearance of complement-fixing substances. The complement-fixing substances vanished a few days after their appearance.

A previous ophthalmic test had no influence upon the outcome of a serum test. Conglutinating substances appeared much later than complement-fixing substances when mallein was instilled in the eye, so that the conglutination test can not be used for diagnosing the disease in its first stages. The conglutinin-fixing bodies, however, remain much longer in the blood stream than the complement-fixing bodies, and from this standpoint the method should be employed where an absolute diagnosis of glanders is desired.

The advantage of using larger amounts of extract in conducting the complement fixation test for diagnosing glanders, ECKERT (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 4, pp. 298–305; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 33, p. 602*).—As a rule, in this method a 1 per cent glanders bacillary extract is used, but it has been observed in some cases that the use of a solution of this strength declared horses free of glanders which, on clinical examination or on autopsy, were found to be affected with the disease. When an extract of 5 per cent was used for each 0.2 cc. of serum, the sera of many of the horses which did not react with the lower concentration indicated that glanders might be present. The highest bacillary extract concentration recommended by the author is 10 per cent.

Studies in the immunity to tubercular disease.—I, The caseation of the tissues, C. C. TWORT (*Vet. Jour., 70 (1914), No. 473, pp. 543–551*).—This article discusses "what takes place in the presence of the tubercle or other bacilli producing caseation, and, on the other hand, what takes place in the presence of Johne's bacillus.

"In the case of the tubercle bacillus, the soluble toxin secreted probably does not act detrimentally on the surrounding cells, but may even act as a stimulant, so that phagocytosis of the bacilli is in no way interfered with. This toxin may have an influence in causing encapsulation of the diseased area, and thus more or less isolation from the other tissues of the body. Meanwhile the bacilli, both intra- and extra-cellular, but especially the former, commence to be disintegrated to the humors of the host. The products of this disintegration lead to a further fabrication of the specific lysin, while at the same time, if it becomes too great in amount, the animal cells are unable to survive, as the intermediate products of the breaking down of proteids are intensely toxic for the cells of the animal body. The increase of the specific lysin leads to further destruction of the bacilli, and this in turn to the liberation of more endotoxins, so that ultimately the cells inside the nodule are doomed to destruction. Thus the cells and bacilli within the constricted area react upon one another, and both in the end are killed out, the edges of the nodule, where the accumulated toxins can more easily be got rid of, being the only situation in which intact cells and bacilli can be found. Bacilli, apparently normal, may be found in the center of the caseous mass, but rarely any intact cells; and it is quite probable that many of the bacilli here found are really dead.

"In Johne's disease it is highly probable that little or no soluble toxins are produced, and the bacilli, although actively phagocytosed, are not toxic for the cells, and can live and multiply within them. At the same time, if a certain number of bacilli die or are killed by the host, the products of disintegration are better able to get away than in tubercular disease, as the lesions are never encapsulated, but blend more or less imperceptibly with the normal tissues. In leprosy the lesions are often encapsulated, but here again it is probably due to the nontoxicity of the bacilli for the cells, and especially on their ability to live and multiply within the cells, that there is an absence of caseation. The disintegration products of Johne's bacillus and the leprosy bacilli are as toxic for the animal as a whole, or locally for its tissues, as those of the tubercle bacillus. This is seen by the reaction produced on inoculation of a diagnostic vaccine on the one hand, and the effect produced by the inoculation of an emulsion of dead bacilli on the other, when with all three diseases, and with all three bacilli, the results are the same, that is to say, a rise of temperature in the first case and caseation of the tissues in the second."

Remarks on the work of Krautstrunk on tuberculosis protective vaccination tests with antiphymatol, M. Klimmer (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 2, pp. 169–175*).—A discussion of the article previously noted (E. S. R., 29, p. 584).

The intradermal test in bovine tuberculosis, H. Welch (*Montana Sta. Bul. 105 (1915), pp. 351–380, figs. 20*).—The subject of bovine tuberculosis in relation to public health and as a stockman's problem is first discussed and illustrations of tuberculous animals and pathologic tissues taken therefrom are shown.

The intradermal test was found equal in accuracy to the thermal test. The ordinary tuberculin produced by the Bureau of Animal Industry of the U. S. Department of Agriculture, for thermal testing, containing 5 per cent glycerol, was found preferable to any other kind for intradermal testing. In over 3,000 tests no swellings were observed that would be confusing.

"After an intradermal test, a retest of an infected animal in 6 to 8 days will give a distinct reaction. If several retests are made at similar intervals, the reaction becomes less and less characteristic with each injection of the tuberculin. . . .

"In applying the intradermal and the thermal tests at the same time, no appreciable effect is noticeable on the temperature curve but the size of the local reaction is somewhat modified. . . .

"When the cattle have been tested first by the thermal method, diseased animals frequently will not react to the intradermal test for at least 20 days, though the exact time has not been determined."

A large number of tuberculous animals will have to be tested and retested before an approximate time limit can be set for such a retest. It was also found that some animals react to the intradermal test but not to the thermal test. "Both tests applied simultaneously to a herd should, in the great majority of cases, pick out all the tuberculous animals."

In all, there were 4,055 intradermal tests on "2,635 cattle, there being 1,420 retests made by this method. One hundred and seventy-two cattle reacted; 169 of these were slaughtered and 168 were found tuberculous on post-mortem examination."

With calves typical reactions were obtained at four months of age, although it seems probable that the reaction would be typical in younger animals. In testing range cattle a corral or chute and some sort of a squeeze may be employed. "One man and a helper can test range cattle accurately at the rate of about 200 a day for an indefinite period. . . .

"The objection to the intradermal method as an official test [for interstate shipments], that is most frequently advanced, is that it leaves no record. As a matter of fact, it leaves more record on the cow than does the thermal test. . . . The intradermal test, in economy of time, labor, and expense, is preferable to the thermal test."

See also a note by Haring and Bell (E. S. R., 30, p. 883).

Studies on the biochemistry and chemotherapy of tuberculosis.—VIII, Therapeutic use of certain azo dyes in experimentally produced tuberculosis in guinea pigs, Lydia M. De Witt (*Jour. Infect. Diseases, 14 (1914), No. 3, pp. 498–511*).—A continuation of work previously noted (E. S. R., 30, p. 80; 31, p. 583).

"Trypanblue and trypanred readily penetrate the tubercle in all stages of its development, thus showing that it is possible to penetrate the avascular tubercle by chemicals introduced either subcutaneously, intravenously, or intraperitoneally. Trypanblue and trypanred do not penetrate the tubercle bacillus well, and do not kill it in vitro even after 24 hours' exposure to a

1 per cent solution. In therapeutic doses, frequently repeated for long periods, trypanblue and trypanred seem to have no favorable or curative influence in experimental tuberculosis in guinea pigs. In a single large, nearly lethal dose at the beginning of the infection they also have no favorable influence.

"Silver trypanblue and iron trypanblue also penetrate the tubercle, but have no bactericidal and no therapeutic influence. It is doubtful whether the metals are carried in with the dye. Copper trypanblue is soluble, but does not penetrate either the normal or the tuberculous tissues, and is probably changed to an insoluble form or a suspension colloid and retained at the point of injection. Mercury trypanblue is insoluble, is strongly bactericidal in its action on the tubercle bacillus, but is too toxic for therapeutic use, since the pigs died apparently from chronic mercury poisoning, rather than from the tuberculous infection, the tuberculous process being generally very slight. The findings with this salt, however, are suggestive, and further experiments with mercury salts will be made."

Tuberculocidal action of certain chemical disinfectants: Studies of the biochemistry and chemotherapy of tuberculosis IX, Lydia M. De Witt and Hope Sherman (*Jour. Infect. Diseases, 15 (1914), No. 2, pp. 245–256*).—Very little is in the literature in reference to the power of chemical substances to kill tubercle bacilli. It has generally been accepted that tubercle bacilli, though nonsporogenous, are the most resistant of pathogenic organisms.

"Phenol in 5 per cent water solution kills human tubercle bacilli in five minutes, one hour, six hours, and twenty-four hours. It is nearly as efficient in 1 per cent solution, and shows some tuberculocidal action down to 0.1 per cent solution. Formaldehyde in 1 per cent solution kills all tubercle bacilli in one hour (shorter time not tested). In 0.01 per cent solution it kills in twenty-four hours and so no disease develops in guinea pigs. Formaldehyde, therefore, is somewhat more efficient than phenol. Ethyl alcohol in 25 per cent solution kills all tubercle bacilli within one hour (shorter time not tried). Acetone, chloroform, and ether have very little, if any, tuberculocidal influence. Toluene and iodin show slight influence.

"Of the metallic salts used, mercuric chlorid shows the greatest tuberculocidal action, 0.001 per cent killing in twenty-four hours, and 0.1 per cent in one hour. Gold chlorid in 0.005 per cent solution kills in twenty-four hours, while 0.025 per cent silver nitrate kills in the same time. One-tenth per cent gold tricyanid and 5 per cent copper chlorid kill the organisms in twenty-four hours.

"From a comparison of the results of the experiments contained in this paper with those of disinfection work on other more rapidly growing organisms, the *Bacillus tuberculosis* appears less resistant than the streptococcus, staphylococcus, pneumococcus, or gonococcus, or than the *Bacillus typhosus*, *coli*, or *anthracis* spores, to phenol, formaldehyde, mecuric chlorid, silver nitrate and gold chlorid, but more resistant than these other organisms to alcohol, chloroform, ether, acetone, toluene, and Lugol's solution. The fat content of the tubercle bacillus does not determine its resistance to disinfectants. Our experiments seem to show that if the comparatively high content of this organism differentiates its behavior from that of bacteria of low fat content it does so by rendering the tubercle bacillus more resistant to fat solvents and less resistant to substances insoluble in fats."

Coccidiosis in cattle and carabaos, C. H. Schultz (*Jour. Infect. Diseases, 17 (1915), No. 1, pp. 95–108*).—A discussion of bovine coccidiosis and observations in the Philippines, where it apparently has an extensive distribution.

Hog cholera and methods of control, E. A. Cahill (*Amer. Vet. Rev., 46 (1915), No. 4, pp. 417–424*).—A discussion of the methods of preventing and treating cholera in hogs by serum and serum virus, and of the causes for failure.

The refractive index of serum from pigs immunized against hog cholera, E. Proniewicz (*Abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 29, pp. 520, 521*).—The refractive index of the sera of either normal pigs or of pigs hyperimmunized against hog cholera showed no characteristics which would enable one to detect the presence of hog cholera virus or antibodies.

Shall we adopt the use of hog cholera serum and virus as an immunizing and curative agent? S. J. Marquardt (*Amer. Vet. Rev., 46 (1915), No. 5, pp. 542, 543*).—A plea for the discontinuance of virus in immunizing against hog cholera.

My experience with the simultaneous method of immunization, H. A. Smothers (*Amer. Vet. Rev., 46 (1915), No. 6, pp. 621–625*).—An account of some untoward results obtained by the serum simultaneous method.

The filterability of Bacillus bronchisepticus, with an argument for a uniform method of filtration, N. S. Ferry (*Jour. Path. and Bact., 19 (1915), No. 4, pp. 488–493; abs. in Science, n. ser., 41 (1915), No. 1060, pp. 619, 620*).—The author here reports a series of filtration experiments with *B. bronchisepticus*, which has been described as the cause of canine distemper. The work was carried on with a Berkefeld N and six Pasteur F candles that upon test showed no signs of leakage or weakness at any point and gave a very high efficiency as recorded by the pressure gauge.

"The results of the work proved conclusively, according to all rules as laid down by the several authorities on filterable viruses, that the *B. bronchisepticus* is a filterable organism. The work also corroborated the results of previous investigators with regard to the fact that the less pressure used the more easily will some organisms pass through the filters."

Is Leucocytozoon anatis the cause of a new disease in ducks? A. B. Wickware (*Parasitology, 8 (1915), No. 1, pp. 17–21, pls. 3*).—Numerous inquiries regarding an apparently infectious disease which appeared among ducks at Ottawa, Ontario, led to the investigations here reported. At a poultry farm on which the investigations were conducted young ducks were found dying at an average of 20 a day. The mortality was exceptionally high, being estimated at 65 to 70 per cent, and the young ducks that recovered remained undersized and stunted.

Examinations of the blood showed the presence of *L. anatis* in large numbers in the peripheral circulation of the ducks in which the affection ran an acute and fatal course. These protozoa gradually diminished in number in the ducks which made an apparent recovery, while in contact birds which presented no clinical manifestations parasites were not demonstrable. Attempts to transmit the disease failed.

The author found that until further experimental studies are undertaken no general conclusions should be drawn. The fact that this parasite was present in large numbers in all affected birds and absent in all the controls coming under observation is considered significant.

Poultry parasites: Some of the external parasites that infest domestic fowls, with suggestions for their control, G. W. Herrick (*New York Cornell Sta. Circ. 29 (1915), pp. 29–39, figs. 5*).—This is a popular account of the commoner parasites of poultry and control measures, descriptions of which are given in the bulletin previously noted (E. S. R., p. 353).

RURAL ENGINEERING.

The effect of the width of the channel of approach on the flow of water over weirs, W. F. MARTIN (*Cornell Civ. Engin., 23 (1915), No. 5, pp. 180–190, figs. 4*).—"The object of this investigation was in part to supplement or continue the work of Bazin, who had conducted experiments on sharp crested weirs without end contractions, for the express purpose of determining the effect on the coefficient of discharge of the height of weir above the bottom of the channel of approach.

"Four distinct series were run on sharp crested weirs, without lateral or end contraction and having the same height of crest and same length of channel of approach, but with widths 2.023 ft., 0.5165 ft., 0.2597 ft., and 0.1296 ft. . . . The heads ranged from the lowest or zero up to 1.5 ft. except for the longest weir, in which case the maximum head was about 1 ft.

"It was found that the coefficient of discharge varies with the width of the channel of approach, the variation being very slow for the longer weirs and quite rapid for the very short weirs. As might be expected, there is a decrease in the coefficient of discharge. This effect probably ceases to be noticeable when the length of weir is three or four times as great as the maximum head on the weir."

The relation of stream gaging to the science of hydraulics, C. H. PIERCE and R. W. DAVENPORT (*U. S. Geol. Survey, Water-Supply Paper 375–C (1915), pp. 77–84, fig. 1*).—A brief discussion of the development of hydraulics with reference to the measurement and computation of stream flow is given.

Artificial control sections for river measurement stations, J. C. HOYT (*Cornell Civ. Engin., 23 (1915), No. 5, pp. 176–179, figs. 3*).—The author states that "the most successful control so far constructed consists of a low submerged dam, which in many places may be made on a reef or bar of gravel or bowlders by grouting with cement. In other places it may be necessary to excavate the bed and build a concrete structure or to drive sheet piling across the section nearly flush with the bottom. Such structures will tend to prevent scour and at the same time so limit the channel that the natural current reduces the probability of silting."

Surface water supply of Pacific drainage basins in Washington and upper Columbia River basin, 1912 (*U. S. Geol. Survey, Water-Supply Paper 332–A (1915), pp. VI+282, pls. 2*).—This report, prepared in cooperation with the States of Montana, Idaho, and Washington, presents the results of measurements of flow made on the Queniult River, Puget Sound, and upper Columbia River drainage basins during 1912.

Ground water in Paradise Valley, Arizona, O. E. MEINZER and A. J. ELLIS (*U. S. Geol. Survey, Water-Supply Paper 375–B (1915), pp. 51–75, pls. 3, figs. 9*).—This report deals with the ground-water supplies of an area covering about 200 square miles, which lies between the Phoenix and McDowell ranges of mountains and occupies a trough-like depression that has been partly filled by unconsolidated rock débris washed from the mountains.

"Paradise Valley is underlain by a deep deposit of detrital material, which in its lower part is saturated with water. . . . The water table . . . slopes southward at an average rate of about 5 ft. to the mile, which is much less than the slope of the land surface. Along the Arizona canal the depth to the water table is 50 ft., or slightly more; toward the north it increases as the land surface rises until along the abandoned Verde canal it is nearly 300 ft." The ground water of the valley is supplied from the run-off and underflow of Cave Creek, the run-off from the mountain areas directly tributary to the valley, and the rain that falls on the valley, and is nearly or wholly inclosed by impervious bed rock, except at the south end where there is underflow into the Salt River valley.

"There is no evidence of artesian structure in the valley fill nor in the surrounding bed rocks, and wells should be drilled with the understanding that pumping will be necessary. Except near the Arizona canal the ground water is of good quality for domestic and industrial uses and for irrigation. Even in the vicinity of the canal it is believed to be usable for irrigation. . . . Both the yield of wells and the ultimate supply of ground water will no doubt be found to be much less in Paradise Valley than in the Salt River valley, but the prospects for obtaining dependable supplies from underground sources for irrigation on a small scale are sufficiently encouraging to justify the sinking and testing of wells. On account of the great depths to the water table the cost of ground-water supplies will at best be high, but it is believed that if electric power is obtained at a low price, if crops are raised that are valuable and do not require very large quantities of water, such as long-staple cotton, and if thrift and good management are applied it will be practicable to pump the available supply of ground water for irrigation in the southern part of the valley."

A plan for municipal irrigation from the Los Angeles aqueduct, B. A. Heinly (*Engin. News, 73 (1915), No. 7, pp. 344–346, fig. 1*).—It is stated in this article that the surplus waters of the Los Angeles aqueduct are to be distributed by a number of main conduits and a vast network of smaller pipe to irrigate 87,090 acres.

The soil of the district to be irrigated ranges from sandy loam to clay, and much of it is said to be adapted to the growth of citrus fruits.

In this system there will be 317 miles of riveted steel mains from 8 to 54 in. in diameter under a head of from 40 to 300 ft. Storage reservoirs will also form a part of the system. The estimated cost of the entire project is $4,472,674, or $50.90 per acre. Of the latter, $17.42 will be borne by the city and $33.58 by the owners of the land to be irrigated.

The Valier-Montana irrigation project, K. A. Heron (*Engin. News, 73 (1915), No. 6, pp. 241–246, figs. 12*).—A description is given of what is said to be the largest Carey Act project in Montana. Important features of this project are a rock fill dam 165 ft. high forming a large reservoir, a larger storage reservoir formed by a less important dam, and 153 miles of main and 274 miles of distributing laterals on which are structures, including concrete chutes, pipe lines, and drops, to reduce high velocities.

Thirteenth annual report of the Reclamation Service, 1913–14 (*Ann. Rpt. Reclamation Serv. [U. S.], 13 (1914), pp. V+505*).—This report relates in particular to the work completed and in progress during the fiscal year ended June 30, 1914, but contains also information in regard to previous operations, "in order that the methods, progress, and results of reclamation work may be more readily understood."

Notes in connection with the work in the hydrographic department of the Porto Rico Irrigation Service, F. K. Knapp (*Cornell Civ. Engin., 23 (1915), No. 5, pp. 195–206*).—"These notes are based upon the Porto Rican Irrigation Service records of observations in connection with the actual routine field work prior to operation, and are comments upon some special problems arising from unusual conditions rather than discussion of hydrographic investigations."

Irrigation in Spain, G. F. de la Rosa (*Bol. Agr. Téc. y Econ., 6 (1914), No. 67, pp. 620–622; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, pp. 1420, 1421*).—The total irrigated area in

Spain is estimated at 3,233,108 acres, of which about 200,000 acres are irrigated with subsoil water. Two-thirds of the area is distributed in the four great districts of Spain as follows: Aragon and Navarre, 580,091 acres; Catalonia, 472,920 acres; Levante, 629,259 acres, and the Boetic-Mediterranean region, 364,690 acres.

Three systems of irrigation are practiced, namely, pumping from wells, canals fed by the large rivers, and artificial lakes or reservoirs, the third being preferred. The use of artesian water has not been very successful.

Report of the interstate conference on artesian water (*Rpt. Interstate Conf. Artesian Water* [*Aust.*], *1912, pp. XV+275, pls. 42*).—This report covers the origin, extent, and use of artesian water in Australia, hydrographic surveys, boring and casing of artesian wells, and legislation for controlling artesian bores, and devotes considerable space to the corrosion of well casings.

Ownership and disposal of seepage water, J. G. WHITEHEAD (*Irrig. Age, 30* (*1915*), *No. 4, pp. 104, 105, fig. 1*).—The subject is discussed from the standpoints of both the landowner whose land is seeped and the landowner whose land needs irrigation, it being concluded "that the ownership and control of seepage water is now, and should be, in the landowner on whose land it is."

Malaria control: Drainage as an antimalarial measure, J. A. A. LE PRINCE (*Pub. Health Rpts.* [*U. S.*], *30* (*1915*), *No. 8, pp. 536–545, figs. 13*).—The author discusses land drainage as an antimosquito measure, with particular reference to training natural streams and water courses, construction of open and intercepting ditches, installation of permanent lining in ditches, subsurface draining, filling, and proper maintenance. He points out that the ordinary methods of draining agricultural land are not sufficient for mosquito control, and states that land must not only be properly drained, but the drainage ditches must be so planned, constructed, and maintained that they will not become a breeding place for mosquitoes. "As a general rule shallow water is more favorable to mosquito production than deep water. A depth of an inch is sufficient; therefore, in order to prevent mosquito breeding we must remove all the water or make conditions unfavorable."

The agricultural utilization of the water of municipal sewage, R. PEROTTI (*Bol. Quind. Soc. Agr. Ital., 19* (*1914*), *No. 22, pp. 801–810*).—The author discusses the possibilities in the agricultural use of municipal sewage, both for irrigation and fertilizing purposes. He points out, however, the importance of making such a process successful from the standpoints of both agriculture and sewage purification and disposal. He suggests, therefore, that it be a Government undertaking.

Disposal of sewage from hospitals and medical establishments, H. KÜHL (*Heilanstalt, 8* (*1913*), *No. 2, pp. 21–23; abs. in Wasser u. Abwasser, 9* (*1915*), *No. 2, p. 37*).—The best process for the purification of such sewage is said to be by land irrigation. Where the necessary land is unavailable a biological sewage purification system is considered necessary. A number of such systems are described.

Fifth biennial report of the state highway commissioner, F. F. ROGERS (*Bien. Rpt. State Highway Comr. Mich., 5* (*1913–14*), *pp. 123, pls. 34, figs. 9*).—This is a report of the activities of the commissioner during the biennium ended with June, 1914. Considerable structural data are included.

Results of French experiments on the transmission of pressure through macadam to the subgrade, W. DE H. WASHINGTON (*Engin. and Contract., 42* (*1914*), *No. 25, p. 571*).—French tests on the amount of pressure exerted through the road on the subgrade by a wheel load of 4 tons, with a 5½-in. tire, gave the following results:

Transmission of pressure through macadam to subgrade.

Macadam alone.		Foundation alone.		Combined foundation and macadam.			
Crust thickness.	Pressure on subsoil per square inch.	Foundation thickness.	Pressure on subsoil per square inch.	Foundation thickness.	Pressure on subsoil per sq. in.		
					Macadam thickness 3.94 in.	Macadam thickness 5.91 in.	Macadam thickness 7.87 in.
Inches.	*Pounds.*	*Inches.*	*Pounds.*	*Inches.*	*Pounds.*	*Pounds.*	*Pounds.*
1.97	102.5	5.91	56.0	5.91	19.3	13.2	9.7
3.94	47.7	7.81	37.4	7.87	14.7	10.9	8.2
5.91	27.4	11.81	20.7	9.84	12.6	9.1	6.8
7.87	17.4	....	....	11.81	10.2	7.7	6.1
11.81	9.1	....	....	....	....	....	....

The pressure on the subsoil through a 12-in. bed of simple macadam is apparently the same as the pressure through a 6-in. bed of macadam laid over a 10-in. stone foundation. It is considered that poor soil requires at least a 12-in. macadam layer or its equivalent.

Test of a bridge slab, E. B. McCormick (*Cement Era, 13 (1915), No. 3, pp. 54, 55, figs. 8*).—The author briefly describes experiments being conducted by the Office of Public Roads and Rural Engineering of this Department to determine the effective width of reinforced concrete bridge and culvert slabs under various conditions of loading. The effective width is considered to be "the width of a slab, which, if subjected to a load of a certain magnitude, uniformly distributed along the top fiber of the center section, will have the same maximum outside fiber stress, and the same total fiber stress as the tested slab showed under the concentrated load of that magnitude."

Diagrams are given showing lines of equal stress and fiber stresses along sections for a slab under one, two, and four point loadings. The diagrams for center loads show that the effective width is the same for loads of different magnitude, that is, "the effective width of a slab is apparently independent of the magnitude of the load."

No conclusions are drawn, as further investigations are in progress.

Estimating curves for standard bridges of the Illinois Highway Department, G. F. Burch (*Engin. and Contract., 43 (1915), No. 6, pp. 123–126, figs. 13*).—This article gives data and a set of curves for estimating the quantities of materials in the various types of highway bridges designed by the Illinois Highway Department.

Structural engineering, J. E. Kirkham (*Chicago: The Myron C. Clark Publishing Co., 1914, pp. V+669, pls. 3, figs. 452*).—This book, while dealing primarily with general structural engineering, contains a section covering the design of simple steel highway bridges, including the beam, pony truss, and high truss types.

Tests and uses of hydrated lime, R. C. Haff (*Cement Era, 13 (1915), No. 2, p. 69*).—The author found in his tests that the addition of from 10 to 15 per cent of hydrated lime to 1:3 cement and sand mortar increased the strength. He states that his experience has proved hydrated lime to be the best waterproofing material available, and recommends the addition of 15 per cent for this purpose.

The industrial use of peat, E. C. Verschoor (*Chem. Weekbl., 11 (1914), No. 45, pp. 980–990*).—This article discusses the use of peat as a fuel for steam boilers and as a source of gas fuel for gas burners and internal combustion engines. The heat efficiency obtained from the gas is said to be greater than from the fuel itself. The development of gas fuel from peat is thought, therefore, to offer the greater commercial inducement.

The use of electricity on Ontario farms, H. P. Starrett (*U. S. Dept. Com., Com. Rpts., No. 52 (1915), pp. 886–888*).—It is stated that since the action taken in 1905 whereby the province controls and operates all water powers within its boundaries, the use of electricity on farms has gradually developed and "the result today in Ontario is the definite establishment of electricity as a very practical aid to the farmer of the more progressive type. In this development actual experiments have demonstrated that motors developing from 1 to 8 horsepower will do all of the ordinary power work of the farm, while for the heavier work, such as threshing, silo filling, grinding, etc., 20-horsepower motors are required."

It is stated that considerable economy has accompanied the use of electric current as compared with steam.

Machines and implements at the 1914 exposition of the German Agricultural Society, Luedecke (*Fühling's Landw. Ztg., 63 (1914), No. 19–20, pp. 609–654, figs. 22*).—This article describes and illustrates recent developments in a large number of agricultural machines.

The first large American Humphrey pump, C. C. Trump (*Gas Engine, 17 (1915), No. 2, pp. 95–100, figs. 8*).—This article describes and illustrates a 66-in. pump to be used for irrigation purposes, said to be the first of its kind in this country. The principles under which this type of pump operates were described in a previous article (E. S. R., 26, p. 893).

A new deep-well pump, L. Andreuzzi (*Agr. Colon. [Italy], 7 (1914), No. 10, pp. 620–640, pls. 2, figs. 6*).—The author describes and diagrammatically illustrates a type of compressed-air or pneumatic pump which he states is adapted to deep-well pumping for both irrigation and domestic uses. The mathematical principles underlying the operation of this pump are presented and efficiency tests compared with similar tests of other types of pumps, particularly the centrifugal pump. It is claimed that an efficiency of 70 per cent may be exceeded with this pump, while the tests of other types show efficiencies rarely reaching 70 per cent. Its deep-well pumping facilities are said to be its greatest asset.

Results of a tractor investigation, P. S. Rose (*Amer. Thresherman, 17 (1915), No. 11, pp. 5–9, fig. 1*).—The author tabulates the first 96 answers to a large number of letters sent to tractor owners in the various States and the western provinces of Canada asking for views as to tractor farming.

A large percentage of the replies stated that the tractor is cheaper than horses. The estimates of service ranged from 4 to 25 years, with an average of a little less than 10 years. While some of the repair bills have been rather high, it is stated that the amount of work has been in proportion and the cost per unit of work has been excessive only in a few cases. It is also brought out that no particular make of tractor has had a monopoly of either the successes or the failures. Of the 60 per cent reporting the possession of a shop, a number have been unsuccessful with the tractor.

The author states that on the whole the evidence that he has obtained is favorable to the tractor, in spite of the number of failures, which he attributes mostly to lack of knowledge on the part of the operator in the beginning.

The gas tractor situation in Iowa, J. B. Davidson (*Amer. Thresherman, 17 (1915), No. 11, pp. 70, 71, fig. 1*).—The author states that the factors which will influence the success of the gas tractor in the State are the character of the farming, the size and topography of the farms, the climate, the prosperity of the farmer, and the present extensive use of machinery. He is of the opinion that out of 225,000 farms in Iowa 50,000 could use the tractor with economic success.

The tractor situation in Indiana, A. H. GILBERT (*Amer. Thresherman, 17 (1915), No. 11, pp. 10, 11, fig. 1*).—Of 36 replies received from tractor users in the State, 30 reported the tractor to be a practical investment, 2 said that it paid fairly well, and 3 reported a failure. The author maintains that while the present situation does not prove conclusively that the tractor is a profitable investment for every farm, it can be made a paying proposition in Indiana.

Small tractor a benefit to Kansas threshermen, R. C. NICHOL (*Amer. Thresherman, 17 (1915), No. 11, pp. 74, 75, fig. 1*).—The author is of the opinion that threshermen will be benefited materially from the present interest in small tractors due to the increased yields brought about by the use of mechanical power.

The Minnesota view of traction engines, J. L. MOWRY (*Amer. Thresherman, 17 (1915), No. 11, pp. 18, 19, fig. 1*).—In reviewing the tractor situation in the State, the author states that the traction engine has not been a paying investment in the past, and he is of the opinion that a 240-acre farm is the smallest that can profitably use a traction engine.

The necessary and most appropriate machines for the tillage of different classes of soil, A. R. URANGA (*Bol. Estac. Agr. Expt. San Juan Bautista, Tabasco, No. 9, (1913), pp. 40, figs. 61*).—This bulletin describes and illustrates a number of the more common tillage tools and other agricultural implements.

Note on machines for pseudocultivation, M. RINGELMANN (*Ann. Inst. Nat. Agron., 2. ser., 13 (1914), No. 1, pp. 5–31, figs. 10*).—The author reviews a number of dynamometer tests of scarifiers, weeders, cultivators, and disk pulverisers in soils of different density.

The results show that these machines, which the author terms pseudocultivators, require a tractive effort per unit section of moved earth which is equal to, and in some cases greater than, the tractive effort required per unit section of moved earth for a double bottom plow in the same soil. They also show the influence of the density of the soil on the required tractive effort for these machines. With a soil density of 1.99, the average traction in kilograms per square decimeter was for the scarifiers 45.5, weeders 72, cultivators with flexible teeth 25.8, and pulverizer 31.8. The corresponding values with a soil density of 2.03 were 47.9, 74.1, 42.9, and 50.3.

It is stated that when these machines are operated on a soil which does not support vegetation these results should be multiplied by a coefficient varying according to the nature and state of the soil from 0.7 to 0.8.

With reference to a proposal that the pseudocultivators be used several times in place of one passage of the deeper tilling plow, it is concluded that it is more practicable to use the plow. It is further concluded that on the same work under the same conditions less energy is expended on machines with flexible teeth or shovels than with rigid shovels. The tests also show that the flexible shovels should be fixed in groups of three to five on independent frames and not on one rigid frame.

Construction of sanitary mangers in dairy barn at Troy, Pa. (*Concrete-Cement Age, 6 (1915), No. 2, pp. 104–106, figs. 8*).—This article illustrates and describes the method of construction of a large L-shaped dairy barn, 70 by 102 ft. in plan, wherein sanitary mangers have been installed.

The housing of the agricultural laborer, H. D. SEARLES-WOOD (*Jour. Roy. Sanit. Inst., 36 (1915), No. 1, pp. 29–37, figs. 2*).—The author discusses various plans which have been put forward for the housing of agricultural laborers in England, and gives information regarding arrangement and construction, including plans.

Cottage building in rural districts, T. W. Potter (*Jour. Roy. Sanit. Inst., 36 (1915), No. 1, pp. 38–44*).—The author expresses his views regarding the housing requirements in rural districts, which he states have been developed from 25 years' experience, chiefly on large estates.

Dampness in houses, its cause and remedy, M. Metzger (*Deut. Landw. Presse, 41 (1914), Nos. 98, pp. 1015, 1016; 100, p. 1032*).—This article draws attention to the unhealthful conditions caused by dampness in houses, and points out the effectiveness of waterproofing and insulating cellar walls in preventing the entrance and capillary rise of ground water.

RURAL ECONOMICS.

The resources of United States and their relation to opportunity, R. M. Keir (*Ann. Amer. Acad. Polit. and Soc. Sci., 59 (1915), No. 148, pp. 1–28, figs. 36*).—The author points out that the natural resources as related to population are high in the United States compared with other countries, but that if the resources do not increase as rapidly as the population the opportunities decrease accordingly. He claims that up to the year 1892 the exports from the United States were chiefly farm products. Since that time the percentage of agricultural exports to the total has rapidly declined, while manufactured goods ready for consumption have comprised a larger and larger proportion, and one which is increasing more rapidly than the increase in population. With a corresponding falling off in farm exports it follows that greater numbers of men are working in factories. He believes that the country should, therefore, pay more attention to conserving the wealth it has, and should make increased efforts to gain foreign trade. He also advises that the United States seek to sell manufactured goods and keep more raw materials at home.

The open door to independence, T. E. Hill (*Chicago: Hill Standard Book Co., 1915, pp. 448, pl. 1, figs. 413*).—This book describes the natural and agricultural resources of the various States and gives details regarding government irrigation projects and other general information of interest to those who wish to engage in agriculture.

Farms for sale or rent in New York, C. W. Larmon (*N. Y. Dept. Agr. Bul. 67 (1915), pp. 641–974, pls. 49*).—This bulletin lists the farms for sale or for rent in New York, and briefly describes them.

Farm land for sale in West Virginia (*W. Va. Dept. Agr. Bul. 2 (1915), pp. 117, figs. 15*).—This publication lists and describes the farms for sale in West Virginia.

The efficiency movement in its relation to agriculture, W. J. Spillman (*Ann. Amer. Acad. Polit. and Soc. Sci., 59 (1915), No. 148, pp. 65–76*).—The author points out a number of typical instances where an analysis of a farmer's business has shown wherein lay the weakness in his system of management.

Diversified agriculture and the relation of the banker to the farmer, B. Knapp (*U. S. Dept. Agr., Off. Sec. Circ. 50 (1915), pp. 15*).—In this address, delivered to several State bankers' associations and the Southern Commercial Congress, the author points out that a system of agriculture for any given community ought to be self-supporting and to have sufficient diversification so that its interests are not jeopardized by mishaps to one crop. To bring this about he suggests the establishment of local cash markets for locally grown produce, and that the credit system should be so changed that the farmer would adopt a plan of farming which would make his farm self-supporting. Bankers and merchants should, in his opinion, alter their present system of giving credit upon the basis of the farmer devoting a certain acreage to a single crop to the requirement that the farmer establish a diversified system.

Rural cooperation in the sandhill section of North Carolina, R. A. DERBY (*Market World and Chron., n. ser., 9 (1915), No. 20, pp. 630–632*).—There is in this community a federated board of trade composed of the local boards of the 17 towns in the league. This article describes the methods employed by the federated board in developing the agricultural interest of the community by means of exhibits, a better school system, and the establishment of marketing and warehouse facilities.

Cooperation and the great war, G. R. CARTER (*Cooperation Agr.* [*London*], *11 (1915), No. 5, pp. 77–83*).—The author of this article believes that the greater the degree of self-sufficiency possessed by cooperative industrial societies through the resources of wholesale societies, the more stable the position of the cooperator as a consumer. The strength of the latter is apparent if he is able to draw upon the resources of the farmer, the manufacturer, the banker, and the commercial agent entirely through the cooperative connections of his society.

The Muscovite Union of cooperative distributive societies and rural distributive cooperation in Russia (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Econ. and Soc. Intel., 6 (1915), No. 4, pp. 16–34*).—According to the author, of the total number of distributive societies in Russia on January 1, 1912, 4,716, or 70.1 per cent, could be classified as rural cooperative distributing societies. Between 1865 and 1912, 7,626 societies had been established, one-eighth of which had been dissolved. The functions of the societies are classified under the following heads: (1) Commercial, where the union seeks to concentrate in its hands the capital and orders of the separate cooperative societies, to effect purchases in common on the best and cheapest conditions possible, and to eliminate useless intermediaries between producers and purchasers; (2) production, where the union proposes, by opening cooperative workshops and factories, to encourage production by its members, and to organize sales in such a way as to prevent as far as possible purchases independent of it; and (3) noneconomic, where the union seeks to diffuse the idea of cooperation and the knowledge required for the practical realization of this idea.

The author also discusses the development of these societies and the amount of business transacted.

Suggested lines of cooperative production, W. W. THOMSON (*Saskatchewan Dept. Agr. Cooper. Organ. Branch Bul. 42 (1914), pp. 24, figs. 2*).—This bulletin describes the essentials for successful organization of community breeding associations, seed-growing centers, cooperative egg circles, and beef rings, and gives suggested constitutions and by-laws.

Cooperative live stock marketing, W. W. THOMSON (*Saskatchewan Dept. Agr. Cooper. Organ. Branch Bul. 41 (1914), pp. 30*).—The author outlines the advantages of cooperative marketing associations and points out methods of organization and operating. This bulletin also contains a suggested constitution and by-laws, forms used in accounting, and a brief description of markets for Saskatchewan live stock.

Studies in the marketing of farm products, L. D. H. WELD (*Univ. Minn. Studies Soc. Sci., No. 4 (1915), pp. 113, pls. 2, figs. 14*).—This publication contains a series of articles concerning the following subjects: Market Distribution, by L. D. H. Weld (E. S. R., 33, p. 293); The Marketing of Live-Stock Products in Minnesota, by K. F. Warner; Cooperative Potato Marketing in Minnesota, by O. B. Jesness; The Marketing of Minnesota Poultry, by S. H. Thompson; Milk Distribution in Minneapolis and St. Paul, by W. L. Cavert; Minneapolis Central City Market, by R. M. Peterson; and Cooperative Marketing of Grain in Western Canada, and the Food Supply of the Iron Range, by L. D. H. Weld.

The permanent warehouse and marketing law (*33. Tex. Leg., 2. Sess., House Bill 4 (1914), pp. 77*).—The text of this law, together with a number of forms for use in carrying it out is given.

[Elevators in western Canada] (*Saskatchewan Dept. Agr. Bul. 35 (1913), pp. 21–25*).—It is pointed out that there were 516 elevators and grain-storage warehouses in Saskatchewan in 1907, with a capacity of 14,621,500 bu. of grain. By 1912 the number had increased to 1,252, and the capacity to 36,503,000 bu. Detailed data as to the various elevators are included.

Cost of farm implements (*Saskatchewan Dept. Agr., Ann. Rpt. Sec. Statis., 7 (1913), pp. 11–15*).—Following an investigation regarding the cost and methods of purchasing farm implements, it is recommended that no salesman of any implement company shall canvass farmers for farm implements except within the limits of cities, towns, and villages. Waivers of exemption rights in purchase contracts should be considered null and void. The security of implement companies should be limited to the article sold and to the individual liability of the purchaser. Interest on all notes in respect to farm machinery should be limited to 8 per cent. All contracts for the sale of farm implements should be entered into before a notary public or justice of the peace, who should explain the terms of the contract to the purchaser. No mortgage should be given in respect to farm implements for a sum less than $300.

Statistical abstract for the British Empire in each year from 1899 to 1913 (*Statis. Abs. Brit. Empire, 11 (1899–1913), pp. XII+306*).—Among the statistical data contained in this report are the quantity of agricultural products imported and exported, with the country of origin and destination, the total quantity produced, and the total and per capita consumption.

Prices and supplies of grain, live stock, and other agricultural produce in Scotland (*Agr. Statis. Scotland, 2 (1913), pt. 3, pp. 189–241, figs. 3*).—This report gives prices and supplies of grain, live stock, and other agricultural produce at the principal markets and in different counties in Scotland for 1913, with comparative date for earlier years.

The agriculture of Lund and Helleland, Norway, H. Aarstad (*Tidsskr. Norske Landbr., No. 4 (1915), Bilag, pp. 46, figs. 4*).—The author describes the climate, topography, character of the soil, and the area used for different agricultural purposes.

Agriculture in the Lower Alps, M. Capoduro (*L'Agriculture dans les Basses-Alpes. Paris: J. B. Baillière and Sons, 1914, pp. 120, figs. 3*).—This monograph describes the soil, topography, climate, flora, and fauna, the occupation and movement of the population, types of crops grown, and the general agricultural practice.

Emigration from Roman Tuscany, G. Valensin (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 11 (1914), No. 3, pp. 264–281*).—The author discusses the agricultural conditions by districts, and the extent of the emigration and its destination.

American influence upon the agriculture of Hokkaido, Japan (*Sapporo, Japan: Tohoku Imp. Univ., 1915, pp. 21, pls. 11*).—This report indicates the agricultural machines and implements, field and horticultural crops, and live stock introduced into the island from America and their influence upon its agriculture.

AGRICULTURAL EDUCATION.

The training in forestry during the next decade, J. W. Toumey (*Off. Pubs. Cornell Univ., 5 (1914), No. 19, pp. 27–35*).—The author submits a brief survey of the origin and development of forestry education in this country, and points out some of its weaknesses and needs.

He finds that the "tremendous impetus in national and state forestry coincident with the development of the older forestry schools of collegiate grade, and their inability to supply at once all the men required by the national and state governments and for private work, stimulated to an inordinate degree the development of facilities for forestry education and the multiplication of schools" until the United States now has 21 colleges and universities that offer degrees in forestry and announce that they train men for the broad fields of national, state, and private forestry. Of the collegiate institutions 18 at the close of 4 years of satisfactory work offer the degree of B. S. in forestry and one the degree of forest engineer; 6 institutions at the close of an additional year of graduate work offer the degree of master of forestry or of master of science in forestry; in 2 institutions the work is wholly of graduate character, the degree of master of forestry being given for 2 years of satisfactory work. "After less than 15 years of development in forestry education in the United States, we have more schools that aim to prepare men for the profession of forestry than there are in all Europe after more than a century of forest school development."

In the opinion of the author the inclination has been to overemphasize empirical methods and to underemphasize fundamental laws and efficiency. Forestry education should be developed by incorporating forestry in the general education system of the country from the public school to the university as a coordinate subject with agriculture or horticulture, and by the development of ranger schools which should teach merely the art or trade of forestry. The rational development of the educational system along these lines will make it necessary for the high-grade professional man at the top to be better trained and surer of his technical equipment, minor subjects will be cut out of the curricula of professional schools, greater emphasis placed on fundamental subjects, and greater specialization undertaken on the professional side.

Development of instruction in animal and dairy husbandry, H. Nylander (*Kreatursskötsel- och Mejerilärlings-Institutionens Utveckling. Helsingfors: Govt., 1914, pp. 53*).—The author discusses the development of practical instruction in animal and dairy husbandry, in accordance with the provisions of the law of 1908, the text of which is included, for the reorganization of this instruction.

Agricultural education (*Ber. Deut. Sekt. Landesk. Rates Königr. Böhmen, 22 (1913), pp. 21–71*).—A detailed report on the activities of itinerant agricultural instructors, and progress notes on agricultural schools and educational institutions in 1913 under the supervision of the German Section of the Agricultural Council of Bohemia.

Agricultural schools and itinerant instruction (*Jahresber. Landw. Kammer Prov. Sachsen, 1912, pp. 125–133*).—This is a report on the agricultural and housekeeping schools, special courses, agricultural instruction in the army, and itinerant agricultural instruction under the supervision of the chamber of agriculture of the Province of Saxony in Prussia.

Agricultural education service (*Jaarb. Dept. Landb., Nijv. en Handel Nederland. Indië, 1913, pp. 79–186, pls. 9*).—A report on the activities of the department of agriculture in promoting agricultural instruction in 1913 in the Dutch East Indies.

A historical sketch of the College of Agriculture, Tohoku Imperial University (*Sapporo, Japan, 1915, pp. 22, pls. 12*).—This sketch indicates what American educators have done to assist in the founding and development of the College of Agriculture at Sapporo, Japan, including its founding in 1876 by William S. Clark, then president of the Massachusetts Agricultural College.

Does an agricultural education pay? C. H. LANE (*High School Quart.* [*Ga.*], *3* (*1915*), *No. 3, pp. 203–205*).—The author calls attention to the results of several studies relating to the incomes of farmers with varying degrees of education.

How to teach agriculture, C. W. BURKETT, F. L. STEVENS, and D. H. HILL (*Boston: Ginn and Co., 1914, rev. ed., pp. 22*).—This is a revision of the text issued in 1906, in which the authors offer suggestions on what to teach, what not to teach, and how to teach, including the conduct of experiments, and a suggested outline of lesson topics based on Agriculture for Beginners (E. S. R., 16, p. 832).

Agriculture for the Kansas common schools, L. E. CALL and H. L. KENT (*Topeka, Kans.: State, 1914, pp. V+468, pls. 4, figs. 483*).—The subject matter of this text was prepared by the staff of the Kansas College and Station, but was rearranged for uniformity and better adaptation to the needs of the schools. It consists of lessons on the structure and growth of plants, grain crops, marketing and milling wheat, legumes, grasses, improvement of plants and animals, weeds, soils, drainage, irrigation, feeding and raising farm animals, dairying, poultry, diseases of animals and plants, growing and caring for trees, insects, spraying, orcharding, the vegetable garden, beautifying home grounds, birds, and good roads. Each chapter is followed by review questions and an appendix contains suggestions on method of teaching, list of reference books, directions for making the Babcock test and measuring farm products and land, a seed table for field crops adapted to Kansas, etc.

Agriculture, theoretical and practical, J. WRIGHTSON and J. C. NEWSHAM (*London: Crosby Lockwood and Son, 1915, pp. XX+628, figs. 322*).—This textbook of mixed farming, for large and small farmers and agricultural students, comprises six parts treating of (1) soils, manures, and crops; (2) live stock, feeding, and economic zoology; (3) buildings, machinery, implements, and accounts; (4) dairying; (5) horticulture; and (6) poultry, rabbits, and bees.

Agriculture and life, A. D. CROMWELL, edited by K. C. DAVIS (*Philadelphia: J. B. Lippincott Co., 1915, pp. X+369, pl. 1, figs. 143*).—This text was written for normal training classes and teachers' reading circles to give instruction in methods of teaching agriculture in the common schools. Following the discussion of educational aims in which the author calls attention to the educational, economic, esthetic, moral, and religious values of agriculture, chapters are devoted to seed selection and plant breeding; pets and home projects; stock and grain judging; feeds and feeding; farm accounts and farm management; the soil; school and home gardens; birds and agriculture; insects and agriculture; plant and animal diseases; weeds; rural life institutions; the rural school, festivals, clubs, short courses, and continuation schools; and courses of study, correlations, booklets, lesson plans, tables, etc. Each topic is followed by review questions and references to the literature.

Simple laboratory exercises for high schools, M. C. CROSS (*Rural Educator, 4* (*1914*), *No. 4, pp. 65, 66; 5* (*1915*), *No. 1, pp. 13, 14*).—The author outlines 25 simple laboratory exercises in plants, animals, farm management and machinery, soils, and plant growth, largely adapted from standard texts and bulletins.

Studies in soils, M. J. ABBEY (*W. Va. School Agr., 5* (*1915*), *No. 7, pp. 23, figs. 11*).—The author outlines lessons in soil formation, activities, and improvement.

Experiments with living plants, M. OETTLI (*Versuche mit lebenden Pflanzen. Leipzig: B. G. Teubner, 1914, pp. 44, figs. 7*).—The author outlines experiments in plant constituents, food, germination, and growth for pupils from 12 to 14 years old and offers suggestions for keeping a notebook.

A forestry arithmetic for Vermont schools, A. F. HAWES (*Vt. Forestry Pub. 14 (1914), pp. 30, pls. 4*).—Examples in forestry arithmetic to supplement the text-book are given, together with simple experiments to learn tree flowers and seeds, to study seed distribution and germination, the growth of trees, and the rotting of wood, and to teach how to make observations at the sawmill.

Insects of economic importance, G. W. HERRICK (*Ithaca, N. Y.: Carpenter and Co., 1915, pp. 138*).—These outlines of lectures in economic entomology discuss the habits and life histories of the principal pests of the main fruits, vegetables, cereals, farm animals, and shade trees, methods of control, losses caused by insects in this country, and the cost of combating insects. References to literature are added.

[Farm animals], M. J. ABBEY (*W. Va. School Agr., 5 (1914), No. 4, pp. 24, figs. 9; 5 (1915), No. 5, pp. 22, figs. 11*).—The first of these papers deals with winter care, and outlines lessons in housing, feeding, and caring for animals, with suggestions for correlation with other subjects. The second presents lessons on types of horses, sheep, and hogs, including data on judging contests and farm arithmetic.

Domestic science, BERTHA J. AUSTIN (*Chicago: Lyons and Carnahan, vols. 1 [1914], pp. 192, figs. 79; 2 (1914), pp. 239, figs. 60; 3 (1915), pp. 334, figs. 91*).—The subject matter of this course of practical training in cookery is pedagogically presented, the steps in every process being given in the order of operation and the underlying principles clearly set forth. The first two volumes, designed for the first and second years of the course, take up the cooking necessary for the average menu for the three daily meals, while the third volume, for the third and fourth years, is devoted to more advanced subjects, such as the preservation of food, including canning, preserving, jelly making and pickling, the chemistry of foods, food values, studies in dietetics and invalid cookery, the cost of living, business in the household, household accounts, and some practical problems in food arithmetic.

Supplementary problems for domestic science classes (*Manila: Bur. Ed., 1913, pp. 49*).—These arithmetic problems relating to domestic science have been prescribed as supplementary exercises for the sixth and seventh grades.

Household arts (*Misssouri Bd. Agr. Mo. Bul., 13 (1915), No. 2, pp. 88, figs. 50*).—This bulletin furnishes an outline for school work in domestic arts, including the various stitches and their practical application, pattern drafting, selection of materials, suggestions for making garments, public exhibitions and score cards, etc.

The house and its furnishing, ABBIE DELURY (*Univ. Saskatchewan, Col. Agr. Bul. 4 (1914), pp. 31, figs. 15*).—The different parts of the house are considered as to plan and furnishing.

Home laundering, TREVA E. KAUFFMAN (*Agr. Col. Ext. Bul. [Ohio State Univ.], 10 (1915), No. 7, pp. 16, figs. 14*).—The author offers practical suggestions on equipment for laundering, fabrics, effects of alkalis and acids on fabrics, cleaning and bleaching agents, removal of stains, and washing operations.

Arbor and Bird Day manual (*W. Va. School Agr., 5 (1915), No. 6, pp. 79, figs. 31*).—This manual comprises outlines for the study of trees and birds, by M. J. Abbey, and a description of 40 common birds of West Virginia, together with brief accounts of their range, habits, and usefulness, by E. A. Brooks.

Ohio arbor and bird annual, F. W. MILLER (*Ohio Dept. Pub. Instr. Bul. 6 (1915), pp. 96, figs. 67*).—A compilation of articles and poems on trees and birds.

NOTES.

Alabama College.—The first degree of doctor of science to be conferred by the institution has been granted to A. L. Quaintance of the Bureau of Entomology of this Department.

California University and Station.—*Science* announces that plans are being prepared for an additional building of the agricultural group to cost $250,000; the first unit of a new group of chemistry buildings, this structure to cost $250,000; and the completion of the university library at a cost of $400,000.

A marble chair is about to be placed in the open-air Greek theater in honor of Dr. E .W. Hilgard, professor of agriculture and dean of the college of agriculture from 1875 to 1906 and now professor emeritus. The degree of emeritus professor of horticulture has been conferred upon ex-Dean Wickson.

Idaho University and Station.—Recent appointments include Carl B. Wilson as director of the school of practical agriculture and instructor in agricultural education; C. V. Singleton as instructor and assistant in animal husbandry; and Glen S. Ray as assistant in farm crops.

Illinois University.—H. W. Stewart has resigned to become assistant professor of soils at the University of Wisconsin. W. J. Fraser and John W. Lloyd have been granted leave of absence for further study, the former in rural economics at Harvard University and the latter at the University of California.

Nebraska University.—The contract has been let for the new dairy building. A structure 141 by 64 feet is planned, with three stories and basement and a wing 70 by 30 feet especially arranged for handling butter, ice cream, and market milk. The first floor of the main building will contain student laboratories, the second a large milk testing laboratory, quarters for experimental work, a reading room, and offices, and the third, the dairy bacteriological laboratories, a large lecture room, and class rooms. A modern refrigerating plant in the basement will provide cold storage facilities for dairy work and also in horticulture, home economics, and veterinary science.

Third Conference of American Association of Agricultural College Editors.—This conference was held at the College of Agriculture, University of Wisconsin, June 24 and 25, with representatives and visitors from 19 institutions in 18 States and this Department.

An address of welcome was given by Dean H. L. Russell, who drew attention to the more specific division of labor in the agricultural colleges and experiment stations due to their growth and increasing complexity of organization. He stated that the editorial work, connected usually though not always directly with the administrative office of the institution, is coming to be one of its most important departments, although it is hard to find men who are fitted by both temperament and training to conduct it. In his opinion one of the most important things for the consideration of the association is the matter of the popularization of scientific material for the use of the farming community at large. Permanent bulletins, both scientific and popular, he regarded as necessary, but inasmuch as the farm paper is more widely read, many more people can be reached through that medium.

The presidential address by C. A. Whittle, of Georgia, had for its subject The Status of the Agricultural College Editor. In his opinion the mission of the agricultural college editor is to reach the individual farmer, and in order to render him adequate service the editor must see, feel, and think the same way. The greatest defect in editorial work at present was thought to be the limit of the power of the "blue pencil." He believed that editors must be vested with full editorial powers, but that when these powers are given they must be used wisely and very carefully. He also advocated conferring upon them full professorial rank.

Dr. B. E. Powell, of Illinois, in his report as secretary-treasurer reviewed the history of the organization. He called attention to the large demand for the proceedings of the last meeting, although these could not be published because of the lack of available funds. Subsequently provision was made by the association for the publication of the proceedings of the 1915 meeting.

G. W. Wharton, chief of the Office of Information of this Department, discussed Getting Information to the People Who Can Use It. He cited as obstacles to the successful dissemination of agricultural information, (1) overtechnical statements, (2) attempts to mix both popular and technical matter in the same bulletin, and (3) the tradition of form, size, type, etc. He advocated the use of posters, colors, cards, and general follow-up methods. He much preferred the term "information" instead of "publicity" in such work, as "publicity" has come to be associated with "press agency" with which a properly defined information service can have no connection. The most efficient medium for the dissemination of agricultural information he thought to be the farm press, and the next the daily and weekly newspapers. In any case those issuing information material must write from the viewpoint of both the editor and the farmer.

Mr. Wharton stated that while, of course, it was impossible to attribute the increase to any one specific cause, the circulation of the Department's bulletins since the establishment of the information service had, according to last year's figures, increased 40 per cent. Inasmuch as the press notices contain fairly complete summaries and practical advice, he believed that those who now write in for the bulletins as a result of these notices do so because of a real need, and it is probable, therefore, that the notices assist in reducing waste circulation. He described in detail the activities of the Office of Information, explaining especially the method of limiting the press material to the class of papers or the geographical district to which it would be of direct application. He believed that the press material should be deemed an official output of the institution as well as its bulletins or other permanent publications. It should concern itself merely with conveying practical information and recommendations and be kept scrupulously free from any partisan tinge. Mention of individuals or institutions should be limited to what is necessary to establish the authority of the facts or advice. One great advantage of mimeographed press information sheets, he pointed out, is that they can be issued in cases of emergency and through the cooperation of the press reach those affected far more quickly than ordinarily would be possible in the case of formal publications.

Frank C. Dean, of Nebraska, read a paper on The Efficiency of Press Matter for Newspapers, defining efficiency as the ability to get a thing published. He considered the preparation of press matter the most important of the agricultural college editor's duties. Items of ten lines or less have been found most useful for newspapers, and 95 per cent of the papers to whom he has furnished news material have used only about one column per week.

In a paper on Some Common Inconsistencies of Typography of Bulletins, O. M. Kile, of West Virginia, presented the tabulated replies from about 25 editors in answer to a questionnaire on the usage of compound and hyphenated words and certain synonyms, and the capitalization of breed, variety, and certain other names, which showed a very wide variation in usage. A discussion followed on the use of style books and other standards. A committee on proper usage of compound words, forms, capitalization, etc., was appointed, consisting of O. M. Kile, B. Adams, and A. W. Hopkins, and a preliminary report of this committee, embodying numerous suggestions, was subsequently adopted.

Walter Stemmons, of the Oklahoma College, read a paper on How to Get Press Material from the Staff, in which he narrated some difficulties encountered. He has found one of the best helps toward getting material to be the occasional sending to members of the staff press clippings of material they have furnished. The field reports of county agents in the extension service have also been a fruitful source of stories of human interest.

Mr. Esborn, of the Simplified Spelling Board, addressed the association on simplified spelling. He reviewed the present movement for spelling reform and stated that up to May 15, 1915, 100 educational institutions in the United States and Canada and about 100 newspapers and periodicals with a combined circulation of over 2,000,000 had approved the movement.

T. R. Bryant discussed the use of placards, giving experiences in Kentucky for two or three years. Neat bulletin boards with glass fronts have been installed in the stations of five railroad systems in the State, the agents exchanging the placards monthly. The railroads have been very enthusiastic about this feature and the practice has appeared to be very effective.

Charles Dillon, of Topeka, Kans., addressed the meeting on the Source of News and What is News from a College of Agriculture. He discussed especially the press material being sent out by the agricultural colleges and experiment stations to farm papers and newspapers, illustrating by concrete examples some of its shortcomings from the viewpoints of the editor of the paper who is to publish the material and of the farmer who is to read it. He also exhibited advertising and publicity material of railroads and business houses. He closed his remarks by reading papers prepared by agricultural journal editors on What College Editors Ought to Send Out to Farm Papers. The sending out of advice which farmers can readily adopt and more seasonable matter were especially desired.

A round table discussion was opened by F. W. Beckman, of Iowa, on the question, Do College Editors in Sending Material to Newspapers Interfere with the Activities of Farm Papers? Some differences of opinion were noted in various States, but the advantage of utilizing the newspaper to create as much as possible an interest in farming was generally recognized.

In a discussion of the propriety of the receiving of compensation by a college editor for articles furnished papers, the consensus of opinion seemed to be adverse to the practice as regards papers within the State, with wider differences of opinion as regards other articles.

Another question discussed was the handling of requests from outside the State for publications. The use of classified mailing lists was mentioned as helpful in conserving editions. One of the chief functions of the agricultural college and station editor as regards the permanent and scientific publications of these institutions was suggested by M. D. Moore, of the States Relations Service of this Department, as that of so informing the farmers and others interested of the nature of these publications that intelligent request can be made for the publication wanted.

One session of the association was held at the Forest Products Laboratory, where an address was given by Director H. F. Weiss of the laboratory, on the types and prices of the different papers being used by the stations. Mr. Weiss based his remarks on tests made in the laboratory of samples sent in by various editors. Wide differences in the cost and value of these samples were revealed by the comparison.

Bristow Adams, of Cornell University, presented a comprehensive discussion of An Information Service in Connection With Extension Work. He gave a detailed review of the evolution of the information work at Cornell University, where the attempt is now made to reach by means of reading courses, press service, etc., the farmer not yet in touch with the field man in extension work. In the matter of publications, direct and intimate relation is maintained between the bulletins, memoirs, etc., and press notices in extension work. Press notices are sent out about the bulletins, especially to the county or counties to which those of a local nature pertain, to fruit growers in the case of a bulletin pertaining to them, etc. Each notice emphasizes the fact that the complete bulletin can be had on application. The use of the term "publicity work" is deprecated, as misleading. The right kind of information service is regarded as that farthest removed from publicity and an advertising propaganda, which is its own undoing, whereas the service which seeks only to help the farmer will be permanent.

The program was concluded with an illustrated lecture by F. J. Trezise, of Chicago, on What is Required to Make a Typographically and Mechanically Good Bulletin. This was an instructive discussion from an expert point of view of such questions as measure balance, proportional margins, shape harmony. use of borders and decorated margins, tone harmony, and use of cuts, type, and harmony in border arrangements.

A special feature of the convention was the exhibit of bulletins and other illustrative material, contributed by 18 institutions and this Deparment. Information and press material preponderated in the exhibits, but several of the institutions, notably Wisconsin and Iowa, also illustrated the evolution of the regular bulletin in a striking way.

The constitution submitted by a special committee was adopted. Among the resolutions agreed to were those memorializing the Association of American Agricultural Colleges and Experiment Stations as to the desirability of further developing editorial work, establishing full editorial authority, and otherwise improving its status and dignity, favoring the use of the term "information service" in preference to that of "publicity," and suggesting the need of means for utilizing the publications of one institution by others.

Officers for the ensuing year were selected as follows: President, F. W. Beckman of Iowa; vice president, F. H. Jeter of North Carolina; secretary-treasurer, B. E. Powell of Illinois; and additional members of the executive committee, C. A. Whittle of Georgia, and N. A. Crawford of Kansas.

The executive committee is empowered under the new constitution to decide as to the place of the next annual meeting.

Vocational Agricultural Education in New York.—The regents of the University of the State of New York have voted to reorganize the present Vocational Schools Division into a Division of Agricultural and Industrial Education with A. D. Dean as director.

A recent act of the state legislature authorizes the board of supervisors of any county outside of the City of New York to establish a farm school for the purpose of giving instruction in the trades and in industrial, agricultural, and home making subjects to children of the county between the ages of eight and eighteen. Each of such schools may receive annually from the State $1,000 and an additional $200 for each teacher employed therein for a period of 36 weeks during each school year whose entire time is given to the instruction of pupils in the school, provided the school has at least 15 pupils actually in attendance during the 36 weeks and its organization and course of study have been approved by the commissioner of education. The board of supervisors must provide for the maintenance of the school, the repair and improvement of the buildings, land, and the equipment.

Agricultural Advancement in the Caucasus.—In response to the increasing demand for assistance in agricultural research and education, the viceroy of the Caucasus appointed in 1913 a commission of the leading farmers and specialists to consider the more efficient correlation of the various agricultural agencies. Their report when submitted recommended the concentration of all educational, experimental, and extension work under the board of agriculture, with the establishment of agricultural stations at suitable points, the employment of district agriculturists, and a system of advisory work by government specialists.

A permanent commission was also suggested, with the chief of the agricultural section of the Caucasus as president and with representatives from the Tiflis Botanical Gardens, the Caucasian Sericultural Station, senior specialists of the board of agriculture, officials connected with the various land-improvement and educational services, members of the civil veterinary section, and the Imperial Agricultural Society of the Caucasus as members, the commission to be supplemented by the addition of district agriculturists, superintendents of agricultural establishments, other specialists, and in general of all persons competent in agricultural affairs, as desired. A reference section and statistical and editorial bureau were projected.

The early opening of the Tiflis Polytechnic Institute with an agricultural section, the establishment of schools for intermediate agricultural education, and the introduction of practical agriculture into the elementary school system, were also advocated. In 1913, about $500,000 was expended for agricultural advancement in this region, of which $35,000 was for agricultural organization, $300,000 for experimental work, etc., $10,000 for live stock improvement, $25,000 for aid to agricultural societies, and $20,000 for destruction of insects, exhibitions, meetings, collection of statistics, and other activities.

Miscellaneous.—The medal and grant for 1915 of the South African Association for the Advancement of Science have been awarded to C. P. Lounsbury, chief of the department of entomology of the Union Department of Agriculture.

A new laboratory of plant pathology at Kew Botanic Gardens has been recently opened. A. D. Cotton has been promoted to assistant in connection with the new laboratory with W. B. Brierley as first class assistant.

Dr. A. W. Bothwick, lecturer in forest botany in the University of Edinburgh, has been appointed advisory officer for forestry to the Scottish Board of Agriculture, vice the late Dr. John Nisbet.

M. T. Dawe, director of agriculture in British East Africa, has been appointed agricultural adviser to the Government of Colombia.

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U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. XXXIII ABSTRACT NUMBER No. 6

EXPERIMENT STATION RECORD

WASHINGTON
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1915

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EXPERIMENT STATION RECORD.

VOL. XXXIII. ABSTRACT NUMBER. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A rapid method of estimating nitrates, E. KNECHT (*Jour. Soc. Chem. Indus., 34 (1915), No. 3, pp. 126, 127*).—Titanous hydroxid causes an instantaneous reduction of nitrates to ammonia. "When caustic soda is added to a solution of a titanous salt, black titanous hydroxid is precipitated, but this begins to decompose almost at once, yielding nascent hydrogen and the white titanic hydroxid, probably according to the following equations:

$$Ti_2(SO_4)_3+6NaOH=Ti_2(OH)_6+3Na_2SO_4;\ Ti_2(OH)_6+2H_2O=2Ti(OH)_4+H_2.$$

"A convenient amount of nitrate for a single estimation is about the equivalent of 0.1 gm. potassium nitrate. Thus, in the assay of a commercial sodium nitrate, about 1 gm. is accurately weighed, dissolved in water, and made up to 100 cc. Of this, 10 cc. are measured into a copper flask, excess of caustic soda is added, and then about 20 cc. of commercial titanous sulphate or chlorid. The distillation can then at once be proceeded with and, after the boiling has been continued for a quarter of an hour, the operation is finished and back titration is effected."

Nitrites are also quantitatively reduced to ammonia by titanous hydroxid when an excess of caustic alkali is present.

The estimation of protein ammonia, L. W. WINKLER (*Ztschr. Angew. Chem., 27 (1914), No. 56, Aufsatzteil, p. 440, fig. 1; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 15, p. 804*).—Instead of determining the organic matter in water by making a cumbersome albuminoid ammonia determination, the author suggests determining the protein ammonia.

The method proposed consists essentially of treating 100 cc. of the water, acidified with one drop of concentrated sulphuric acid, with 0.05 gm. of pure powdered potassium persulphate, heating in the steam bath for 15 minutes, cooling, and determining the ammonia in the fluid by the Nessler colorimetric method, adding 5 cc. of a mixture of equal volumes of Nessler's reagent and a solution of Rochelle salts. A second test is prepared in the same manner, without heating, adding standard ammonium chlorid solution to equal the color of the first test. Distillation is not necessary in the process.

There are two disadvantages in the method, one being that even the purest potassium persulphate contains ammonia, and the other, the unstability of the potassium persulphate solution. The first can be obviated by recrystallization from warm potassium hydroxid solution and the latter by acidifying with concentrated sulphuric acid.

It was found that pure natural waters contain no protein ammonia, the limit for a drinking water being set at 0.1 mg. per liter.

Oxidation of carbohydrates and related substances by means of potassium persulphate, J. K. WOOD and NELLIE WALKER (*Jour. Chem. Soc. [London], 105 (1914), No. 618, pp. 1131–1140, fig. 1; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 10, p. 561*).—Aldoses may be almost quantitatively oxidized with potassium persulphate in the cold and the process may be accelerated by the addition of small quantities of silver sulphate. Galactose, arabinose, and xylose are oxidized at about the same rate, polyhydric alcohols and dextrose more slowly, while ketoses and disaccharids are attacked somewhat more rapidly than the aldoses.

Analytical work, P. L. GILE and J. O. CARRERO (*Porto Rico Sta. Rpt. 1914, p. 13*).—A comparison of the potassium sulphocyanate colorimetric method for iron with the permanganate method indicated that the former was preferable for the determination of the small amounts of iron contained in most plant substances.

Determination of eggs in food pastes, L. FARCY (*Ann. Falsif., 7 (1914), No. 66, pp. 183–187*).—The soluble nitrogenous substances in food pastes were estimated before and after boiling, as suggested by Rousseaux and Sirot (E. S. R., 31, p. 809). The purpose was to determine whether or not eggs had been used in the goods under examination.

The ferments of honey, F. GOTHE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 6, pp. 273–286, fig. 1; abs. in Ztschr. Angew. Chem., 27 (1914), No. 99, Referatenteil, p. 700*).—Lactase, proteases (peptic and tryptic), and lipase could not be detected in honey. Inulase is probably present. Invertase in honey is of both animal and vegetable origin, and in genuine bee honey its amount is greater than in feeding honey. It is destroyed at 60° C. and has its optimum of activity at 40°. Catalase and diastase are not present in the same proportion in honey. By filtering honey a marked reduction of catalytic power occurs, and when much impurity is present in honey it is evidenced by a high catalase figure. Honey catalase is markedly affected by heating for one hour at 60° C. (undiluted honey at 70°).

Experimental studies on honey diastase activity as well as the judgment of honey by its diastase content, F. GOTHE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 6, pp. 286–321, fig. 1; abs. in Ztschr. Angew. Chem., 27 (1914), No. 99, Referatenteil, pp. 700, 701*).—Honey diastase is of both animal and vegetable origin. Its quantitative estimation enables an estimate of the value of a honey. A high diastase figure indicates absolutely pure honey. If a medium figure is obtained, Fiehe's test, the precipitation test, and other tests should be made to exclude the suspicion of adulteration. A low diastase figure indicates a low-grade product which has been either overheated or adulterated. Heating undiluted honey for one hour at from 85 to 90° C. destroys the diastase. Diluted honey loses its activity at 70°.

Estimation of chlorin ions in honey, F. E. NOTTBOHM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 5, pp. 255–259; abs. in Ztschr. Angew. Chem., 27 (1914), No. 99, Referatenteil, p. 700*).—By directly ashing honey more than one-half of the chlorin is lost. This may be prevented, especially in honey high in chlorin, by adding bicarbonate of soda.

About the preservation of milk samples for examination purposes, J. TILLMANS, A. SPLITTGERBER, and H. RIFFART (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27 (1914), No. 12, pp. 893–901*).—Mercuric chlorid in a concentration of from 0.04 to 0.03 per cent conserved milk samples for 120 hours. Samples so preserved are said to show no appreciable increase in acidity, and the mercuric chlorid had no noticeable effect on the milk constituents. Other substances tested in this regard were chloroform, thymol, oil of mustard, phenol, creosote, sodium fluorid, and potassium bichromate.

Investigations upon the changes which take place in milk preserved with potassium bichromate, A. KLING, GELIN, and LASSIEUR (*Ann. Falsif.*, *7* (*1914*), *No. 67, pp. 244–250*).—Potassium bichromate is a convenient, although not an ideal, preservative of milk. If 1 gm. is added to 1 liter of fresh milk the sample is fit for examination for a period of 2 months, and milk preserved with 3 gm. per liter will keep fresh for 3 months. In this study phenol as advocated by Denigès (E. S. R., 30, p. 14) was also used for comparison. Milk preserved with bichromate of potash and kept at 27° C. coagulated much quicker than milk which was stored at from 18 to 20°.

The action of milk mold on phenylaminoacetic acid, H. HORSTERS (*Biochem. Ztschr.*, *59* (*1914*), *No. 5–6, pp. 444–450*).—*Oïdium lactis* when grown on a solution containing phenylaminoacetic acid, monopotassium phosphate, magnesium sulphate, traces of sodium chlorid, ferric chlorid, and either dextrose or invert sugar elaborated benzyl alcohol, very small traces of phenylglyoxylic acid, benzoic acid, traces of formic acid, and *l*-mandelic acid.

Volumetric estimation of casein in milk by the aid of tetraserum, B. PFYL and R. TURNAU (*Arb. K. Gsndhtsamt.*, *47* (*1914*), *No. 3, pp. 347–361*).—As a preliminary casein was prepared from cows' milk and its nitrogen and acid equivalents were determined. The average nitrogen content was 15.5 per cent, which corresponds to a factor of 6.45 per cent. For neutralizing 1 gm. of casein toward phenolphthalein 8.75 cc. of decinormal alkali was necessary on the average, indicating an acid equivalent of 1,143. The method for determining casein was as follows:

To 50 cc. of the milk under examination, cooled to 15° C., add from 5 to 6 drops of a 1 per cent phenolphthalein solution and titrate to a pink color with decinormal (carbonate free) alkali solution. Treat another 50 cc. of milk in a stoppered bottle with about 5 cc. of carbon tetrachlorid, shake thoroughly, treat with exactly 1 cc. of a 20 per cent acetic acid solution (of known titer), then shake again, and filter. Then titrate 25 cc. of the serum, after adding from 2 to 3 drops of a 1 per cent phenolphthalein solution, with decinormal alkali solution until a pink tint appears. From the first titration and the titer of the 20 per cent acetic acid solution the alkali required for 25 cc. of milk+0.5 cc. of acetic acid (a=amount of alkali solution) is determined. From this result, the alkali required for titrating the serum (b=cc. of decinormal alkali solution), and the fat content of the milk (f=gm. of fat in 100 cc. of milk) the casein content is calculated:

$$g=\text{the casein in 100 cc. of milk}=0.457\left(a-b\,\frac{99.3-f}{100}\right)$$

The derivation of the formula is discussed and some results obtained with the method are included. With heated milk the procedure gave correct results. This was not the case with either the Schlossmann or Hoppe-Seyler methods. See also previous notes by Hart (E. S. R., 19, p. 707; 21, p. 613).

Old and new methods for determining fat in milk, A. V. OVEN (*Milchw. Zentbl.*, *43* (*1914*), *Nos. 11, pp. 285–295; 13, pp. 350–356*).—A review of the literature, especially with reference to the methods in use in Europe.

Determination of lactose in milk by the polarimetric method, E. FEDER (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *28* (*1914*), *No. 1, pp. 20–29; abs. in Ztschr. Angew. Chem.*, *27* (*1914*), *No. 72–73, Referatenteil, p. 533*).—To 75 cc. of milk add 6 cc. of asaprol solution (consisting of 75 gm. of asaprol and 75 gm.

of citric acid to 250 cc. of solution), fill up to the 100 cc. mark, and after standing for 15 minutes filter and polarize. One degree of rotation to the right in circular instruments and sodium light at 20° C. in a 200 mm. tube=0.9518 gm. of milk sugar. If the rotation $\times 0.9518=a$, the lactose content M=

$$100.8-t+\frac{96.7-f)\,a}{75}$$
$$a\frac{\qquad}{75}$$

t=percentage of total solids and f=percentage of fat in milk.

The estimation of the viscosity of milk as an aid for detecting added water, W. D. KOOPER (*Milchw. Zentbl., 43 (1914), Nos. 7, pp. 169–179, fig. 1; 8, pp. 201–208*).—In these studies composite milks were principally examined. The apparatus used is illustrated and described.

The expression of the viscosity is analogous to that used by Engler in reporting the viscosity of oils. The degree of viscosity in the milk seems to be an expression of the total solids content and its determination will enable one to detect added water or the removal of cream. With the method at least 5 per cent of water may be found. The fat content of the milk apparently does not influence the viscosity to the extent suggested by Micault,[a] and although an increased fat content is expressive of an increased viscosity there are instances where the reverse is the case. A still smaller relation exists between the specific gravity and the viscosity. A milk diluted with 25 per cent of added water has a higher viscosity than unadulterated milk. If, however, the viscosity obtained is divided by the factor 0.1384 the total solids content of the milk may be approximately estimated.

Detection of goat's milk in cow's milk, J. PRITZKER (*Chem. Ztg., 38 (1914), No. 93, pp. 982, 983; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 4, p. 195*).—The test depends upon the difference in behavior of the two milks with ammonia.

The freezing point of some abnormal milks, J. B. HENDERSON and L. A. MESTON (*Proc. Roy. Soc. Queensland, 26 (1914), pp. 85–90; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 4, p. 195*).—Two samples of mixed milks from eight animals, badly fed and in poor condition, were found to be low in solids not fat (7.74 and 7.79 per cent) but had a normal freezing point (−0.55 and −0.54° C.). When the milk from each animal was examined only one of them was found to give a normal milk, but in every case the freezing points were within the normal limits (−0.54 and −0.56°). The ash of the milk contained large amounts of chlorin (up to 31 per cent). This is regarded as evidence of the power of the mammary glands to regulate the osmotic pressure through the extraction of an increased amount of sodium chlorid from the blood in order to compensate for the deficiency of other constituents.

The electrical conductivity of milk during its concentration, with suggestions for a practical method of determining the end point in the manufacture of sweetened condensed milk, LILIAS C. JACKSON, L. MCNAB, and A. C. H. ROTHERA (*Jour. Soc. Chem. Indus., 33 (1914), No. 2, pp. 56, 60*).—The maximum electrical conductivity is noted when morning milk is concentrated to 28 per cent total solids with 8 per cent protein. Evening milk gives higher figures. The electrical conductivity is deemed of no value in determining the degree of concentration of a separated unsweetened milk because the concentration may increase considerably between 25 and 30 per cent of total solids with very little alteration in the conductivity. "It is quite different, however, with a sweetened milk concentrated to the degree which is usual in the manufacture of condensed milk. With full fat, and with added cane sugar equivalent approximately to 16 lbs. sugar per 100 lbs. milk, the reversal of the conductivity comes at the

[a] Ann. Chim. Analyt., 9 (1904), No. 9, pp. 93–96.

start of the process of concentration. When the concentration reaches the necessary degree for the production of sweetened condensed milk, the electrical conductivity decreases rapidly for each increase in concentration of the milk. . . . From theoretical considerations supported by experimental work in the laboratory, there is every reason to think that the measurement of electrical resistance or conductivity should furnish an accurate method of following the progress of concentration in the manufacture of sweetened condensed milk."

Dry milk with particular reference to determining the fat content, UTZ (*Milchw. Zentbl., 43 (1914), No. 5, pp. 113–120*).—The determination of water, ash, nitrogen, and lactose in dry milk is comparatively simple but certain difficulties are experienced when fat is to be estimated by the usual methods. A modification of the Bondzynski-Ratzlaff method and the Polenske method (E. S. R., 25, p. 12), is recommended for determining the fat in this kind of material. Gerber's method did not yield satisfactory results.

The acidity degrees (Soxhlet-Henkel) were determined in 26 samples of powder made from whole milk, cream, partly skimmed milk, and skim milk. The method employed is as follows: About 80 cc. of a neutral alcohol-ether mixture is poured over 10 gm. of the air-dry milk powder, shaken at intervals, and after 24 hours the mixture is made up to a volume of 100 cc. The number of cubic centimeters of decinormal alkali required to neutralize 50 cc. of the solution is calculated in the same manner as employed for fats and oils.

Some data are being collected regarding the acidity of dry milk stored over a long period of time.

A critical study of Césaro's method for the detection of coconut fat in butter, L. STŒCLIN (*Ann. Falsif., 7 (1914), No. 67, pp. 223–231*).—It is stated that the Césaro method [a] can be employed for detecting coconut fat in butter. If the fat added is solid as little as 10 per cent can be detected, but when added in a liquid state only 25 per cent can be noted. Additions of less than 10 per cent can not be noted with certainty.

Rapid analysis of butter: Estimation of nonfats, E. ISNARD (*Ann. Falsif., 7 (1914), No. 69, pp. 369–371*).—For the purpose of determining especially the nonfatty materials in butter, from 2 to 3 gm. of butter is weighed into a porcelain dish, and 10 cc. of water is incorporated on the water bath. The emulsion is then brought into a separatory funnel and cooled to 35° C. Ten cc. of water and from 20 to 30 cc. of ether are then used to remove the fatty materials adhering to the sides of the dish, the washings are transferred to the funnel, and the mixture is shaken cautiously. After 15 minutes standing the aqueous layer with the supernatant casein is drawn off, two portions of 10 cc. each of water are added, and the process of shaking with water and drawing off is repeated twice. The ether layer is then transferred to a dish, the ether is dispelled by a current of air, and the residue dried at 100° C. In the aqueous portion the casein is determined by collecting it on a filter. The total solids contained in the filtrate represents casein, albumin, and salts. The latter can be determined by incinerating the residue.

Extraction of neutral fats from ripe sheep's milk cheese for the purpose of determining the chemical and physical constants of the same, F. BÁRÁNY (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 1, p. 33; abs. in Ztschr. Angew. Chem., 27 (1914), No. 72–73, Referatenteil, p. 533*).—For this purpose 80 gm. of cheese is rubbed up with 15 cc. of water to a paste and brought up to a bulk of 250 cc. by the addition of water. The mixture is neutralized toward phenolphthalein, with potassium hydroxid solution made up to a bulk of 300 cc., shaken vigorously with 300 cc. of petroleum ether, 300 cc. of 95 per cent alcohol

[a] Acad. Roy. Belg., Bul. Cl. Sci., 1907, No. 12, p. 1004.

added, and the mixture shaken again. After standing from 24 to 48 hours the clear petroleum ether layer is removed, the solvent dispelled by distillation, and the residue dried at 100° C.

Determination of unsaponifiable matter in oils and fats, H. SALOMON (*Ber. Deut. Pharm. Gesell., 24 (1914), No. 3, pp. 189–193*).—It is stated that the modification of the Marcusson and Schilling method proposed by Klostermann can be extended so as to allow at the same time the estimation of unsaponifiable matter.

From 50 to 100 gm. of oil or fat is saponified with alcoholic potash solution and the resulting soap dissolved in water, extracted with ether, and after dispelling the ether from the extract drying and weighing the residue. The crude phytosterol is dissolved in hot alcohol and precipitated with an excess of digitonin solution, 1 gm. of crystalline digitonin being required for each 0.4 gm. of unsaponifiable matter. The precipitate resulting is collected, acetylated, and the phytosterol acetate recrystallized according to the Klostermann procedure. The unsaponifiable material in the filtrate can be determined by adding water, extracting with ether, and weighing the ether extract after removing the ether. Some tabulated results are given.

Rice oil and rice fat, J. DAVIDSOHN (*Seifenfabrikant, 34 (1914), pp. 178, 179; abs. in Ztschr. Angew. Chem., 27 (1914), No. 66–69, Referatenteil, p. 518*).—The rice oil obtained from rice bran by extracting or pressing is a mixture of solid and fluid substances. The portion of the substances solid at room temperature melts at 24° C. Freshly ground bran yields an oil with only a small amount of fatty acids, but when old contains a large amount of these acids. Rice oil has a specific gravity of 0.8907 at 99°, a saponification number of 193.2, and an iodin number of 96.4 according to Smethan or of 91.65 according to Browne. On storage the oil separates into a compact fat and a supernatant clear oil of dark-greenish color, which can be saponified very easily. Its value for the manufacture of soap is pointed out.

The estimation of hydrocyanic acid in feeding stuffs and its occurrence in millet and guinea corn, J. R. FURLONG (*Analyst, 39 (1914), No. 463, pp. 430–432; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 21, p. 1069*).—According to this method 100 gm. of the ground material under examination is placed in a Soxhlet apparatus and extracted for three hours with 10 per cent alcohol. The extract, after removing the alcohol by distillation, is distilled with 150 cc. of 10 per cent sulphuric acid, the distillate being collected in 5 cc. of 10 per cent potassium hydroxid solution. At the end of one hour the receiver is changed, water added to the distillation flask, and the distillation continued. This operation is repeated until no more hydrocyanic acid is evolved.

"The distillate is concentrated to 15 cc., boiled for 10 minutes after the addition of 1 cc. of a 20 per cent solution of ferrous sulphate containing also 1 per cent of ferric chlorid, cooled, acidified with hydrochloric acid, and 10 cc. of glycerol added. After standing for about 18 hours the mixture is transferred to a graduated cylinder, diluted to 50 cc. with water, and the blue coloration compared in tubes of 1 in. diameter with standards prepared from known quantities of hydrocyanic acid. When the amount of hydrocyanic acid present is not less than 0.001 gm. the standards may be made up directly, but with smaller quantities it is necessary to dilute to 150 cc. and then concentrate as in the preparation of the solution from the plant material.

"From determinations of hydrocyanic acid in millet and guinea corn plants of various ages it was found that all the young plants contained a cyanogenetic glucosid, while the full-grown plants were free from this substance. In the case of guinea corn the yield of hydrocyanic acid reached a maximum (0.01 per cent) in the 12-in. plants and decreased as growth proceeded. With millet the maximum amount of hydrocyanic acid (0.045 per cent) was found in the 24-in. plants."

Solvents employed in the determination of hop-bitter constituents and their estimation by means of cold extraction, R. SEIBRIGER (*Wchnschr. Brau., 30 (1913), Nos. 12, pp. 177–179; 13, pp. 196–198, fig. 1; abs. in Chem. Abs., 7 (1913), No. 19, p. 3387*).—The author states that by constantly shaking hops with cold petroleum ether (boiling point 30 to 50° C.), the bitter principle can be removed in from three to four hours. This can also be accomplished by shaking with carbon tetrachlorid in the cold for from one to two hours, but the results are higher. Boiling petroleum ether gives intermediate results.

Investigation on hops.—IV, A method for quantitative determination of resins in hops, Ö. WINGE and J. P. H. JENSEN (*Compt. Rend. Lab. Carlsberg, 11 (1914), No. 2, pp. 116–147*).—It is pointed out that the valuation of hops for brewing purposes must be made on the basis of the chemical analysis, and the object of this work was to find a convenient method whereby hops could be valued by chemical means without the services of a skilled operator. It is believed that an approximately correct expression of the value of hops can be obtained by the following cold extraction method:

Thirty gm. of hops is comminuted by passing through a meat chopping machine. The first 5 gm. coming through the machine is discarded and the remainder coming through, which is usually about 15 gm., is carefully mixed. Five gm. of this, corresponding to a volume of 25 cc., is removed with a measuring glass and placed in a 300-cc. Erlenmeyer flask of known weight. The flask, with its contents, is weighed, dried in a vacuum desiccator for 24 hours at 35° C. over sulphuric acid, and again weighed, the loss in weight representing the moisture content of the hops. Then 150 cc. of water-free ethyl ether is added, the mixture allowed to stand for about one-half hour, with repeated shakings, the ether extract is filtered into an Erlenmeyer flask, and the residue and filter washed with 100 cc. of ethyl ether. The ether extract is then titrated with twentieth-normal potassium hydroxid solution in 93 per cent alcohol, using from 6 to 8 drops of a 1 per cent phenolphthalein in 93 per cent alcohol as the indicator, until a permanent red tint is obtained. Since 1 cc. of the normal potassium hydroxid solution corresponds to 0.4 per cent of resin, the percentage of resin in water-free hops is equal to this factor multiplied by the number of cubic centimeters of potassium hydroxid solution utilized, divided by the total solids of the hops.

A method for the recovery of the ether used is described.

The resin of hops, contrary to previous opinion, is considered of value, because it gives flavor to the wort and aids in the precipitation of the proteins. "Although the resins of hops, which are all soluble in cold ethyl ether, are not all equally bitter and equally valuable—the relation between their bitterness can be expressed by the proportion $\alpha:\beta:\gamma=10:7:4$—yet the total quantity of resins extracted from the hops by means of cold ether and determined by titration is an approximately accurate expression of the bitterness value of hops."

A comparative study was made between the cold ethyl ether extracts made and the carbon tetrachlorid method of Seibriger. See also work by Tartar and Bradley previously noted (E. S. R., 27, p. 814).

Investigations on hops.—VII, The employment of artificial light in titration of the resins in hops, S. H. LARSEN (*Compt. Rend. Lab. Carlsberg, 11 (1915), No. 4, pp. 184–187, figs. 2*).—In the course of work on the quantitative determination of resins in hops by the Winge and Jensen method, noted above, it was found that on dark or cloudy days difficulty was experienced in noting the end point during the titration process. A titration table was devised to obviate this difficulty. It consists of a wooden box with one side replaced by a removable ground-glass plate. The source of light is a 25-candlepower incandescent lamp. Some results of experiments with and without artificial light are included.

Chemistry of tobacco. The essential oil of tobacco, W. Halle and E. Přibram (*Ber. Deut. Chem. Gesell., 47 (1914), No. 7, pp. 1394–1398*).—An essential nitrogen-free oil acid in reaction was isolated from Hungarian tobacco with solvents. The amount obtained was 0.047 per cent. A hydrocarbon of the formula $C_{10}H_{18}$ or $C_{11}H_{20}$, boiling point 73 to 76° C. at 20 mm., was obtained from the lower boiling fractions. The oil before being submitted to distillation was treated with sodium carbonate. When oxidized with potassium permanganate it yielded compounds resembling terephalic and isobutylacetic acids. Isovaleric acid was separated from the sodium carbonate solution used in treating the original solution.

METEOROLOGY.

Modern methods in meteorology, D. E. Fontseré y Riba (*Mem. R. Acad. Cien. y Artes Barcelona, 3. ser., 11 (1914), No. 21, pp. 18*).—This is an inaugural address reviewing some recent progress in methods of studying meteorological problems.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 2 (1915), Nos. 5, pp. 238, pls. 2, figs. 8; 6, pp. 226, pls. 2, figs. 7*).—These numbers contain, respectively, brief summaries and detailed tabular statements of climatological data for each State for May and June, 1915.

Annual report of the Iowa Weather and Crop Service for 1914, G. M. Chappell (*Iowa Yearbook Agr., 15 (1914), pt. 11, pp. 747–794, figs. 2*).—This is "a condensed summary of the monthly and weekly bulletins issued by the Iowa Weather and Crop Service in cooperation with the Weather Bureau of the U. S. Department of Agriculture. . . .

"The mean temperature for the State was 49.1° F., or 1.7° higher than the normal. . . . The highest temperature reported was 109° at Centerville, Appanoose County, on July 12. The lowest temperature reported was −31° at Iowa Falls on December 26. . . . The average amount of rainfall and melted snow for the year was 31.93 in., or 0.04 in. less than the normal, and 1.98 in. more than the average for 1913. The greatest amount at any station was 44.11 in., at Marshalltown, Marshall County, and the least amount was 23.32 in. at Columbus Junction, Louisa County. The greatest monthly precipitation was 16.24 in. at Lenox, Taylor County, in September. . . . The average amount of snowfall was 27.5 in. The greatest amount reported from any station was 50.7 in. at Northwood, Worth County, and the least amount was 14.9 in. at Monroe, Jasper County. . . . The prevailing direction of the wind was south. The greatest velocity reported was 68 miles per hour from the northwest at Sioux City on February 28. The average number of clear days was 166; partly cloudy, 102; cloudy, 97, as against 182 clear days, 89 partly cloudy, and 94 cloudy days in 1913. More than the normal amount of sunshine was experienced."

As regards crop production, the year was characterized by a deficiency of rainfall during the growing season. "The hot, dry weather during July and August greatly reduced the yield of corn, especially in the southern counties, where the effects of the drought were even worse than in 1913."

The weather of the past agricultural year, F. J. Brodie (*Jour. Roy. Agr. Soc. England, 75 (1914), pp. 117–124*).—The means and extremes of temperature, rainfall, and sunshine for 1914 and for long series of previous years in different districts of England and Wales are summarized in tables and discussed as usual with reference to agricultural conditions. The annual and average rainfall (1904–1914) at different places in the United Kingdom are also tabulated. It is stated that agriculturally the most notable feature of the weather of the year was the irregularity of the rainfall. Nevertheless "the crops were on the whole in excess of the average."

The weather of 1914, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 22 (1915), pp. 95–101*).—The rainfall during 1914 at the Cockle Park Experiment Station is compared with that of previous years and other regions of England.

The rainfall at this place was 30.7 in., or 1.75 in. above the 17-year average. The number of rain days was 199. The heaviest rainfall (4.26 in.) was in December; the lightest (0.61 in.) in April. Data are also given for pressure, temperature of air and soil (see p. 510), summer frosts (1898–1914), humidity, cloudiness, wind, etc. The mean temperature for the year was 47.3° F.; the maximum, 77.2°, June 30; the minimum 24.4°, December 21. Frost temperatures on the grass were recorded as late as June 1 and as early as September 22.

The weather of Scotland in 1914, A. WATT (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 341–354*).—"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 as regards weather was the more or less general prolonged shortage of rain from the middle of April to the end of October. At the end of October the total rainfall for the first ten months of 1914 was, as a rule, much below the normal, but the heavy rains of November and December brought about in various inland and western districts an excess for the whole year. In eastern districts there was a fairly well-defined deficiency."

Meteorological observations in Moscow during 1913–14, E. LEYST (*Bul. Soc. Imp. Nat. Moscou, No. 4 (1913), pp. 616–664; n. ser., 28 (1914), pp. 279–327*).—Data for atmospheric pressure, temperature of the air and soil, radiation, humidity of the air, cloudiness, duration of sunshine, precipitation, direction and force of the wind, and miscellaneous optical and electrical phenomena are summarized and briefly discussed.

Meteorological observations (*Ann. Statis. Egypte, 6 (1914), pp. 9–19*).—This article contains a brief note on the meteorological service of Egypt, and summarizes the available reliable records of observations on pressure, temperature, humidity, rain days, and nilometer readings at different places in Egypt up to and including 1913. Some of the records run back to 1868.

On the climate of the principal rubber producing countries, W. VAN BEMMELEN (In *International Rubber Congres met Tentoonstelling, Batavia, Sept., 1914. Rubber Recueil, Amsterdam: J. H. de Bussy [1915], pp. 145–166, pl. 1*).—This article describes the climate of the Amazon and Congo basins, Ceylon, Malacca, Sumatra, Borneo, and Java.

It is stated in general that "the climate of these countries is purely tropical; that is to say, warm, damp, and equable. The temperature in the plains is 25 to 27° C., declining above the sea level at the rate of about 0.6° for every 100 meters. The percentage of moisture in the air is great, and as a result the pressure of aqueous vapor is proportionately high (±20 mm.) and the rainfall is more than abundant (2,000 mm. and more per year); above all, however, its evenness is the most conspicuous feature of the climate. The yearly rise and fall in temperature amounts to only a few degrees and the daily difference far exceeds the yearly, though even that is not excessive. Periods of drought are seldom of longer duration than two months. The force of the wind is slight, storms are practically unknown; there are merely the gusts which are forerunners of the many thunderstorms and can be pretty violent."

Temperature in cultivated and uncultivated soil, and influence of good cultivation, D. A. GILCHRIST (*County Northumb. Ed. Com. Bul. 22* (*1915*), *pp. 97, 98*).—Observations in adjacent plats cultivated to a depth of 2 in. and uncultivated showed a more even temperature in the former at a depth of 1 ft. At a depth of 4 ft. there was no appreciable difference. The uniformity of temperature in the cultivated soil is attributed to its higher water content.

The rains of the Nile basin and the Nile flood of 1912, J. I. CRAIG (*Survey Dept. Egypt Paper 32* (*1914*), *pp. 104, pls. 7*).—Observations similar to those of previous years (E. S. R., 30, p. 511) are included in this report. The last chapter contains an extension of the known equation of continuity for a river to include the effects of seepage, evaporation, and rainfall, and applies the theory to calculate the losses on the White Nile between Malakal and Omdurman in the beginning of 1912.

SOILS—FERTILIZERS.

Soils of the eastern coal field, S. C. JONES (*Ky. Geol. Survey* [*Rpt.*], *4. ser., 1* (*1913*), *pt. 2, pp. 1067–1078*).—This article discusses the soils of an area of about 10,000 square miles in eastern Kentucky, the topography of which is rough, hilly, and mountainous.

The soils of the area are classed as ridge, hillside, and bottom soils. The ridge soils vary from sand to sandy loams, silt loams, or loams with a clay subsoil. The hillside soils are loams, silt loams, sandy loams, and shale or gravel loams with a yellowish or reddish loam subsoil mixed with sandstone gravel. The first bottom soils consist of brown sandy loams and loams, and the second bottom soils of loams and silt and clay loams, varying in color from gray to yellow and brown.

Chemical analyses by the state experiment station of soils from different counties in the area show that the soils of the upper coal measures "contain on an average about twice as much total nitrogen, total phosphorus, and total potassium as the lower coal measures soils. Also, they contain a much larger amount of soluble phosphorus and potassium." The bottom lands are all acid and contain much less total nitrogen and soluble phosphorus and potassium, due, it is stated, to long cultivation without any system of crop rotation."

Soil survey of Webster County, S. C. JONES (*Ky. Geol. Survey* [*Rpt.*], *4. ser., 1* (*1913*), *pt. 2, pp. 1079–1107*).—This report deals with the soils of an area of 214,400 acres in western Kentucky, the topography of which is divided into low flat bottoms, undulating or gently rolling upland, and broken or hilly upland. With reference to origin, the soils are residual and transported, the former occupying the upland soils and comprising 135,680 acres and the latter, the bottom lands, comprising 78,720 acres.

Five soil types are recognized, of which the yellow silt loam of the hilly and undulating lands predominates. Mechanical and chemical analyses (the latter by the state experiment station) of each type are reported. "Both the crop yields and chemical analyses indicate a lack of plant food in all these soils with the exception of the dark brown clay loam." The soils are more abundantly supplied with potassium than with either phosphorus or nitrogen. A large portion of the bottom soils need drainage.

Pot experiments with a soil similar to the yellow silt loam of this county showed that "on the whole, phosphorus decidedly increased the yields of wheat, oats, and clover, but not that of tobacco. Nitrogen decidedly increased the yields of wheat, oats, and tobacco, but not that of clover. Potassium moderately increased the yields of wheat and oats and slightly increased that of clover, but did not have a marked effect on that of tobacco. Rock phosphate used alone gave consistent gains except with tobacco. Used with manure, however, its effect seems to have been negative." Limestone alone produced a moderate increase with oats and clover and with tobacco following clover; used with phosphorus on clover there was a decided increase over that resulting from phosphorus alone.

Soil survey of the Marrs farm, S. C. Jones (*Ky. Geol. Survey* [*Rpt.*], *4. ser., 1* (*1913*), *pt. 2, pp. 1109–1118*).—This report deals with the soils of a farm of 300 acres in the northwestern part of Henderson County, Ky. The topography consists of rolling uplands and flats or bottom lands. The natural drainage of the flats and parts of the upland is poor.

It is stated that the soils are probably largely of transported origin. These are described in three types which are, in the order of area, yellow silt loam, gray clay loam, and gray silt loam. Chemical analyses made at the Kentucky Experiment Station show the soils of this farm to be poor in total nitrogen and phosphorus and rich in total potassium. All of the soils are more or less acid. Liming and the use of leguminous green manures and rock phosphate are suggested for these soils.

Soil surveys of the Hartford, Madisonville, and Central City quadrangle, S. C. Jones (*Ky. Geol. Survey* [*Rpt.*], *4. ser., 1* (*1913*), *pt. 2, pp. 1119–1132*).—This report is in two parts.

The first part deals with the soils of the Hartford quadrangle, an area of 158,080 acres in the western coal field of Kentucky, the topography of which is divided into low flat bottoms, gently rolling upland, and broken hilly land. The soils are of residual and transported origin, the former occupying the upland and the latter the bottom land. Five soil types are recognized, of which the yellow silt loam predominates, covering more than half the entire area.

The second part deals with the Madisonville and Central City quadrangles. which cover an area of 316,160 acres in the central part of the western coal field. The topography is divided into bottom lands, rolling upland, hilly areas, and high flat ridges. The soils are of residual and transported origin and are classed as yellow silt loam, which occupies the undulating and hilly areas, gray silt loam, and low flat bottom soils. The first is the most extensive.

Soils of Meade and Breckinridge [Counties], S. C. Jones (*Ky. Geol. Survey* [*Rpt.*], *4. ser., 1* (*1913*), *pt. 2, pp. 1139–1156*).—This report deals with the soils of an area in northwestern Kentucky which comprises two counties, the topography of which is rather diversified.

The soils are derived mainly from sandstone and limestone. The soils of the limestone region are mainly residual. The surface soil to a depth of 6 or 8 in. varies from yellowish or reddish loam to reddish or yellowish fine sandy loam with a reddish clay loam subsoil. The sandstone soils are rather uniform, the surface layer to a depth of 6 or 8 in. varying from a gray to a light brown fine sandy loam which is very loose in texture, has a poor moisture-holding capacity, and usually has a low content of organic matter. The subsoil is a yellow fine sandy material containing considerable clay. Chemical analyses of both types of soil showed them to be relatively rich in potassium and poor in nitrogen and phosphorus.

The results of analyses and pot culture experiments with different fertilizers indicate that the most practical method of improving these soils is to use leguminous green manures, lime, and rock phosphate, and to prevent soil washing.

The soils and agriculture of the southern New York highland region, E. O. Fippin (*Cornell Countryman, 12* (*1915*), *No. 7, pp. 578–584, 600, 602, figs. 3*).—This article deals with the soils and agriculture of an area of 15,000 square miles in southern New York, comprising twenty-seven counties, the topography of which varies from hilly to mountainous.

The soils are mainly of glacial and alluvial origin. Four series of glacial soils are discussed, of which the Volusia series predominates outside of the Catskill region. Of the water deposited types the valley terrace and first bottom soils are discussed. It is stated that the poorer of these soils need liming, proper subsoil drainage. and the addition of organic matter.

Soils from the East Africa Protectorate (*Bul. Imp. Inst.* [*So. Kensington*], *12* (*1914*), *No. 4, pp. 515–540*).—Mechanical and chemical analyses of samples of 24 soils from the land bordering the Juba River in East Africa are reported.

Most of the soils were of a clayey character, had good moisture retaining powers, and contained adequate quantities of calcium carbonate. The content of mineral plant food constituents is considered adequate in all cases except one, but nitrogen deficiencies occurred in certain cases. All the soils contained alkaline carbonates and also sodium chlorid and sulphates in smaller quantities. Calcium sulphate sometimes accompanied sodium carbonate.

On rubber soils, E. C. J. Mohr (In *International Rubber Congress met Tentoonstelling. Batavia, Sept., 1914, Rubber Recueil, Amsterdam: J. H. de Bussy* [*1915*], *pp. 167–170*).—The principal characteristics of soils of various rubber-producing regions, but especially those of the east coast of Sumatra, are described. No attempt is made to define sharply types of soil best suited to rubber trees, but it is pointed out that such soils should, as a rule, have high water holding, percolation, and capillary capacities, insuring an abundant water supply to the plant. The larger proportion of the rubber (and tobacco) soils of Sumatra are sandy and vary widely in chemical composition.

The acidity of Malayan soils, M. Barrowcliff (*Agr. Bul. Fed. Malay States*, *3* (*1914*), *No. 2, pp. 45–50*).—Estimations of the lime requirements of Malayan soils taken over extensive areas, using the method of Bizzell and Lyon (E. S. R., 30, p. 422) with a slight modification, showed that inland undulating land has an acidity corresponding to 2 to 3 tons of lime per acre, while the clays and peaty clays found near the west coast require from 5 to 6½ tons to produce neutrality. These results are taken to indicate that liming treatment as hitherto advocated is totally inadequate. "The figures . . . show plainly the efficiency of limestone as a neutralizing agent and its employment in preference to lime can be unhesitatingly recommended."

It is further noted that the soils on which the best coconut growth in the country is obtained have an acidity equivalent approximately to 6 tons of lime per acre-foot.

Reference is made to previous work by Hutchinson and MacLennan (E. S. R., 32, p. 32).

The inundation of the valley of the Yser, Barois (*Bul. Soc. Nat. Agr. France*, *75* (*1915*), *No. 2, pp. 174–181*).—It is thought that the inundation of the valley of the Yser as a war measure will result in a compacting of the agricultural soils, a diminution of aeration, and a deposit of marine salts in the surface soils.

Agricultural chemistry and vegetable physiology, N. H. J. Miller (*Ann. Rpts. Prog. Chem.* [*London*], *11* (*1914*), *pp. 213–237*).—Investigations during 1914 relating mainly to soils and plant nutrition are reviewed as usual. It is stated that "although for the year 1914 no results of exceptional importance have to be recorded, a number of investigations of considerable interest relating to soils and plant nutrition have been carried out. The soil problems which have received most attention are those connected with partial sterilization, absorption of bases, acidity, and the production and movements of nitrates in soils, while in the case of plant nutrition a good deal of attention continues to be given to the question of stimulants."

Soil problems, J. W. LEATHER (*Rpt. Agr. Research Inst. and Col. Pusa, 1913–14. pp. 16–18*).—In continuation of investigations (E. S. R., 22, p. 20) on the relations existing between the amount of carbon dioxid in soils and the amounts of lime and magnesia in solution, it was found that if magnesium carbonate is present in more than very small quantities, calcium carbonate becomes practically insoluble. Dolomite was found to dissolve as a double salt in carbon dioxid, but the presence of either calcium carbonate or magnesium carbonate was found to protect the dolomite from the action of the carbon dioxid. "This work has shown that no fertile soil can contain material proportions of magnesium carbonate, for if it did, the lime would become practically insoluble and the plant would die of lime starvation."

Analyses of samples of the alluvial soils from the lands irrigated by the upper and lower Swat River canals in India indicated that the lime content varies from high to low, potash is abundant, and there is an occasional deficiency in available phosphoric acid and a general deficiency in organic nitrogenous matter.

The movement of soluble salts with the soil moisture, F. S. HARRIS (*Utah Sta. Bul. 139* (*1915*), *pp. 119–124, figs. 2*).—Experiments with small sections of soil containing various quantities of soluble salts and through which water was passed horizontally and vertically are reported, the purpose of the experiment being to determine the movement of salts with water through the soil.

The results indicate that soluble salts in the soil very readily move horizontally and vertically with the current of soil moisture. It was found that salts moving horizontally with the soil moisture accumulated at the end of the test tank where evaporation took place, and that in general the salts increased in the soil from the end where water was added to the other end. The upward movement of salts and their accumulation at the surface were especially marked in soils containing a large amount of salt. It is concluded in general from these experiments that "lowlands will continue to be ruined by the accumulation of alkali salts as long as the uplands are overirrigated."

The rôle of colloids in agricultural soil, L. G. DEN BERGER (*Teysmannia, 24* (*1913*), *Nos. 7, pp. 438–450; 8–9, pp. 512–520; 11–12, pp. 689–701; 25* (*1914*), *Nos. 1, pp. 45–53; 2, pp. 65–67; 3, pp. 145–152; 5–6, pp. 251–255*).—This article describes the common properties of colloids, particularly their powers of absorption, and discusses the soil colloids in some detail, with particular reference to their origin and influence under different conditions on the physical, chemical, and biological properties of soils and on plant growth.

Some data on the question of the form of nitrogen in the soil, A. SHMUK (*Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *15* (*1914*), *No. 2, pp. 139–153, figs. 2; abs. in Chem. Abs., 9* (*1915*), *No. 7, p. 946; Zentbl. Agr. Chem., 44* (*1915*), *No. 1, p. 9*).—Investigations are reported which indicate that the distribution of amid compounds in podzol and chernozem soils is much the same as in protein. While the ratio of proteid nitrogen to the total organic matter of soils varied widely, the ratio to total nitrogen was quite similar in all tests. Podzol soil was found to contain a considerable proportion of water-soluble amid compounds. The distribution of different forms of nitrogen was quite similar in chernozem and podzol soils, but was quite different from that observed in the case of laterite soil.

Soil bacteriology, C. M. HUTCHINSON (*Rpt. Agr. Research Inst. and Col. Pusa, 1913–14, pp. 81–88*).—This is a brief review of investigations which have already been noted in part from other sources (E. S. R., 31, pp. 722, 731).

In continuation of studies of ammonification and nitrification of green manures, 14 species of bacteria were identified as apparently closely connected with the decomposition of buried Sann hemp, and their physiological and morphological characters were studied. No one species of bacteria capable of attacking cellulose was found, although this result was produced by two or more associated bacteria.

The investigations indicated that soil fungi play an important part in breaking down cellular tissue. The fertilizing value of green manures appears to depend upon the rapid formation of simple nitrogen compounds, such as ammonia, from proteid substances. It was found that the nitrification of ammonia "is interfered with by the fact of its concentration and also by the presence of soluble organic substances, some of which, at least, are strongly toxic to nitrifying bacteria and in less measure to others; this condition persists so long as the water extract remains acid to litmus, which under ordinary conditions of manufacture might extend to as much as six weeks. . . . The rapid ammonification which takes place when green manure is placed in water and allowed to ferment was found to be accompanied by the development of large numbers of ciliates, flagellates, and amœbæ, whose presence does not appear in this instance to be prejudicial to the activity of ammonifying bacteria." It was also found "that ammonification is the necessary antecedent to nitrification in the case of organic matter, that this process is furthered by a high percentage of moisture, that high concentrations of ammonia inhibit nitrification, but that such ammonia is absorbed by the soil and can then be nitrified."

The most complete and rapid nitrification was secured "by producing anaerobic conditions with water saturation and subsequently draining and aerating; the rapidity with which nitrification takes place under these conditions depends upon the relative completeness of the anaerobic and subsequently of the aerobic conditions." Under anaerobic conditions produced by water saturation "toxins were produced which not only inhibited nitrification before the ammonia concentration was sufficient to do so but afforded water extracts which were toxic to seedlings and to bacteria; subsequent aeration removes this toxic condition and the formation of nitrates takes place, the ultimate result being a high percentage of nitrification of the nitrogen of the organic matter. . . . In connection with the nitrification of green manure it was found that a loss of nitrate invariably occurred between the eighth and twelfth weeks of the process in the laboratory," but the cause of this was not determined.

Mustard oil cake furnishing nitrogen equivalent to 1 per cent of the dry weight of soil was added to a soil rich in lime without interfering with the normal rate of nitrification. Although the rate of nitrification was in direct proportion to the lime content, it was found that a soil low in lime in time attained the same nitrate concentration as one high in lime.

Azotobacter isolated from various soils showed marked differences in morphological and cultural characters and in nitrogen-fixing capacity. Nitrogen fixation by a pure culture of Azotobacter isolated from Pusa soil "was increased by the additions of basic slag or humus to the ordinary medium, but was diminished by the substitution of magnesium carbonate for calcium carbonate. . . . The addition of a seer [2.057 lbs.] of cane sugar to a plat 2 sq. yds. in area resulted in an increase, in the nitrogen content of the first 6 in. of soil, of nearly 15 per cent in 10 weeks. . . .

"It was found possible to measure the relative toxicity of various bacterial species to an intermediate form (*Bacillus prodigiosus*) and to one another by use of plate cultures and the measurement of the rate of CO_2 formation in solid and liquid media, and the effect upon the latter of the antagonism of symbiotic action, as the case might be. Marked instances of antagonism and symbiosis were found, and the production of toxins was demonstrated."

Investigations on protozoa in relation to the factor limiting bacterial activity in soil, T. GOODEY (*Proc. Roy. Soc. [London], Ser. B, 88 (1915), No. B 606, pp. 437–456, figs. 8*).—From the results of further investigations (E. S. R., 25, p. 817) of the Russell and Hutchinson hypothesis (E. S. R., 24, p. 621) it is concluded that "the protozoa, including ciliates, amœbæ, and flagellates added to the soil have not been able to act as a factor limiting bacterial activity in the soil. Inferentially, therefore, the ciliates, amœbæ, and flagellates obtainable from ordinary soil under cultural conditions do not function as the limiting factor."

Further investigations on the biological absorption of phosphoric acid in the soil, A. DUSHECHKIN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 6, pp. 467–500, figs. 6; abs. in Chem. Abs., 9 (1915), No. 8, p. 1085*).—In further studies of the biological absorption of phosphoric acid in soils (E. S. R., 27, p. 216), the experiments were extended to include the effect of water content and light and to determine the connection between denitrification and phosphoric acid absorption.

It was found that the biological absorption of phosphoric acid in soils increased with increasing water content. With time, decomposition products accumulated in the soil which had a dissolving effect on the phosphoric acid and diminished the absorption process. Nitrate additions increased the phosphoric acid absorption only with medium moisture content (25 per cent). The absorption was most marked under conditions favoring denitrification. With a higher moisture content (35 per cent) it was stronger in light, but with a lower moisture content (25 per cent) it was favored by darkness.

The comparative effect of phosphates and sulphates on soil bacteria, E. B. FRED and E. B. HART (*Wisconsin Sta. Research Bul. 35 (1915), pp. 35–66, figs. 6*).—Investigations on the influence of phosphates and sulphates in the form of chemically pure salts upon the activities of soil bacteria, as measured by rates of ammonification with pure and mixed cultures in soil and solution, by rates of carbon dioxid evolution, and by plate counts to determine if the fertilizing effect of these substances can be explained in part by the promotion of bacterial action are reported. The soil used was Miami silt loam.

It was found, in general, that the addition of mineral fertilizers to soils caused an increase in ammonification, carbon dioxid evolution, and total number of bacteria. Monobasic potassium phosphate, precipitated calcium phosphate, and the sulphates of potassium and calcium all increased ammonification in solution more or less, while tricalcium phosphate was ineffective. The action of monobasic potassium phosphate as compared with that of potassium sulphate is taken to indicate that the potassium ion does not materially influence ammonification. Monobasic potassium phosphate caused an enormous increase in numbers of bacteria in solution, followed by a rise in ammonia production, which was not, however, in proportion to the number of bacteria.

All the phosphates used increased the number of soil bacteria, particularly dibasic potassium phosphate. Dibasic potassium phosphate and tricalcium phosphate also stimulated ammonification in soil. Calcium sulphate, potassium and calcium phosphates, and ammonium, magnesium, and potassium sulphates all stimulated more or less the evolution of carbon dioxid from the soil.

"The results of this work, as a whole, suggest that possibly the increased crop production of a soil resulting from the application of soluble phosphates is in part due to the promotion of bacterial activity. . . . The sulphates, although as low in amount in most soils as the phosphates, will not, in all probability, have the same general crop-producing power as the phosphates."

A new case of unproductiveness in sugar cane soils, F. Ledeboer and A. E. Berkhout (*Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 18, pp. 653–672, pl. 1; Meded. Proefstat. Java-Suikerindus., 4 (1914), No. 26, pp. 521–540, pl. 1; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, p. 1000; Internat. Sugar Jour., 16 (1914), No. 190, p. 486; Jour. Soc. Chem. Indus., 33 (1914), No. 21, p. 1066*).—A case of unproductiveness in certain so-called white clay sugar cane soils in the Residency of Pelsalongan in Java is reported.

Chemical analyses show these soils to be relatively poor in nitrogen and phosphoric acid but to contain relatively large percentages of sodium carbonate (as much as 0.321 per cent), to which their unproductiveness is mainly attributed. Pot culture experiments with these soils using physiologically acid reacting fertilizers, lime, and stable manure in different combinations showed that complete fertilization with lime and the addition of ammonium sulphate with lime produced better cane crops than complete fertilization without lime or the addition of ammonium sulphate and stable manure.

While ammonium sulphate, potassium sulphate, and double superphosphate apparently neutralized the extreme alkalinity of the soil and supplied the lacking plant food, the chief benefit is attributed to the liming, owing to its favorable effect on the soil structure.

The soils containing the carbonate puddle badly after rains. The addition of 1.2 per cent of quick lime greatly improved the soil, and an application of 3.6 per cent of lime, while injuring vegetation, completely deflocculated the soil. Applications of gypsum produced still better results. The subsoil water was found to be very rich in sodium carbonate and is apparently the source of this substance in the soil.

A practical way to supply plant food to our soils, S. C. Jones (*Ky. Geol. Survey* [*Rpt.*], *4. ser., 1 (1913), pt. 2, pp. 1133–1138*).—The results of pot culture experiments carried on at the Kentucky Experiment Station on two soils, a red loam and a gray fine sandy loam, are reviewed. They indicate "that for general farm practice in which such crops as corn, wheat, oats, and tobacco are grown, a profit may be obtained from an increase in the nitrogen and phosphorus content in the average soils of the State." The use of leguminous green manures and rock phosphate is recommended as being the most practicable method of supplying the needed plant food.

The composition and value of farm manures, O. F. Jensen (*Michigan Sta. Circ. 25 (1915), pp. 3–7*).—Data are compiled from various sources to show the composition and value of farm manures. It is stated that sheep, hog, and hen manures are more valuable than other manures because of the great proportions of concentrates fed.

Experiments with barnyard manure at Darmstädt, P. Wagner (*Mitt. Deut. Landw. Gesell., 30 (1915), Nos. 4, pp. 41–44; 5, pp. 52–55*).—Some of the more important results of twelve years' experiments with manure and fertilizers are summarized in this article, with special reference to the decline of yield without manure, plant food removed by crops on manured and unmanured soil, the possible increase and cost of increase of yield with commercial fertilizers, the relation of plant food applied to the needs of the plant and requirements of the soil, the amount and cost of the increased yield with barnyard manure, the practical value of manure as compared with its fertilizing effect, and the fertilizing action of the different constituents of manure.

The sandy soil used in these experiments contained 0.077 per cent of nitrogen, 0.072 per cent of acid-soluble phosphoric acid, 0.214 per cent of total phosphoric acid, 0.05 per cent of acid-soluble potash, and 1.96 per cent of total potash. The yield of potatoes on this soil without fertilizer or manure declined more than three-quarters in eleven years, and of rye more than one-half in twelve years. With a rotation of potatoes, rye, and beets without manure there was removed from the soil in twelve years 131.25 lbs. of phosphoric acid per acre, 329.65 lbs. of potash, and 334.64 lbs. of nitrogen. When the soil was fertilized with combinations of two of the essential fertilizer constituents the amounts removed by the crops were 566.94 lbs. of phosphoric acid, 1,453.76 lbs. of potash, and 1,156.76 lbs. of nitrogen. It was found that the phosphoric acid and potash of manure was better utilized than that of Thomas slag and potash salts, and this was especially marked during the first years of the experiments.

Bat guanos, P. L. Gile and J. O. Carrero (*Porto Rico Sta. Rpt. 1914, p. 16*).—Brief reference is made to vegetation tests which have been undertaken to determine the availability of the phosphoric acid in the bat guanos of Porto Rico.

"The work accomplished so far shows that these deposits vary greatly in chemical composition, but that there are several more or less well-defined types. The vegetation tests show that the availability of the phosphoric acid also varies greatly.

"These deposits appear quite numerous and well distributed over the island. There is probably no doubt but that the deposits can furnish valuable fertilizing material for certain districts of the island. The individual deposits, however, are probably too small and transportation on the island too costly for the guanos to be exploited on any scale commercially."

Fertilizer experiments on the red clay soil, P. L. Gile and J. O. Carrero (*Porto Rico Sta. Rpt. 1914, p. 14*).—It is stated that the results of these experiments showed that lime, sodium nitrate, ammonium sulphate, dried blood, a nitrogenous and phosphatic fertilizer, and a complete fertilizer all failed to increase appreciably the yield of cane on this soil.

Drill fertilizing, Tacke (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 9, pp. 118, 119*).—In experiments with rye, drilling fertilizers showed little advantage over broadcasting.

Production of nitrates from air, with special reference to a new electric furnace, E. K. Scott (*Jour. Soc. Chem. Indus., 34 (1915), No. 3, pp. 113–126, figs. 10; rev. in Elect. Rev., 76 (1915), No. 1941, pp. 166, 167; Engin. Mag., 49 (1915), No. 1, pp. 104, 105, figs. 2*).—The author describes and explains the operation of his combined three-phase current furnace for the oxidation of the nitrogen of the air, and shows why he believes it will considerably increase the present yields of nitrogen compounds from this source.

Potassium from the soil, C. G. Hopkins and J. P. Aumer (*Illinois Sta. Bul., 182 (1915), pp. 3–10, figs. 2*).—Five years' pot experiments with clover and rape on a brown silt loam and on the so-called insoluble residue obtained from digestion of the brown silt loam for ten hours with boiling hydrochloric acid, having a specific gravity of 1.115, are reported, the main purpose of which was to determine the extent to which decaying organic matter is able to liberate soil potassium.

The results indicate that after two years' green manuring sufficient potassium was liberated from the insoluble residue to enable clover to be benefited by lime and phosphate fertilizers so as to exceed the yield of crops on the normal soil to which no such fertilizers had been added. The clover hay produced on the normal soil contained about three times as much potassium per gram as was contained in crops from the insoluble residue, which is taken to indicate that the actual requirement of clover for potassium may be very much less than has been estimated from the composition of hay grown on ordinary soils. It is also thought that the results support the theory that the benefit sometimes produced by potash fertilizers when applied to soils very deficient in decaying organic matter may be due in part to the power of the soluble potash salt to increase the availability of phosphorus and other elements.

Salines in the Owens, Searles, and Panamint basins, southeastern California, H. S. GALE (*U. S. Geol. Survey Bul. 580–L* (*1914*), *pp. VI+251–323, pls. 3, figs. 31; abs. in Amer. Fert.*, *42* (*1915*), *No. 8, pp. 42–51, figs. 3*).—This is a preliminary report summarizing the history of the saline deposits of these basins, which are believed to have been produced by the concentration and ultimate disappearance of "waters that formerly filled Owens Valley until they overflowed, flooding successively lower and lower basins, and forming for a time a chain of large lakes in what is now the desert region of southeastern California." "These flood waters passed from Owens Valley, the principal source of the water supply, through Indian Wells, Searles, and Panamint valleys, in each of which there was an extensive lake. Finally the waters are believed to have overflowed also into Death Valley. . . . It is the purpose to point out in the present paper the more salient distinguishing features and relations of these several basins and to suggest interpretations that may be placed on their influence in saline deposition."

It is estimated that the Searles Lake deposit contains 4,000,000 tons of water-soluble potash salts. In six analyses of brine from Searles Lake reported in this bulletin, the potassium varied from 5.54 to 7.27 per cent. Searles Lake is thought to offer the most promising prospect of commercial production of any of the localities so far examined for potash deposits. The author is of the opinion, however, "that commercially valuable concentrations of potash are not to be looked for in the desert-basin deposits generally. In the first place, salines deposited by shallow, intermittent lakes are not only so mixed with muds as to render their profitable recovery very doubtful, but such deposits are unlikely to retain on a large scale any considerable percentages of potassium in the soluble form. Only in the basins where large and deep saline lakes have existed and dried up under favorable conditions are massive deposits of saline free from mixture with mud to be looked for. Such conditions are rather exceptional. Probably few desert saline lakes have in fact dried up so free from the mixture of clay or other sediments that their water-soluble salts have retained the major portion of the potash originally present in the lake water.

"The confident hope is still held out that these exceptional conditions exist in some places and that by good fortune or otherwise they may be revealed. It seems that in Searles Lake one such exceptional place has been found, and it is possible that there may be even larger and more valuable deposits still to be discovered."

German potash situation, J. G. LAY (*U. S. Dept. Com., Com. Rpts., No. 76* (*1915*), *p. 10*).—The authorized deliveries of potash for domestic and foreign consumption during 1915 are given. These amount to 948,800 metric tons of potash (K_2O) as compared with 1,166,600 metric tons for 1914. It is stated that plans for denaturing potash salts so that the embargo can be removed have not yet materialized and the embargo, therefore, still remains in force.

The phosphate deposits of South Carolina, G. S. ROGERS (*U. S. Geol. Survey Bul. 580–J* (*1914*), *pp. 183–220, pl. 1, figs. 2; abs. in Amer. Fert.*, *42* (*1915*), *No. 2, pp. 37–49, fig. 1*).—The history, character, distribution, amount available, methods of mining, present status, and future prospects of these phosphates are discussed.

It is shown that production has fallen off greatly within the last few years. In 1912 it was only 131,490 tons, or about that of the period between 1875 and 1880. While the prospects of a marked revival of mining operations in this field are considered to be poor, attention is called to the fact that there is probably at least 5,000,000 tons of 60 per cent phosphate still available which improved machinery may at some later time render workable. The highest grade of rock that the field can be expected to produce, however, does not average more than 61 per cent phosphate containing, as a rule, more than 3 per cent iron and alumina.

A briefer report on these deposits has been noted (E. S. R., 30, p. 27).

Solubility of the different constituents of slag, M. Sirot and G. Joret (*Jour. Agr. Prat., n. ser., 27 (1914), No. 25, p. 787; abs. in Chem. Abs., 9 (1915), No. 5, p. 684*).—It is shown that citric and malic acids have greater solvent power for the constituents of basic slag than do tartaric, acetic, lactic, and oxalic acids. All of the constituents of the slag, including silicon, phosphoric acid, calcium, magnesium, sulphates, iron, and manganese, were found to be soluble in the weak acids, the solubility varying with the fineness of the slag and the actual solubility of the salts formed. The author concludes that slag is not simply a phosphatic fertilizer but that it contains many other substances useful to plants in forms very soluble in weak organic acids.

The solubility and assimilability by plants of the water insoluble-phosphoric acid or superphosphate prepared from Kostroma phosphates, P. Kossovich (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 6, pp. 501–538, figs. 5*).—Superphosphate containing about 11 per cent of phosphoric acid soluble in water and 3½ per cent almost completely soluble in Peterman's reagent (ammonium citrate) made from low-grade phosphate (containing from 20 to 24 per cent of phosphoric acid) was tested in pot experiments with oats and mustard on sand and chernozem soil. The citrate-soluble phosphoric acid appeared to be not less than half as valuable as the water-soluble for fertilizing purposes.

A new theory regarding the feeding power of plants, E. Truog (*Science, n. ser., 41 (1915), No. 1060, pp. 616–618*).—As a result of his own investigations and these of others, the author formulates the hypothesis that "plants containing a relatively high calcium oxid content have a relatively high feeding power for the phosphorus in raw rock phosphate. For plants containing a relatively low calcium oxid content the converse of the above is true."

Within the meaning of this hypothesis "a calcium oxid content of less than 1 per cent may be considered relatively low. Corn, oats, rye, wheat, and millet belong to this class. A calcium oxid content of somewhat more than 1 per cent may be considered relatively high. Peas, clover, alfalfa, buckwheat, and most of the species of the Cruciferæ belong to this class."

The explanation offered for this hypothesis is that, with plants having a high capacity for assimilating lime, the calcium bicarbonate formed by the action of carbonic acid on tricalcium phosphate will be readily absorbed along with the dicalcium form and thus permit the continued action of the carbonic acid on the insoluble phosphate. On the other hand, with plants having a low assimilative power for lime, the reaction between carbonic acid and tricalcium phosphate soon reaches a state of equilibrium, and soluble phosphate ceases to be produced. The hypothesis is based upon the general theorem that the feeding power of a plant for an insoluble substance depends "(1) on the solubility of that substance in carbonated water and (2) on whether or not the plant removes from solution all the products of the solubility reaction in the proper proportion so as to allow the solubility reaction to continue indefinitely."

Chlorosis of sugar cane, P. L. Gile and J. O. Carrero (*Porto Rico Sta. Rpt. 1914, pp. 14, 15*).—Tests on the effect of ferrous sulphate and stable manure on the development of chlorotic cane showed that small applications of these materials had but little effect on the cane. Heavier applications seemed to produce quite notable increases in tonnage but at a prohibitive cost.

Lime-induced chlorosis, P. L. GILE and J. O. CARRERO (*Porto Rico Sta. Rpt. 1914, pp. 15, 16*).—Brief reference is made to experiments with rice similar to and in extension of previous experiments with pineapples (E. S. R., 26, p. 121; 31, p. 816). In these experiments an attempt was made to determine whether the action of calcium carbonate in inducing chlorosis is due solely to its depressing effect upon the assimilation of iron.

When ferrous sulphate was applied to chlorotic rice grown in calcareous soils it was found that "the results were similar to those obtained in previous work with pineapples. Ferrous sulphate applied to the leaves as a spray restored the green color and induced a normal growth, but applied to the soil was without effect."

Various other experiments bearing on the causes of chlorosis are referred to as in progress but no results are reported.

The purification of waste liquors from paper mills, G. B. KERSHAW (*Surveyor, 47 (1915), No. 1199, pp. 28–30*).—The author states that in the treatment of waste waters from paper mills large amounts of sludge are obtained which may be used for manuring purposes as it contains considerable lime.

Commercial fertilizers, W. J. JONES, JR., ET AL. (*Indiana Sta. Bul. 180 (1915), pp. 407–520*).—This bulletin gives the results of the fertilizer inspection, including analyses and valuations of 1,420 samples collected in Indiana during the spring and fall of 1914. A list of brands registered since May 15, 1914, and brands previously registered, to be on sale in 1915, and other data are also given.

Analyses of commercial fertilizers, P. H. WESSELS ET AL. (*Rhode Island Sta. Insp. Bul., 1914, Sept., pp. 2–8*).—This bulletin contains analyses and valuations of 50 samples of high-grade fertilizers and fertilizing materials collected in Rhode Island during the spring of 1914. It is stated that nearly two-thirds of the total number of brands listed fell below their guaranties as regards water-soluble phosphoric acid and about one-half are deficient in available phosphoric acid.

Analyses of commercial fertilizers, P. H. WESSELS ET AL. (*Rhode Island Sta. Insp. Bul., 1914, Oct., pp. 3–11*).—This bulletin contains analyses and valuations of 21 samples of limes and wood ashes collected in Rhode Island during 1914 and of 33 samples of complete fertilizers not reported in previous bulletins, together with a summary of results for the year. This last indicates that "in 82 per cent of the instances reported the amounts of nitrogen, potash, and total and available phosphoric acid were equal to or above the amounts that were guarantied, in 9 per cent the amounts were less than 0.3 per cent below the amounts that were guarantied, and in 9 per cent the amounts were more than 0.3 per cent below the guaranties."

AGRICULTURAL BOTANY.

An experimental study of the rest period in plants: Seeds, W. L. HOWARD (*Missouri Sta. Research Bul. 17 (1915), pp. 58*).—In continuation of other investigations on the rest period of plants (E. S. R., 33, p. 223), the author gives an account of studies carried on with seeds, begun in 1907 and continued for seven years.

In the preliminary tests it was found that seeds of many annual plants were able to germinate while quite immature, but that more than half the species investigated had a pronounced rest period. Of the species having a definite rest period by far the greater percentage are woody plants. The investigations were continued to determine when the resting phase sets in and whether it can be broken by treatments and what agents are most effective for breaking the rest.

During 1912 and 1913 a study was made of about 100,000 seeds representing about 200 species of plants, and it was found that about 76 per cent had a definite rest period. Where seeds grow at all without rest, germination takes place more quickly in the immature seeds than in mature ones.

In 1912 seeds of a number of species of woody plants were treated to break the rest period. It was found that stratifying these seeds and letting them freeze while in the moist sand proved the best treatment tried for hastening the sprouting and bringing about the highest percentage of germination. Etherizing dried or moist seeds had some beneficial effect on germination, and etherizing seeds that had been stratified and frozen hastened sprouting and also increased the percentage of germination. Etherizing old, dry seeds of herbaceous plants had but little effect on germination and in most instances was found detrimental. Seed corn etherized when dry seemed to be materially benefited. It was found that while corn seed did withstand severe freezing when dry it was badly injured when in a moist or wet condition. Lima beans were found to be severely injured if frozen when dry, and proportionately greater injury was effected if wet. Freezing and etherization were detrimental to watermelon seeds if dry, but they were not injured and in some cases were benefited by freezing, if the seeds were quite moist. Soaking okra seeds had a bad effect on germination, and ether treatments had little or no effect on dry seeds, but were very beneficial to moist or wet ones.

A historical summary and bibliography are appended.

Experiments in forcing native plants to blossom during the winter months, C. O. Rosendahl (*Plant World, 17* (*1914*), *No. 12, pp. 354–361*).—Giving an account of attempts to obtain fresh flowers for class use during the winter months, the author states that while the experiments made were not comprehensive enough to form a basis for sweeping conclusions, it has been demonstrated that a considerable portion of the perennials native to the neighborhood of Minneapolis, Minn., lend themselves to successful forcing during winter and that a wealth of fresh material can thus be obtained with comparatively little effort and expense.

The effect of shade on transpiration and assimilation of tobacco in Cuba, H. Hasselbring (*Estac. Expt. Agron. Cuba Bol. 24* (*1915*), *pp. 1–33, fig. 1*).—The principal conclusions from this work have already been noted (E. S. R., 31, p. 326).

Absorption of ions by plants, F. Plate (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23* (*1914*), *I, No. 10, pp. 839–844; abs. in Jour. Chem. Soc.* [*London*], *106* (*1914*), *No. 622, I, p. 1039*).—*Triticum sativum* and *Hyacinthus orientalis* were grown separately in solutions of the chlorid, bromid, nitrate, and sulphate of manganese. It was found that the anion and cation are utilized in about the same proportion as that which obtains in the solution, the anion going mainly to the shoot and the cation to the root.

The antagonism between ions in the absorption of salts by plants, W. Stiles and I. Jörgensen (*New Phytol., 13* (*1914*), *No. 8, pp. 253–268*).—The authors review briefly the work and opinions of earlier investigators dealing somewhat indirectly, and those of later ones dealing more directly, with antagonism between salts or ions in their absorption from aqueous solutions by plants.

It is considered as evident that this phenomenon is of widespread if not of universal occurrence in organic life. Antagonism appears to be characteristic of cations, not only of nutritive but also of indifferent or poisonous character, and even between metals and alkaloid bases. It appears to be greatest between ions of different valency, but to be not altogether absent between those of the same valency.

The explanation of antagonism considered as most plausible is that which regards the plasma membrane as a carrier of ions into the interior of the cell by means of reversible combinations with them, the different ions thus interfering with each other's activity in this respect.

A bibliography is given.

Determination of elements necessary to development of maize, P. Mazé (*Compt. Rend. Acad. Sci.* [*Paris*], *160* (*1915*), *No. 6, pp. 211–214*).—In continuance of previous studies (E. S. R., 31, p. 221) the author carried out experiments testing the growth of maize in a nutritive solution of given composition, to which some or all of the elements aluminum, boron, fluorin, iodin, and arsenic had been added. The results appear to show that all of the elements named are necessary to the best growth of maize except arsenic, which is distinctly unfavorable to its development.

The chlorosis of plants, P. Mazé (*Compt. Rend. Soc. Biol.* [*Paris*], 77 (*1914*), *No. 31, pp. 539–541*).—Summarizing some of his investigations relating to chlorosis (E. S. R., 31, p. 221), the author found that this disease could be induced in maize by a lack of iron, sulphur, manganese, etc. For chlorosis caused by a lack of iron, providing this substance in solution to chlorotic leaves quickly restored their green color. Chlorosis due to a lack of magnesium was less easily controlled, indicating that there are several kinds of chlorosis. The lack of iron is said to be the most common form of the trouble, and this is usually brought about by the presence of large amounts of carbonate of lime in the soil, which check the absorption of iron. Chlorosis due to a lack of manganese is considered to be of a special type, although it too is influenced by alkalinity of soils.

It is said that other alkaline carbonates, as those of potassium and sodium, produce similar effects on the absorption of iron, etc., by plants. Exudation from diseased cells is said to cause chlorosis, and this action is considered to be more or less specific for the different kinds of plants studied.

The influence of fluorin upon vegetation, A. Gautier (*Compt. Rend. Acad. Sci.* [*Paris*], *160* (*1915*), *No. 6, pp. 194, 195*).—It is stated that in experiments with fluorin in the nutritive medium it was found that an inhibitive or unfavorable influence was exerted upon very few plants, many more showing an increase of growth, flowering, and bearing, and some showing no effect from fluorin. Mustard gave a ninefold gain as regards seed output under the influence of fluorin, and several other plants named gave analogous results.

Investigations on the resistance of growing plants to hydrocyanic acid fumigation, J. Cotte (*Compt. Rend. Soc. Biol.* [*Paris*], 77 (*1914*), *No. 22, pp. 185–187*).—In order to test the injury by hydrocyanic acid gas fumigation on plants, the author experimented with wheat, castor beans, and garden nasturtiums grown in pots and subjected to different strengths of hydrocyanic acid gas for different periods of time at a nearly uniform temperature of 16° C. (60.8° F.). The gas was generated by the action of dilute sulphuric acid on potassium cyanid. The quantities of potassium cyanid used per cubic meter of space were 12.5, 15.63, 23.25, and 39.06 gm., respectively, amounts which are in excess of those usually recommended for use in fumigation.

Wheat plants were only silghtly affected when exposed for one hour to the action of 12 gm. potassium cyanid per cubic meter, and for the complete destruction of the plants a sojourn of two hours exposed to the action of 39 gm. potassium cyanid was required. The castor bean plants showed some lesions where 15 gm. of the cyanid was used per cubic meter, and at 23 gm. the plans succumbed. The nasturtium plants withstood an exposure to gas from 15.5 gm. of the cyanid for two hours. They appeared to be slightly injured when taken out of the fumigation chamber, but fully recovered vigor in three days.

Action of chloroform and ether on the inversion of saccharose in the roots of sugar beet, P. Mazé (*Compt. Rend. Soc. Biol.* [*Paris*], *77* (*1914*), *No. 32, pp. 549, 550*).—The author states that the immersion of fragments of sugar beet in solutions of chloroform or ether resulted in the excretion of the invert sugar and saccharose into the liquid. Chloroform was found more energetic in this respect than ether. It is believed that chloroform and ether bring about a very abundant secretion of saccharose. The fragments of potatoes submitted to chloroform and ether did not show any saccharification of starch.

Influence of naphthalin on germination, growth, and nitrification in plants, P. Cacciari (*Staz. Sper. Agr. Ital.*, *47* (*1914*), *No. 5, pp. 347–367*).—It was found that when present in from 0.5 to 10 per cent of the seed weight for a considerable period of time naphthalin exerted little or no injurious influence on the germination of wheat and legumes. It was unfavorable to their vegetative development and to their normal rate of nitrification.

The formation of starch in the embryo before the maturity of the seed, A. Guilliermond (*Compt. Rend. Soc. Biol.* [*Paris*], *76* (*1914*), *No. 13, pp. 567–571, figs. 12*).—From a study of beans, peas, castor beans, and squash seed the author claims that starch is formed in the embryo before the maturity of the seed, and that the chloroplasts in the hypocotyl and cotyledons are formed in the beginning of germination. The plastids formed at the beginning of germination are said to be formed from those which have elaborated starch before the maturity of the seed.

Starch reserve in relation to the production of sugar, flowers, leaves, and seed in birch and maple, F. B. H. Brown (*Ohio Nat.*, *14* (*1914*), *No. 7, pp. 317–320, figs. 2*).—This is a brief preliminary report on species of maple and birch examined in the spring of 1914.

It is stated that before the beginning of bud growth little starch had been utilized, the most pronounced changes being confined to the bark of the stem. During vegetative and floral development in spring, starch utilization involved progressively the branches showing from one to ten annual rings of growth. No marked changes have been noted beyond these portions or in the root.

The origin of anthocyanin in different plant organs, F. Moreau (*Compt. Rend. Soc. Biol.* [*Paris*], *77* (*1914*), *No. 29, pp. 502, 503*).—Attention is called to the different manner in which anthocyanin is formed in floral organs and in other portions of plants, but the author claims that in every case it is of a mitochondrial origin.

Anthocyanin formation and mineral nutritive components, A. Czartkowski (*Ber. Deut. Bot. Gesell.*, *32* (*1914*), *No. 6, pp. 407–410*).—The author claims that the production of anthocyanin by young shoots of *Tradescantia viridis* and *T. loekensis* grown in Knop's solution was favored by lowering the content of nitrogen, but of no other single component.

Anthocyanin formation in rose leaves, A. M. Löwschin (*Ber. Deut. Bot. Gesell.*, *32* (*1914*), *No. 6, pp. 386–393, pl. 1*).—The author, having followed up the studies reported by Pensa (E. S. R., 32, p. 428), states that his examinations of young rose foliage leave little room for doubt that not only the filiform, but also the granular elements, serve as a matrix for the production of anthocyanin. It is here synthesized under the influence of the nucleus from the organic materials furnished by the mother plant.

The anatomy of Acacia mollissima, with special reference to the distribution of tannin, P. A. van der Byl (*Union So. Africa Dept. Agr. Sci. Bul. 3* (*1914*), *pp. 32, figs. 41*).—The author describes the anatomy of *A. mollissima*, or black wattle, with reference to the location of tannin. This is said to be present in every organ of the plant, but mostly in the phloem region of trees from six to ten years old, young branches and leaves having too low a tannin content to be profitably used.

Biochemical investigations of saponins, Marie Korsakoff (*Rev. Gén. Bot., 26 (1914), No. 306, pp. 225–244*).—The author studied the occurrence, distribution, and rôle of saponin in *Saponaria officinalis* and *Agrostemma githago.*

No saponin was found in the leaves or pericarp, and none in the very young seed in sufficient quantity to be detected. It appears, however, in the seed as it reaches maturity. This has led to the conclusion that saponin is either formed in minute quantities in the leaves, from whence it passes to the stems from the sugars, or it is formed in the stems themselves. The author considers that within the seed saponin is formed at the same time as the other reserve materials. The fact that in the process of germination the saponin does not diminish leads him to believe that it is not utilized as a food reserve.

On a chemical peculiarity of the dimorphic anthers of Lagerstrœmia indica, with a suggestion as to its ecological significance, J. A. Harris (*Ann. Bot.* [*London*], *28 (1914), No. 111, pp. 499–507, figs. 2*).—The author states that in *L. indica* the stamens are dimorphic, those of the outer whorl being larger than those of the more central yellow group, and differing from them also in both color and contained pollen. It is claimed that the differentiation observable is physiological as well as morphological, the underlying cause of the phenomena appearing to be chemical rather than physical. The morphological and physiological dimorphism is considered to be a case of specialization of parts to facilitate pollination.

Studies on the floral biology and pathology of the olive, L. Petri (*Studi sulle Malattie dell' Olivo, V. Rome: R. Staz. Patol. Veg., 1914, pp. 5–64, figs. 5*).—The author concludes from studies detailed that a constant and considerable arrest of an ovarial development more or less precocious may be noted in both cultivated and wild olive plants under good or deficient conditions of growth, and that among the external factors which may condition almost complete sterility is prolonged drought. Defoliation produces the same effect, as may any cause of deficient water transfer within the plant, and to this may be added abortion of the anthers.

It is stated that in a given plant, and even within the same floral shoots of the more fertile individuals, some flowers may show an arrest of ovarial development at various stages, the percentage of ovarial abortions showing periodic oscillations bearing some relation to vegetative conditions. The arrest of development in the ovaries is held to have one cause in a deficiency of nitrogenous material, this deficiency seeming to be related to insufficient absorption of nitrates, as well as to diminution, more or less lasting, of the activity of the processes of synthesis of nitrogenous substance. Vegetative multiplication is the means, but not the cause, of perpetuation of this pathological deviation, and it is considered advisable to reject for grafting purposes all plants showing high percentages of ovarial abortion.

In the present state of knowledge the constancy of ovarial abortion in olives may be regarded, it is thought, as the consequence of a modification, difficultly reversible, of some physiological property of floral shoots, under the influence, more or less prolonged, of exceptional nutritional conditions, by direct or indirect action of the external medium in relation to profound modifications of the property of absorption and transfer by the roots.

Mutation en masse, H. H. Bartlett (*Amer. Nat., 49 (1915), No. 579, pp. 129–139, figs. 9*).—It is stated that during the author's experiments with Œnothera two species have been discovered, some strains of which give rise by mutation to dwarfs occurring in both cases in unexpectedly large numbers. The less complicated of these two cases (*Œ. reynoldsii* n. sp.), with some of its descendants, is discussed as regards some studies made thereon.

The phenomenon presented by *Œ. reynoldsii*, called here mutation en masse, appears in one of the short-styled self-pollinating species. It seems clear to the author that mutation en masse bears a certain degree of resemblance to Mendelian segregation. No explanation suggests itself for the enormous surplus of dwarfs in the progenies exhibiting diversity, unless perhaps it is that the results are complicated by selective germination or selective mortality. At any rate the ratios thus far obtained do not conform to any Mendelian expectation. The origin of mutant *bilonga* from mutant *debilis*, it is thought, may instance the origin of a new character.

Studies in pea varieties and hybrids therefrom, H. KAPPERT (*Ztschr. Induktive Abstam. u. Vererbungslehre, 13* (*1914*), *No. 1–2, pp. 1–57, figs. 20*).—This is a study, in some detail, of the several characteristics as regards the starch grains, surfaces, chemical constituents, physical peculiarities, etc., of some garden varieties of peas and their hybrids.

A flora of Cuba, M. G. DE LA MAZA and J. T. ROIG (*Estac. Expt. Agron. Cuba Bol. 22* (*1914*), *pp. 182, pls. 33, fig. 1*).—This work is in four parts. The first deals in a general way with living plants (listing genera) and fossils (listing families, genera, species, etc.) of this region. The second gives a discussion of the flora of Cuba in relation to that of other regions. The third indicates collections and other facilities for botanical study. The fourth deals with plants in their economic aspects.

Geography and vegetation of Northern Florida, R. M. HARPER (*Fla. Geol. Survey Ann. Rpt., 6* (*1914*), *pp. 163–437, figs. 51*).—The author gives the results of several years' study on the original distribution of the native vegetation in relation to the several geographical divisions of the State of Florida, as contributing to a better understanding of the complex relations existing between native vegetation, topography, drainage conditions, and soils.

Lists of native plants and an index of plant names are included.

Plant ecology and floristics of Salton Sink, S. B. PARISH (*Carnegie Inst. Washington Pub. 193* (*1914*), *pp. 85–114*).—This contribution includes a citation of the very scanty existing botanical literature on the Salton Sink; a discussion of the derivation, distribution, and determining factors of the flora; a description of the various floral formations and associations; a consideration separately of the trees as classed with regard to soil moisture; a numerical analysis of the flora; and a catalogue of the plants collected in this depression.

Movements of vegetation due to submersion and desiccation of land areas in the Salton Sink, D. T. MACDOUGAL (*Carnegie Inst. Washington Pub. 193* (*1914*), *pp. 115–182, pls. 18, figs. 2*).—An account is given in considerable detail of studies carried on at intervals since 1904 in the Salton Sink, as concerned mainly with organisms overwhelmed by floods, with the physical changes which follow emersion, and with the biological mechanism of reoccupation in areas emerging from the water as related to the present distribution of plants and animals. Such factors are considered in this connection as soil, climate, precipitation, and changes occurring in solutions and in precipitates. Submergence and emergence with corresponding biological alterations are thought to have occurred here many times in the last few centuries, and the accompanying complex interplay of biological and mechanical agencies is partly described and partly suggested.

The behavior of certain micro-organisms in brine, G. J. PEIRCE (*Carnegie Inst. Washington Pub. 193* (*1914*), *pp. 49–69, pls. 3, fig. 1*).—Reporting a further study (E. S. R., 30, p. 431) of organisms in the Bay of San Francisco, some of which endure great and rapid changes of concentration in the saline solutions, the author shows that several of these present remarkable illustrations of adaptability and plasticity. Changes in temperature exercise no very evident influence on the behavior of the brine organisms, but changes in concentration of the brine are reflected in the behavior of the brine algæ, also in marked effects as regards cell permanence or cell division.

The red color of concentrated brines in the salterns and of the salt piled for drainage is due to a chromogenic bacillus, inoculation with which turns salt codfish red.

The osmotic, adsorptive, and other relations noted are considered to justify further study on account of their more general bearings.

FIELD CROPS.

Root systems of agricultural plants, J. G. Maschhaupt (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat.* [*Netherlands*], *No. 16* (*1915*), *pp. 76–89, pls. 5*).—This describes a method of removing a shaft of soil of sufficient breadth and depth to include the root systems of the plants under investigation. After cutting away the soil from one side of the proposed shaft, a board studded with needles of sufficient length to penetrate the shaft's breadth (25 cm.), in order to secure the roots in approximately their original positions, is pressed or driven in a vertical position against the shaft, which the needles penetrate. The shaft is then cut loose on the opposite side by driving down a piece of sheet iron to the desired depth, and the soil is carefully washed away from the roots.

The influence of phosphatic fertilizers on root development, R. D. Watt (*Rpt. Austral. Assoc. Adv. Sci., 14* (*1913*), *pp. 661–665, fig. 1*).—This paper records data taken from water-culture, pot-culture, and field experiments that show an increased root development of barley and wheat apparently due to the application of phosphatic fertilizers. The depths to which roots of wheat penetrated on unmanured plats ranged from 13 to 37 in. and on fertilized plats from 27 to 38 in.

The geographical distribution of the field crops of India, T. H. Engelbrecht (*Abhandl. Hamburg. Kolon. Inst. 19* (*1914*), *Ser. E, pp. IX+271; Atlas, pls. 23*).—Part 1 of this article treats of the distribution of about 70 of the field crops of India. Part 2 consists of maps showing the distribution of the principal field crops.

[Studies with field crops in Montana] (*Montana Sta. Rpt. 1914, pp. 391–393, 397, 398*).—Among other work of the year, it is mentioned that mangels, Gehu and Dakota white flint corn, and Pilot navy beans were grown with success, but that sorghum, Kafir corn, cowpeas, soy beans, and grasses were unsatisfactory. Seeds of alfalfa and several clovers treated with sulphuric acid before planting gave lower yields of hay than check plats. Contradictory results are reported regarding thinning and spacing potatoes, while mulching did not give so good results as cultivation. Favorable results are reported in improving potatoes by hill selection.

Grasses and forage crops (*Mass. Bd. Agr. Bul. 3* (*1915*), *2 ed., rev., pp. 126, pls. 5, figs. 3*).—This is a revised second edition of the bulletin already noted (E. S. R., 23, p. 530) with additional papers on Green Crops for Summer Soiling, by J. B. Lindsey (E. S. R., 23, p. 580); How to Supplement a Short Hay Crop, by C. S. Phelps; New England Pastures, by J. S. Cotton; and Alfalfa for New England, by A. D. Cromwell.

Experiments on permanent grass land, 1915 (*Agr. Students' Gaz., n. ser., 17* (*1915*), *No. 4, pp. 162–165*).—This article notes results of manurial experiments at Cirencester, England, that have been in progress over 20 years.

"Generally the ammonium sulphate gave rather better returns than the corresponding plats with sodium nitrate. Sodium nitrate alone has evil effects on the grass, but ammonium sulphate alone is not so injurious here. The residues of previous manuring for 20 years with rape cake, discontinued after 1911, gave an increase of 6 cwt. of hay. The increase on the basic slag plats was 6 to 7 cwt., rather more this year than on the superphosphate alone plat, where it was 5½ cwt., but the weight of slag given is double that of the superphosphate. The hay from the plat with superphosphate and residues of potash salts was exceedingly rich in Leguminosæ."

[Fertilizer experiments] (*County Northumb. Ed. Com. Guide to Expts. 1915, pp. 10–87, figs. 2*).—This gives some results of manurial treatments of pastures and meadows and rotation experiments.

Pasture grasses: Their cultivation and management, E. Breakwell (*Dept. Agr. N. S. Wales, Farmers' Bul. 96 (1915), pp. 105, pl. 1, figs. 57*).—The author discusses the treatment of native pastures, including overstocking, deterioration, and burning off, and cultivated pastures; classifies useful grasses according to soil, height of grass, and habits of growth; and describes many useful grasses, both introduced and the best native grasses of New South Wales.

Ecology of the purple heath grass (Molinia cærulea), T. A. Jefferies (*Jour. Ecology, 3 (1915), No. 2, pp. 93–109, pls. 2, figs. 2*).—This article gives the results of an ecological study of *M. cærulea* on 3 square miles of moors 6 miles from Huddersfield, England. The morphology and biology of Molinia, factors in its distribution (soil content and acidity), and the invasion and retrogression of Molinia are discussed.

A new species of forest grass (Spodipogon lacei), R. S. Hole (*Indian Forest Rec., 5 (1915), No. 6, pp. 6, pls. 4*).—This describes a grass closely allied to *S. sagittifolius* and given the name of *S. lacei*.

Variety tests with millet and sunflowers, P. R. Fedorov (*Bezenchuk. Selsk. Khoz. Opytn. Stantsīia, No. 60 (1914), pp. 6*).—Variety tests with millet showed yields ranging up to 2,133 lbs. per acre when the soil was plowed to a depth of 7 in.

Tests with sunflowers showed "Green" to be the heaviest yielder of seed (720 lbs. per acre). It is noted that this variety was entirely free from dodder, which for two seasons greatly infested the other varieties.

The effect of the association of legumes and nonlegumes, W. B. Ellett, H. H. Hill and W. G. Harris (*Virginia Sta. Tech. Bul. 1 (1915), pp. 28–36, figs. 3*).—The experiments outlined in this bulletin were conducted in order to account for the high percentage of protein found in samples of Kentucky blue grass grown in Virginia. They consisted of the production (beginning in 1911) of Kentucky blue grass, timothy, and corn grown separately and in association with white clover, red clover, and beans, respectively, in concrete tanks made in the greenhouse for the purpose, and supplemented by field tests.

The data obtained by harvesting and analyzing the crops showed with blue grass and white clover no direct benefit from the association. With timothy and red clover no increase in protein was shown the first year, but in 1913 and 1914, however, some benefit was found. When corn and beans were grown in the greenhouse the corn was benefited by the association.

The high protein content of the grasses was chiefly accounted for by the early age at which they were analyzed. The protein content of the blue grass sown January 1, 1911, and cut March 1, April 1, May 1, June 1, December 1, 1911, and February 4, 1912, is reported for the respective dates as 32.71, 24.37, 25.27, 18.2, 19.93, and 16.91 per cent (dry matter basis). The protein content of timothy sown January 1, 1911, and cut March 1, April 1, May 1, and June 1, 1911, is reported as 30.27, 24.35, 24.68, and 18.59 per cent.

Vegetative regeneration of alfalfa, O. T. WILSON (*Science, n. ser., 42* (*1915*), *No. 1073, pp. 126, 127*).—This article reports the vegetative growth of cuttings from alfalfa plants when these cuttings were left on the moist soil of experimental pots in the greenhouse. "After a week it was found that fragments of several descriptions [portions of stems, portions of petioles, petioles with blades attached, leaflets without petioles attached, and portions of the leaf blade] had rooted firmly and were developing into healthy shoots."

Experiments with corn in 1914, V. SVISHCHEV and B. AKSENOV (*Bezenchuk. Selsk. Khoz. Opytn. Stantsīīa, No. 61* (*1914*), *pp. 6*).—This records variety tests with maize and shows that in general the local varieties produced greater quantities of dry matter per acre than the imported American varieties. The use of manure was found to be unprofitable. In general the use of listers gave better yields than did corn planters.

Soil moisture and tillage for corn, J. G. MOSIER and A. F. GUSTAFSON (*Illinois Sta. Bul. 181* (*1915*), *pp. 563–586, figs. 7*).—This bulletin contains data compiled from results of experiments conducted in Illinois and in several other States in cultivating the corn crop on various kinds of soil. These data have been so edited as to develop principles that should be observed in order to secure the best results in the production of corn, and are summarized as follows:

"A deep, well-prepared seed bed is essential for aeration, proper root development, and conservation of moisture. It gave a gain of 14.5 bu. ($7.25 at 50 cts.) per acre over no seed bed. Killing weeds is the most important factor in cultivating corn on brown silt loam. No weeds gave an increase over weeds of 38.6 bu. of corn, a gain of $19.30 per acre. Weeds reduce the yield of corn more by robbing it of plant food and light than by depriving it of moisture. Irrigation on a weed plat gave an increase of only 3.8 bu. As an average of 16 tests in eight years, killing weeds without cultivation produced a gain of 17.1 per cent, or 6.7 bu. per acre, over ordinary cultivation. Three-fourths of the corn roots are in the plowed soil, and as plants develop no unnecessary roots, any injury to them results in a lower yield. Four-inch pruning six inches from the hill reduced the yield 16.9 bu. The cultivated soil, especially in periods of drought, is too loose and dry for proper root development; consequently the plant is deprived of the food which it contains. After the roots are well distributed through the soil little moisture can escape, even from uncultivated land.

"On gray silt loam on tight clay in southern Illinois, as a three-year average, preparation of seed bed gave an increase of 21.5 bu.; killing weeds by scraping with a hoe gave a gain of 21 bu. over allowing them to grow; and fertilization gave an increase of 14.2 bu. Ordinary shallow cultivation gave a yield of 31.2 bu. per acre, while killing weeds without stirring the surface gave 31.5 bu.

"The proper type of cultivation is deep enough to kill the weeds but shallow enough to reduce root injury to the minimum. On Illinois soils a good seed bed, killing weeds, and soil enrichment are the important factors in growing corn. Cultivation is beneficial for aeration of heavy soils, clays, and clay loams. Cultivation raises soil temperature early in the season and lowers it later. Subsoiling on gray silt loam on tight clay at Odin caused a decrease of 2.7 bu. per acre.

"Results of deep-tilling tests so far conducted by this station do not warrant recommending the purchase and use of deep-tilling machines in this State."

Tests of varieties of corn, W. E. HANGER (*Maryland Sta. Bul. 190* (*1915*), *pp. 181–202, pls. 9*).—This bulletin gives results of tests of varieties of corn grown at the station and by farmers in different sections of the State.

During the years 1903 to 1914, inclusive, the yields at the station ranged from 31.68 to 86.18 bu. of grain per acre. The highest average yield, 70.36 bu.

per acre, for the five years 1903 to 1907, inclusive, was made by St. Omer. The highest average yield of the seven years 1908 to 1914, inclusive, was made by U. S. P. B. No. 120, namely, 59.39 bu. per acre, followed closely by St. Omer with 59.31 bu.

Twenty-two varieties of corn are described.

Variety tests of corn for 1914, G. M. Garren (*North Carolina Sta. Bul. 230* (*1915*), *pp. 3–12*).—This bulletin gives data on over 20 varieties of corn grown in 1914 at the station and at the Buncombe, Iredell, and Edgecombe test farms and summaries for a few varieties covering a period of six years (1909–1914) at the Iredell and Edgecombe test farms. The tables include data on stand, height, number of ears, yield, and shelling capacity. Among the higher yielding varieties were First Generation Cross No. 182 of the Bureau of Plant Industry of the U. S. Department of Agriculture, Biggs Seven-Ear, and Weekleys Improved.

Report on variety tests of cotton for 1914, R. Y. Winters (*North Carolina Sta. Bul. 231* (*1915*), *pp. 3–18*).—The data in this bulletin show the yield of seed cotton per acre, yield of lint and of seed, percentage of lint, length of staple, weight of 100 bolls, and stand for the several varieties. The results obtained from seed secured from both within and out of the State are summarized as follows:

At the experiment station farm the 65 varieties of short-staple cotton tested ranged in yield between 1,375 and 765 lbs. of seed cotton per acre, with an average of 1,023 lbs. The 15 varieties secured within the State ranged between 1,160 and 860 lbs., with an average of 974 lbs., indicating the need of more careful selecting of seed in the State. The 12 long-staple varieties ranged between 1,160 and 875 lbs., with an average of 1,009 lbs.

At the Edgecombe farm the 16 short-staple varieties tested ranged in yield between 1,305 and 870 lbs. of seed cotton per acre, with an average of 1,154 lbs. The 10 short-staple varieties from points within the State ranged between 1,310 and 870 lbs., with an average of 1,113 lbs. The 6 varieties from points out of the State ranged between 1,305 and 1,140 lbs., with an average of 1,222 lbs. The long-staple cottons ranged in yield between 1,520 and 1,045 lbs., with an average of 1,283 lbs.

The variety test at the Iredell farm contained 25 short-staple varieties and 8 long-staple varieties, of which 9 short and 2 long staple varieties came from points in the State. The short-staple varieties from out of the State gave an average yield of 618.4 lbs. of seed cotton and 246 lbs. of lint per acre as compared with 738 lbs. of seed cotton and 288 lbs. of lint for the locally grown varieties. The 4 leading varieties were from seed secured in the State. Four of the 9 local varieties produced lint less than seven-eighths of an inch in length.

Cauto tree cotton, H. H. Cousins (*Bul. Dept. Agr. Jamaica, n. ser., 2* (*1915*), *No. 8, pp. 334, 335, pls. 3*).—This notes the successful cultivation of a wild variety of cotton, *Gossypium brasiliense*, var. *apospermum*, discovered in the jungles of Cuba. Yields of this perennial cotton reached 600, 700, and 900 lbs. of seed cotton per acre in successive years. The lint as grown in Jamaica is stated to be of good quality.

A preliminary note on the factors controlling the ginning per cent of Indian cottons, H. M. Leake (*Jour. Genetics, 4* (*1914*) *No. 1, pp. 41–47*).—This presents the results of a study to determine factors that influence the ginning percentage of cotton and make it clear how the offspring of two parents, each having a ginning percentage of from 25 to 26, could have a percentage ranging from 18 to 36.

It was discovered that the ginning percentage was not directly measured by any single one of the characters of volume of seed, specific gravity of seed, number of fibers arising from a single seed, or the weight of the individual fibers. By using the coefficients of correlation between the characters of number of fibers per seed, weight of 1,000 fibers, and volume of seed, it was found that one, the number of fibers per seed, had a marked effect on the value of the ginning percentage.

Fiber industry of British East Africa, A. WIGGLESWORTH (*London: John Bale, Sons & Danielsson, Ltd., 1915, pp. 15, fig. 1*).—A paper read at the Third International Congress of Tropical Agriculture, held at London in June, 1914, and giving an account of the methods of production and manufacture of fiber from Sansevieria and sisal.

The growth and preparation of Italian hemp, A. WIGGLESWORTH (*London: [Author], 1914, pp. 39, figs. 18*).—This gives methods employed in Italy in the production of hemp and the manufacture of the fiber.

Investigations on hops.—V, On the aroma of hops, J. SCHMIDT (*Compt. Rend. Lab. Carlsberg, 11 (1915), No. 3, pp. 149–163*).—This describes experiments in growing and breeding hops in connection with work previously noted (E. S. R., 31 p. 526). The results have been summarized as follows:

"In exact investigations as to hops, whether of botanical or chemical, practical or scientific nature, the work should be based upon clones, as otherwise the results may be liable to justifiable criticism.

"Among the hop plants cultivated in the experimental garden of the Carlsberg Laboratory, there were in 1911 two American plants (labeled Oregon Cluster and New York Spaulding English Cluster), the hops of which exhibited a very peculiar turpentine-like aroma, so widely different from that of all European varieties that a single hop could at once be recognized by the smell among hundreds of others. Cultivation experiments made during the years 1911, 1912, 1913, and 1914 showed that this aroma remained apparently constant in our climate in these two plants and their clones.

"Crossing experiments made in 1912, 1913, and 1914 with the two American plants and Danish males showed that the turpentine-like aroma was transmitted to between one-half and three-fourths of the offspring plants, without regard to whether the hops themselves retained the appearance peculiar to those of the mother plant.

"From the experiments already mentioned, as well as from several others made with European varieties (e. g., those from Saaz in Bohemia) it would seem that the aroma of hops is not to be regarded as so volatile a character, or so entirely due to purely local conditions, as has generally been believed."

Investigations on hops.—VI, On the amount of lupulin in plants raised by crossing, J. SCHMIDT (*Compt. Rend. Lab. Carlsberg, 11 (1915), No. 4, pp. 165–183*).—In experiments in breeding hops to increase the lupulin content, 21 females of Danish, English, German, and Austrian origin, all cultivated plants, were crossed with wild Danish males in 1911. The lupulin (total content of hard and soft resins) contents of the seedling offspring ranged from 7.3 to 19.7 per cent as maximums of the several groups of different parentage. The average lupulin content of the offspring of any given parentage showed lower than that of the mother plant, but there were a few individuals that showed a higher content. This was true in spite of the fact that wild males, "presumably genotypically poor in lupulin," were used.

Thus by vegetative propagation the author sees a method of improvement by using the highest plus variant among the offspring.

Investigations on hops.—VIII, On the flowering time of plants raised by crossing, J. SCHMIDT (*Compt. Rend. Lab. Carlsberg, 11 (1915), No. 4, pp. 188–*

198).—This article notes the earliness and lateness in time of flowering of crosses between cultivated English and Austrian female hops and wild Danish hops. The dates of flowering of the offspring showed a wide variation, the number of individuals decreasing greatly from the average toward the two extremes and thus offering an opportunity for improvement by selection and vegetative propagation.

"A comparison of offspring and mother plants reveals the fact that the mean flowering date of the former is often essentially different from that of the latter. This made itself apparent in our experiments as a retardation of the flowering time in the offspring of early plants, and an advancement of the same in those of later varieties, while in the offspring of intermediate mother plants, little or no difference was observed."

Report on collective experiments: Results of introducing in 1913 fertilizers on lupines, S. P. Kulzhinskiĭ (*Abs. in Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *15* (*1914*), *No. 3*, *pp. 268, 269*).—Fertilizer experiments with blue lupines, reported from 42 fields, show that the use of 2 poods (72 lbs.) of K_2O as potash salt per dessyatina (2.7 acres) gave increases in yields ranging from 105 to 631 poods per dessyatina in 25 cases. Ten cases reported decreased yields with potash. The use of 2 poods of P_2O_5 per dessyatina as superphosphate showed increases in yields ranging from 31 to 710 poods in 15 fields, and decreases in 19 cases ranging from 17 to 1,212 poods. The average of all the P_2O_5 tests showed decrease in yield of 72 poods. With the combined application of 2 poods of K_2O and 2 poods of P_2O_5 per dessyatina, 18 cases reported increases up to 626 poods, while 16 reported decreases in yields of green forage up to 1,264 poods, with an average decrease of 34 poods of green forage by the use of the combination.

The use of seed potatoes from light soils on richer and heavier soils, Schneidewind (*Landw. Wchnschr. Sachsen*, *17* (*1915*), *No. 3*, *pp. 18, 19*; *abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases*, *6* (*1915*), *No. 4*, *pp. 575, 576*).—This notes the increase in yield, ranging from 2,000 to 7,100 lbs. per acre, of potatoes returned to a loess-loam soil after having been planted a season or two on a sandy soil.

Pictorial practical potato growing, W. P. Wright and E. J. Castle (*London and New York: Cassell & Company, Ltd.*, *1913*, *pp. 152*, *figs. 50*).—This book treats of intensive methods of production and of insect pests and fungus diseases of potatoes, with notes on the cooking of potatoes.

The prototype of the cultivated sorghums, C. V. Piper (*Jour. Amer. Soc. Agron.*, *7* (*1915*), *No. 3*, *pp. 109–117*).—In this article the author reviews the studies of earlier investigators and discusses various forms and subspecies of *Andropogon sorghum* of African origin as possible prototypes. He concludes that "there is yet too much to be learned about the wild sorghums to determine with any assurance which are the actual prototypes of the cultivated sorghums. It seems perfectly clear, however, that *A. halepensis* and its subspecies as above defined are not at all concerned. It appears equally clear that not all of the wild races of *A. sorghum* can be considered as probable ancestors of the cultivated varieties. The ones most likely to belong in this category are *A. hewisoni*, *niloticus*, *drummondii*, and possibly *effusus* and *verticilliflorus*. The last two races as at present understood are very variable and perhaps each name stands for several distinct plants. The problem of the wild ancestors of the cultivated sorghums is now so narrowed that it is reasonable to hope that the details may in the near future be definitely determined."

Variations in soy bean inoculation, J. H. Voorhees (*Jour. Amer. Soc. Agron.*, *7* (*1915*), *No. 3*, *pp. 139, 140*).—This notes the absence of nodules on the roots of certain varieties of soy beans although the seed had been inoculated and grown in mixture with other varieties that formed nodules abundantly on their roots.

The cultivation of sugar beet in Norfolk and Suffolk, C. S. ORWIN and J. ORR (*Jour. Bd. Agr.* [*London*], *21* (*1915*), *No. 11*, *pp. 969–987*).—This article discusses methods and the economics of growing sugar beets in Norfolk and Suffolk counties, England, and gives statistical data for the years 1912, 1913, and 1914, showing the itemized cost of production on 16 farms that had from 4 to 70 acres of sugar beets. In Norfolk the cost per acre ranged from £7 5s. 6d. to £12 4s. 10d., and in Suffolk from £7 9s. 7d. to £12 11s. 6d. The yields in Norfolk ranged from 8 tons to 13 tons 5 cwt., and in Suffolk from 2 tons 7½ cwt. to 9 tons 6 cwt. per acre.

Single-germ beet seed, C. O. TOWNSEND (*Jour. Heredity*, *6* (*1915*), *No. 8*, *pp. 351–354*, *fig. 1*).—This article notes the success attained in the production of single-germ seeds in sugar beets by selection. The author states that "our selected plants are now producing about 75 per cent of single-germ seeds, and individual plants in a few cases show a somewhat higher percentage than this. The work and progress of single-germ beet seed production is based upon the fact that certain beet plants possess the ability so to develop the seed stems that the buds and flowers are separated from each other in the process of growth. This tendency to separate the flowers and thereby to produce single-germ seeds seems to be transmissible from parent to offspring; whether or not this will become a fixed character time only can tell. The indications are that this character will become fixed."

Report of the seedling expert, H. B. COWGILL (*Rpt. Bd. Comrs. Agr. P. R.*, *3* (*1913–14*), *pp. 55–63*).—This reports work in progress in sugar-cane culture.

In fertilizer experiments with second ratoon cane it was shown that the best yield (15.65 tons per acre) was obtained by the use of 120 lbs. each of nitrogen and potash and 60 lbs. of phosphoric acid. This yield was 9.35 tons above the average of the check plats. The application of 2,000 lbs. of lime per acre increased the yield about one-third over an average of all fertilized plats.

In spacing experiments 1½ continuous rows of seed and seed placed end to end gave larger yields than one seed every 2 ft., 1 seed every 3 ft., 2 seeds every 3 ft., and 2 seeds every 4 ft. in rows 4, 5, and 6 ft. apart.

Results of variety tests of cane grown on lowlands and highlands are given.

Manurial experiments, H. A. TEMPANY ET AL. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1913–14, pt. 2, pp. 52–78, pls. 2*).—This article gives in detail the results of manurial experiments with sugar cane for the season 1913–14 and a summary including results for several years.

"It has been shown that under average conditions the amounts of manurial constituents supplied in a dressing of pen manure at the rate of 20 tons to the acre, applied before the crop of plant cane is established, provide sufficient food for the production of a crop of plant canes, first ratoons, and possibly second ratoons; the augmentation of this supply by an additional dressing of pen manure or artificial manures is unattended by corresponding substantial increases. This result is attributed to the limitation of the water supply available for growth.

"With an increase in potential productivity consequent on a more regular water suply it seems reasonable to suppose that such additional manuring would be likely to prove profitable. The beneficial action of quick-acting nitrogenous manures on ratoon canes is attributed to the fact that they stimulate recovery from the check to the growth incident on the reaping of the previous crop, whereby the plant is enabled rapidly to resume its physiological functions, and to continue to utilize the store of manurial material derived from the original application of pen manure. Additional confirmation is given to this view by the results obtained when quick-acting nitrogenous manures are applied in two doses instead of one. A decrease of yield is seen invariably as a result of the division of the application, the inference being that by the time the late dose is given the canes have already made such growth as to preclude the extra supply of readily available nitrogen exercising any great effect. . . .

"Additional investigations have further demonstrated that appreciable residual action is felt on succeeding crops of cane as the result of the applications of artificial manures to any one crop, the effect being seen in first ratoons when the applications are made to plant canes, and in the second ratoons when they are made to first ratoons. In estimating the effect of a manurial dressing, therefore, it is necessary to allow for the existence of possible residual action. In relation to the recently introduced nitrogenous manures, nitrolim and nitrate of lime, it has been shown that nitrolim is ineffective as a manure when applied to ratoon canes, but nitrate of lime possesses a value nearly equal to that of sulphate of ammonia. Applications of molasses to ratoon canes have proved to be unproductive of benefit; the effect of similar applications to plant canes is under investigation. The effect of small dressings of lime has been negative, but when larger dressings of marl have been given benefit has been derived, especially in the case of heavy noncalcareous soils. The effect of intertillage on ratoon canes has been found to be a beneficial one."

Catalytic or fecundating stimuli and mutation in Nicotiana, A. Splendore (*Bol. Tec. Coltiv. Tabacchi* [*Scafati*], *14* (*1915*), *No. 1-2, pp. 3-37, pls. 27*).—This describes offspring derived from 26 crosses between varieties of Nicotiana with each other and with several species of Solanaceæ and Scrophulariaceæ as female parents.

The Georgia velvet bean, J. Belling (*Jour. Heredity, 6* (*1915*), *No. 7, p. 290*).—This article notes an early variety of velvet bean now grown in Georgia, the first flowers of which appear nearly two months earlier than those of the Florida velvet bean. The author concludes that "from crosses between the Yokohama and the Florida the Florida has a factor for late flowering, *H*, which the Yokohama does not possess. Hence it may be supposed that the Georgia velvet arose from the Florida velvet by the "spontaneous" loss of the factor *H*. Since *H* is dominant, the early plants would appear only in the second generation."

Variation in pure lines of winter wheat, C. G. Williams (*Proc. Soc. Prom. Agr. Sci., 35* (*1914*), *pp. 89-94*).—This article gives the results of a series of experiments begun at the Ohio Experiment Station in 1907 and 1908 to study the variation with respect to heritability of length of head, size of kernel, and protein content of pure line selections of wheat. From continued selections for several generations no heritable variation of any of these characters could be detected. The data show that the seed of either extreme character has a tendency to produce a crop having the general average.

Determination of seeds of Cuscuta trifolii and C. suaveolens by anatomical methods, J. Bernátsky (*Kisérlet. Közlem., 18* (*1915*), *No. 2, pp. 207-222, figs. 7*).—This gives results of a microscopical study of the structure of the seeds of *C. trifolii* and *C. suaveolens*, which may ordinarily be distinguished by their size.

When, as frequently happened, the seeds of *C. suaveolens* were unusually small and those of *C. trifolii* were unusually large, the observation of distinguishing characteristics other than size became necessary. The following characteristics were noted, respectively: Length of cells of the first layer of palisade cells, 11 to 19μ and 18 to 28μ; length of cells of the second layer of palisade cells, 16 to 24μ and 40 to 52μ; length of the first of layer palisade cells near the hilum from 12 to 19μ and 18 to 40μ; length of the second layer, 32μ and 56 to

90μ. The starch grains in the endosperm of the small seeds of *C. suaveolens* were massed together and measured about 7μ; those of the large seeds of *C. trifolii* were single and measured about 4μ.

The weed Galinsoga parviflora, K. MÜLLER (*Arb. Deut. Landw. Gesell., No. 272 (1914), pp. 31, pls. 6*).—This article treats of the characteristics of this weed, and discusses its development, vegetative requirements, and methods of seed distribution. Methods of eradication are described, and its useful as well as its undesirable qualities and legislative regulations for its control in Germany are noted.

Methods of determining weight per bushel, H. H. LOVE (*Jour. Amer. Soc. Agron., 7 (1915), No. 3, pp. 121–128, pl. 1*).—This describes an apparatus designed by H. W. Teeter, and presents data showing that by its use it is possible to make comparable all weight per bushel results.

A method for testing the breaking strength of straw, B. C. HELMICK (*Jour. Amer. Soc. Agron., 7 (1915), No. 3, pp. 118–120, pl. 1, fig. 1*).—This describes an apparatus for determining the breaking strength of straw and gives some data showing its satisfactory use.

HORTICULTURE.

[Report of horticultural investigations] (*Montana Sta. Rpt. 1914, pp. 395–397*).—Measurements of fruit trees on the cultural test plats at the horticultural substation in the Bitter Root Valley show that those on the plat cropped with potatoes have made the best growth since planting in 1908. Those on the clover plat where the crop has been cut and left on the ground rank next in growth, and those on the clean cultivated plats rank third. The trees on the cultivated plat are now beginning to show rosette, indicating that while the young trees may thrive for a time under clean cultivation bearing trees can not be expected to continue in good condition under such a system of culture.

Of the apple varieties being tested at this substation the Newtown Pippin and the Spitzenburg have been eliminated as maturing too late. The varieties of apples which have been so seriously affected by blight as to render them of doubtful value for commercial planting are Opalescent, Jonathan, Winter Banana, Wismer Desert, Wagener, and Wealthy. Practically all bearing pear trees were killed by blight during the summer of 1914. The varieties represented were Bartlett, Seckel, Clapp, and Flemish Beauty.

A test of mulching as compared with cultivation in growing vegetables without irrigation has been carried on at the home station. The following vegetables were grown under cultivation and under straw mulch: Beets, cabbage, carrots, cauliflower, cucumbers, endive, kohl-rabi, lettuce, onions, parsnips, peas, pumpkins, radishes, rutabagas, salsify, spinach, squash, sweet corn, Swiss chard, tomatoes, and turnips. With the exception of cabbage, in which the yield and the weight of heads, especially of the later varieties, were increased by mulching and of the late root crops in which the yield and quality were improved by mulching, cultivation seemed to give the best results. The straw mulch conserved more moisture than the cultivation but during warm weather reduced the soil temperature as much as 10° F. during the warmer part of the day. Under the climatic conditions at the station temperature seemed to be as important a factor as soil moisture in crop growth.

Some cultural experiments were conducted with celery. The seed started in greenhouses on February 14 produced an average of 30 per cent of seed stalks, while the same varieties started on March 14 produced a fraction over 1 per cent of seed stalks. Early plantings grown on very rich soil produced 38 per cent of seed stalks, while seed from the same stock planted in medium soil produced only 18 per cent of seed stalks. Sandy soil gave 30 per cent of seed stalks in the case of early planting and but a slight percentage in the case of late planting. The results as a whole seem to indicate that early planting, soil overrich in organic matter, or soil too abundantly supplied with sand will encourage premature seeding.

A comparison of ridge and level cultivation in growing onions resulted in favor of the former method. Ridging apparently induced early maturity and the bulbs seemed to "bottom up" better.

Report of the horticulturist, C. F. Kinman (*Porto Rico Sta. Rpt. 1914, pp. 17–22, pl. 1*).—A short progress report on investigations with fruits, vegetables, and miscellaneous plants (E. S. R., 31, p. 634).

Among the East Indian varieties of mangoes being tested Amini and Cambodiana were the most promising during 1914. Over 400 trees, including 60 imported varieties, were under cultivation. Work with yautias, dasheens, yams, sweet potatoes, etc., is being continued. Cooperative variety tests have been conducted near San Juan on the sandy coastal plains. The first crop of yautias grown on the sandy soils has been unsatisfactory, but few of the varieties proving sufficiently prolific to warrant commercial cultivation. Dasheens were more promising, though not heavy producers. Some varieties of sweet potatoes have given good returns, while many are not profitable under these conditions.

Some data are given on the cooperative fertilizer experiments with citrus fruits, the results of which have been published in full in a bulletin by the station (E. S. R., 33, p. 241). The cooperative experiments with coconuts have been extended to parts of the island where different weather conditions prevail. Eight harvests have been made since the fertilizer experiments were started in 1912. The trees under observation are old palms on sandy beach land suitable for coconut culture, but have been slow to respond to fertilizer treatment. In the last harvest, in plats given a complete fertilizer, the yield was in excess of that in check plats, although only small differences existed between the complete fertilizer and incomplete fertilizer and check plats. Data collected on individual coconut trees have shown a wide variation in yield, indicating the importance of seed-nut selection by those contemplating a new grove.

Experiments are being conducted to determine the advisability of growing leguminous cover crops in a young coconut grove. Jack beans (*Canavalia ensiformis*) and a few species of velvet beans (*Stizolobium* spp.) planted in April all made good growth and crowded out all native weeds and grasses. The *Stizolobium* spp. appeared to have a longer growing season and to produce a heavier crop of vegetation than the jack beans and are therefore preferable in coconut plantations. Leguminous cover-crop work was also conducted in citrus orchards and pineapple plantations. Much of the work was with the velvet bean species. These crops have made an excellent growth in both heavy and light soils where rainfall has been sufficient. They demand frequent cutting back, however, to keep them from injuring the trees. Notes are given on different species of velvet beans desirable for cover-crop planting. Both jack beans and pigeon peas were found to be injurious to the two varieties of pineapples under observation, Cabezona and Red Spanish, when planted in beds with them. The pigeon pea caused the most injury and the Cabezona pineapple was more severely injured than the Red Spanish.

A number of varieties of pineapples were planted more than two years ago in an area between 7-year-old *Pithecolobium saman* trees to test the effect of the shade and the nitrogen stored in the soil by the leguminous trees on the development of the pineapples. The shade trees were planted 20 by 20 feet apart. The shade furnished by these trees was thin and the nodule growth on the roots very heavy, but the pineapples were almost a complete failure. They suffered most during the dry months. The conclusion reached as to growing pineapples with leguminous crops is that clean culture is necessary for the best development of the pineapples.

Report of the assistant horticulturist, T. B. McClelland (*Porto Rico Sta. Rpt. 1914, pp. 23–26, pl. 1*).—A progress report on the station's work with coffee, cacao, vanilla, and some miscellaneous plants (E. S. R., 31, p. 637).

Some of the varieties of foreign coffee being tested came into bearing much later than Porto Rican coffee. Some produced a larger and others a smaller bean, and some are of excellent quality and others inferior. As to vigorous growth and amount of yield the Columnaris coffee, a sport from the ordinary Arabian type discovered in Java less than 30 years ago, is the most promising of the foreign coffees which have been tested on any scale and which have come into bearing up to the present time. The coffee fertilizer experiments do not show as yet that fertilizer can be applied with a financial gain. It seems quite probable that coffee should be included among the acid-tolerant plants, as benefits from lime alone applied to the acid soils at the station have been doubtful. Some of the handsomest coffee trees in the station plantings are in soil which is so acid as to require 1.0527 gm. of sodium hydroxid for neutralization of 1 kg. of soil. Considerable damage to coffee by rats is reported from various sections of the coffee district. From a young coffee tree with some limbs bearing variegated foliage and others normally green leaves seeds were planted to watch the inheritance of variegation. Of 30 seedlings from limbs with variegated foliage 17 had variegated cotyledonous leaves and two more were slightly off color, while of 36 seedlings from limbs bearing normally colored leaves none were variegated.

The yield of the 11-year-old cacao planting has shown an increase of nearly a third over that from the preceding year, and more than two and one-half times as great as the crop of three years ago. The most productive tree yielded the equivalent of about 4 lbs. of dried beans, worth 14 cts. a pound. The experiments with vanilla are being continued satisfactorily, some of the species being considered now worth cultivating as ornamentals in addition to their economic value.

Monthly tappings of rubber are being continued but the yields are so small as to discourage any planting. The cost of tapping and collecting alone has exceeded the value of the product. Among the economic plants obtained in Venezuela in 1913 are a black bean which has proved to be very vigorous and prolific and a delicious table corn, called "Cariaco" which has shown itself fairly well adapted to some local soils. Seedlings of mahogany, *Swietenia macrophylla*, have made exceedingly rapid and vigorous growth. Work with vegetables from seed brought from the North and grown in Porto Rico from one to many generations has been continued. Above everything else the marked effect of the planting season has stood out clearly. The existence of a tropical climate does not mean the ability to disregard the seasons.

[Floral and vegetable trials at Wisley in 1914], C. C. Titchmarsh (*Jour. Roy. Hort. Soc., 40 (1915), No. 3, pp. 499–541, 544–548, 552–562, pls. 2*).—This comprises reports on variety tests of China asters, early flowering chrysanthemums, helianthus, heleniums, rudbeckias, French beans, and melons, tested under the direction of the Royal Horticultural Society in the Wisley gardens in 1914.

[Miscellaneous floral and vegetable trials at Wisley, 1914] (*Jour. Roy. Hort. Soc., 40 (1915), No. 3, pp. 549–551, 563–565*).—Notes similar to the above on a number of miscellaneous flowers and vegetables tested in Wisley in 1914.

Cabbage growing in California, S. S. Rogers (*California Sta. Circ. 130 (1915), pp. 22, figs. 9*).—A treatise on the culture of cabbage with special reference to California conditions. The following phases are discussed: Early history of cabbage growing, types and varieties, the cabbage as a truck crop, intercrop, and market garden crop, soils, moisture, climatic requirements, growing and subsequent care of the plants, time of planting and quality of seed, preparation of the field, planting and subsequent care of the plants, harvesting, storing, marketing, cost of production and profits, diseases, and insect pests.

The inheritance of size in tomatoes, F. E. Perry (*Ohio Nat., 15 (1915), No. 6, pp. 473–497, figs. 5*).—This paper reports a study of the inheritance of size in a red currant-yellow pear tomato cross which was made in 1911 and grown through four generations. The literature on character inheritance is briefly reviewed and a bibliography of literature dealing with inheritance is included.

Summarizing the results of the study as a whole the author finds that a more accurate representation of the size of the tomato fruits can be obtained from their weights than from linear dimensions. The size of fruit of the F_1 generation of the currant-pear cross is the geometrical mean between the parental sizes. From an examination of all available data upon the inheritance of fruit size in the F_1 generation it appears that when two varieties are crossed which differ widely in fruit size, as in the case of the currant and pear tomatoes, the F_1 fruit size will be nearer to the geometrical than the arithmetical mean, but when two parents similar in fruit size are crossed the size of fruits of the offspring will approach more nearly to the arithmetical than to the geometrical mean. The average fruit size of the F_2 generation does not exceed and is even slightly less than the average fruit size for the F_1 generation. Fruits of the F_2 and F_3 gnerations agree fairly well in respect to variability and average generation size. F_4 fruits show diminished variability and size.

Arboriculture, L. Savastano (*Arboricoltura. Naples: Francesco Giannini & Sons, 1914, pp. XI+848, figs. 268*).—This work is essentially a treatise on the principles of fruit and nut growing, with special reference to kinds adapted to Italian conditions.

Part 1 reviews the history and development of arboriculture. Part 2 contains a census of cultivated and cultivable fruits and nuts and treats in detail of the biology of arboriculture, including also information relative to the acclimatization and geography of fruit trees. The succeeding parts treat in detail of the cultural technique, including propagation, grafting, pruning, manuring, tillage, irrigation, crossing, pollination, and artificial ripening; the establishment and management of orchards, groves, and plantations; and harvesting, packing, marketing, refrigeration, storage, transportation, insect pests, diseases and other enemies, orchard renovation, transplanting developed trees, windbreaks and hedges, and orchard valuation.

A bibliography of literature on the subject is also included.

A guide to the literature of pomology, E. A. Bunyard (*Jour. Roy. Hort. Soc., 40 (1915), No. 3, pp. 414–449*).—In this paper the author describes the more important pomological books of various countries and gives a list of important general pomologies; special monographs on various hardy fruits; general catalogues and reference works; treatises on grafting and budding, pruning and training, and culture under glass; and general works on fruit growing.

Small fruits for home and commercial planting, L. F. Sutton (*West Virginia Sta. Bul. 149 (1915), pp. 3–38, figs. 18*).—In this bulletin consideration is given to strawberries, raspberries, blackberries, currants, and gooseberries with reference to establishing plantations, varieties, culture, cost of production, yields, marketing, returns, and profits.

The addition of soft soap to lead arsenate for spraying purposes, D. R. EDWARDES-KER (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 359–362*).—The effect of solutions of soft soap upon arsenate of lead suspensions was studied by preparing the mixture in different ways, filtering after allowing to stand for about one-half hour, and determining the soluble arsenic in the filtrate.

The results as here summarized show that the addition of a 1 per cent soap solution to lead arsenate, either homemade or in commercial form, does not lead to any appreciable increase in the amount of soluble arsenic. In the case of the homemade material, however, soap solution must not be used for making up the lead acetate and sodium arsenate solutions in place of water, as not only is there a marked increase in the soluble arsenic but in addition the precipitate is obtained of such a texture and consistency as to render impossible its application by spraying. This precipitate consists of a mixture of lead arsenate and lead soap, a quantity of soluble arsenate equivalent to the lead soap remaining in solution. The addition of soap solution to lead arsenate paste does not, however, lead to the formation of any lead soap nor to an increase in the soluble arsenic.

Spray calendar, F. W. FAUROT (*Missouri Fruit Sta. Circ. 6 (1913), pp. 12, figs. 7*).—This circular contains a schedule for spraying apples and peaches and other stone fruits, together with directions for the preparation of spray mixtures.

New method of obtaining grafted peaches, A. MANARESI (*Staz. Sper. Agr. Ital., 48 (1915), No. 1, pp. 57–60*).—As a result of successful budding experiments in which over 90 per cent of budded trees were secured, the author recommends the use of the so-called June budding method which is frequently employed in propagating peaches in the southern peach districts of the United States, but which does not appear to have been commonly used in Italy.

Testing grape varieties in the Vinifera regions of the United States, G. C. HUSMANN (*U. S. Dept. Agr. Bul. 209 (1915), pp. 157, pls. 10, fig. 1*).—This bulletin gives additional data on the Department's viticultural investigations in the Vinifera regions of the United States, previously repored on in 1910 (E. S. R., 23, p. 640), and reports on researches started since that date.

A brief description is given of the twelve experimental vineyards in California, with reference to their purpose, location, soil, and climatic conditions, including weather data secured at each vineyard. Other important data presented in tabular form include cultural data of fourteen American species of grapes whose varieties or hybrids are under test as resistant stocks; the relative growth rating of resistant and direct-producing varieties of grapes under test, including a list of stocks worthy of special mention as having made excellent growth ratings at each of eleven vineyards; resistant varieties making the best growth records in each vineyard; improved American native and Franco-American grape varieties which are being tested on their own roots; the relative behavior and value for different purposes of Vinifera varieties tested by grafting on resistant stocks and by growing on their own roots; and the relative behavior and value for different purposes of improved native American and Franco-American varieties tested.

The investigations as a whole have shown that the adaptability of varieties to soil, climate, and some other conditions can be closely forecasted, but congeniality of stock and scion must be determined by actual test. The best results are obtained where the scion and stock are congenial and both are suited to all the conditions of the environment. Different species used as stocks for the same variety may increase or diminish the vigor and productiveness of the variety and the quality, size, and appearance of the fruit; cause it to ripen earlier or later; and bring about varying results from perfect success to almost complete failure. A lack of this knowledge has been responsible for heavy losses in reconstituting California vineyards.

Extensive saccharine and acid determinations show a close correspondence between these constituents of the fruit and the congeniality of stock. Similar growth ratings of a variety grafted on different stocks are accompanied by fairly definite percentages of sugar and acid. Congeniality of the variety to the stock materially affects the resistant qualities of the stock.

Quantity and quality of the fruit are usually in opposition on the soils and vines producing most abundantly. Most vine varieties making perfect growth on resistant stocks are found to yield heavier crops than the same variety grown on its own roots. The relative rooting qualities of resistant varieties are an important consideration in the cost of establishing resistant vineyards. Some stocks are suitable for bench grafting while others are especially valuable for vineyard grafting. Of the various stocks tested Riparia, Berlandieri, Champini, and Aestivalis are in most instances congenial to Vinifera varieties. Fruitfulness of these varieties is increased and the time of ripening hastened in comparison with the same varieties grown on other stocks.

Some of the hybrid resistant-stock varieties are making enviable records as stocks under California conditions. Where all the qualities desired can not be found in a hybrid a complex hybrid may yield the desired results. A number of new grape introductions by this Department are proving to be superior to the varieties now commercially grown for certain purposes.

Physiological research on pollen germination in Vitis vinifera, E. Garino-Canina (*Staz. Sper. Agr. Ital., 47 (1914), No. 7, pp. 481–492*).—The investigation here reported confirms the author's earlier results (E. S. R., 29, p. 839) with reference to a more or less toxic effect of most spray mixtures commonly used on grapes. In conducting laboratory studies a medium containing 15 per cent saccharose and 2 per cent neutral gelatin, acidulated with tartaric acid solution (1:4,000), was found to be the best for germinating pollen grains. The prolonged action of rain appears to cause the explosion of pollen grains and tubes through the dilution of the glucose-acid fluid. This phenomenon may be reproduced experimentally by germination of pollen grains in distilled water. Temperatures inferior to 14° C. and superior to 35° during the period of fecundation are able to bring about infecundity, the lower temperatures preventing germination and the higher temperatures causing abnormal development of the pollen tubes. The author points out that there should be no indecision as to the use of spray mixtures when choosing between a possibility of pollen sterility and a certainty of mildew attack.

Viticulture in Japan, Y. Oinoue (*Inform. Agr. [Madrid], 5 (1915), No. 100, pp. 145–148, figs. 3*).—A short descriptive account of viticulture in Japan with special reference to the kinds of grapes grown and those susceptible and resistant to disease.

Some recent experiments on the conservation of grapes in various gases, G. Dalmasso (*Rivista [Conegliano], 5. ser., 21 (1915), No. 10, pp. 217–219*).—Experiments conducted by the author during 1914 and here briefly summarized indicate that the conservation of grapes in a confined atmosphere of either carbonic acid, deoxygenated air, ozonized air, or pure oxygen is not feasible since deterioration sets in and unpleasant flavors are developed in less than two months' time.

Statistics on the production of grapes and olives in 1914 (*Estadística de las Producciones Viticola y Olivarera en el Año 1914. Madrid: Govt., 1915, pp. 9*).—This is the usual statistical review relative to the production of grapes, wine, olives, and olive oil in Spain (E. S. R., 31, p. 238).

The methods of reproduction in olive culture, C. CAMPBELL (*Staz. Sper. Agr. Ital.*, *47* (*1914*), *No. 4*, *pp. 297–307*).—A biological discussion relative to the sexual and asexual methods of propagating olives, with special reference to the judicious selection of stock and scion.

Bench rooting of citrus nursery stock, W. R. RALSTON (*Cal. Cult.*, *44* (*1915*), *No. 19*, *pp. 556, 557*, *fig. 1*; *Univ. Cal. Jour. Agr.*, *2* (*1915*), *No. 8*, *pp. 292–294*, *fig. 1*).—Investigations conducted by the author at the University of California have shown that the bench root trouble of citrus trees, which has been commonly attributed to the presence of rock or other hard substances beneath the seed when planted, is not due to any external influence, but to the peculiar toughness of the fibrous seed coat, through which the root is unable to penetrate until it has bent and twisted itself to the detriment of the future tree.

It is found that by removing the coat of the seeds very carefully bench root can be totally avoided. This, however, is too expensive a process for nursery practice. Extended experiments have shown that if the seeds are soaked from 36 to 48 hours before planting the bench root will be reduced to 15 per cent of the total number of the seedlings planted.

Notes on the lime and the lemon as sources of citric acid and essential oils, W. R. DUNLOP (*Bul. Imp. Inst.* [*So. Kensington*], *13* (*1915*), *No. 1*, *pp. 66–87*).—In these notes the author contrasts the lemon and the lime as sources of citrus products and compares their respective yields and positions in the world's markets. An outline is given of the methods practiced in cultivating limes in the West Indies, including information relative to the commerce in lime products.

The blood orange in the territory of Caltagirone, F. T. COCUZZA (*Ann. R. Staz. Sper. Agrum. e Frutticol. Acireale*, *2* (*1914*), *pp. 1–13*).—An account of the blood orange in Caltagirone with reference to its culture, harvesting, and marketing, together with analytical data relative to the dimensions, weight, volume, specific gravity, and chemical analysis.

The cultivation of the hazelnut in the Province of Messina, M. STANCANELLI (*Ann. R. Staz. Sper. Agrum. e Frutticol. Acireale*, *2* (*1914*), *pp. 129–214*).—A monograph on the hazelnut (*Corylus avellana*) with reference to its history, economic importance in Sicily, climatic and soil requirements, botany, and varieties, together with details relative to the establishment and care of hazelnut plantations, methods of harvesting, preparation, conservation, and commerce. Economic data are also given relative to the cost of establishing a plantation, cost of production, and returns, including statistics on the commerce of hazelnuts.

An extensive bibliography of cited literature is given.

Dahlias tried at Duffryn, 1914 (*Jour. Roy. Hort. Soc.*, *40* (*1915*), *No. 3*, *pp. 542, 543*).—Data are given on a variety test of dahlias conducted at Duffryn under the direction of the Royal Horticultural Society.

The gardenette or city back yard gardening by the sandwich system, B. F. ALBAUGH (*Cincinnati: Stewart & Kidd Company*, *1915*, *3. ed.*, *pp. 138*, *pls. 33*).—A popular treatise on vegetable and flower gardening, in which the author advocates and discusses the use of plant beds with an under stratum of straw or stable litter about 5 in. deep upon which is placed a thin layer of rich, fine, stable manure, covered by another layer of stable litter about 2 in. deep, and then with 4 in. of street scrapings or compost. It is claimed for such beds, which are especially applicable to back-yard gardening, that they mature crops earlier than ordinary garden soils, are well-aerated, and drain off the surplus water well when irrigated.

The use of charcoal as a medium for plant growth, A. APPLEYARD (*Jour. Roy. Hort. Soc.*, *40* (*1915*), *No. 3*, *pp. 473–475*).—A short review of the literature dealing with the use of charcoal by gardeners.

FORESTRY.

The evolution of forest policy, P. DESCOMBES (*L'Évolution de la Politique Forestière. Paris: Librairie Berger-Levrault, 1914, pp. X+330*).—In this work, which comprises the second part of a course in silvonomy, the author briefly reviews the evolution of the forest policy in France down to the end of the nineteenth century, after which an account is given of subsequent activities by various associations and by the State leading to reforestation, with special reference to the establishment of protective forests along mountain slopes.

The term "sylvonomie" as here used bears the same relation to silviculture as agronomy does to agriculture.

The use book, a manual for users of the National Forests, 1915 (*U. S. Dept. Agr., Forest Serv., 1915, pp. 160*).—A fifth revision of the regulations and instructions for the use of the National Forests (E. S. R., 24, p. 548). In this edition, which has been prepared for forest users, those regulations affecting only forest officers and not of interest to the public have been omitted.

International Forestry Congress (*Cong. Forest. Internat.* [*Paris*], *1913, Compt. Rend., pp. 961*).—A report of the general sessions and of the various sections of the International Forestry Congress, held in Paris, June 16 to 20, 1913, under the auspices of the Touring Club of France. The following sections were held: Forest technique or silviculture; forest legislation and economy; forest technology, commerce in wood and wood-using industries; general forestry operations; and the forest in relation to tourists and the esthetic education of the people. Papers by numerous reporters on various phases of these subjects, together with the discussions following and resolutions adopted are included. A bibliography of literature bearing on each section is also given.

Report of the department of forestry of the State of Pennsylvania for the years 1912–13, R. S. CONKLIN (*Rpt. Penn. Dept. Forestry, 1912–13, pp. 493, pls. 14*).—This comprises a report of the commissioner of forestry for the years 1912 and 1913 relative to the administration and management of the state forests and nurseries, nursery investigations, legislation dealing with forest protection and taxation, state and private planting operations, forest surveys, and miscellaneous work, together with a financial statement. Tabular data showing the loss from forest fires and the timber cut in 1912 and 1913 are included.

Progress report of forest administration in the Province of Assam for the year 1913–14, W. F. PERRÉE and A. V. MONRO (*Rpt. Forest Admin. Assam, 1913–14, pp. 2+30+55+5, pl. 1*).—This is the usual account relative to the administration and management of the state forests in the Western and Eastern Circles of Assam, including a financial statement for the year 1913–14. All important data relative to alterations in forest areas, forest surveys, working plans, protection, miscellaneous work, revenues, expenditures, etc., are appended in tabular form.

Progress report of forest administration in the Jammu and Kashmir State for the year 1913–14, W. H. LOVEGROVE (*Rpt. Forest Admin. Jammu and Kashmir* [*India*], *1914, pp. II+26+LIV*).—A report, similar to the above, of the administration and management of the state forests in Jammu and Kashmir.

The flowers of the woods, C. L. GATIN (*Les Fleurs des Bois. Paris: Paul Lechevalier, 1913, pp. LXXIII+115, pls. 100, figs. 32*).—This is the second volume of an encyclopedia for naturalists (E. S. R., 31, p. 143).

Descriptions and illustrations in color are given of about one hundred species of the more common forest flora. Information is given for each species relative to its synonymy, botanical characters, habitat, and uses.

The results of forest-culture experiments, SCHWAPPACH (*Ztschr. Forst u. Jagdw., 47* (*1915*), *No. 2, pp. 65–84*).—A résumé of the more important results secured from various cultural experiments conducted in the Prussian state forests during the past 40 years. Tabular data are grouped and discussed with reference to the following phases: The effect of various cultural methods, the influence of various combinations of trees, a mixed stand of *Pinus silvestris* and *P. rigida* as compared with a pure stand of *P. silvestris*, the effect of various combinations of trees upon the resistance against crushing by snow, and the effect of early strong thinning on the development of spruce stands.

Some Irish larch plantations, J. H. WADDINGHAM (*Jour. Bd. Agr.* [*London*], *22* (*1915*), *No. 3, pp. 231–235*).—In continuation of a previous article (E. S. R., 31, p. 240) growth measurements are given for sample plats in a larch plantation. The trees on different plats vary from 27 to 58 years of age.

Pine tree culture in Nordland, F. LINDBERG (*Skogsvårdsför. Tidskr.,* *1915, Sup. 2, pp. 48, figs. 22*).—An account is given of methods of reforesting pine lands both by seeding and by planting.

Hevea tapping results, Experiment Station, Peradeniya, 1911–1913, T. PETCH (*Dept. Agr. Ceylon Bul. 12* (*1914*), *pp. 28, pls. 2*).—A progress report on tapping experiments with Hevea rubber started in 1912, including a brief summary of previous work. The experiments are designed to show the difference in yield and the effect on the trees of various systems of tapping which differ in their time interval or space interval. Thus far no definite conclusions are drawn.

Hevea tapping results, Experiment Station, Peradeniya, 1914, T. PETCH (*Dept. Agr. Ceylon Bul. 17* (*1915*), *pp. 16, pl. 1*).—A further progress report on the above noted investigation.

Scientific tapping experiments with Hevea brasiliensis, A. W. K. DE JONG (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Agr. Chem. Lab., No. 10* (*1915*), *pp. 83, figs. 39*).—The first part of this work describes the various experiments included in a comparison of tapping methods on a number of plats of Hevea rubber trees. The second part describes similar comparative tests on individual Hevea trees.

Among the many results from the investigations as a whole it was found that the method of making the cuts by individual tappers affected the yield of rubber considerably. The thickness of the bast strip removed as well as the direction of the cut, that is from above, below, or vice versa, had no material influence on the yield of the cut. The maintenance of a continuous flow of latex depended more on the restoration of capillary action than upon any peculiarity of the latex itself. Neither the evaporation of the latex nor the drying out of the bast had much effect on yield from cuts that were opened daily.

Where cuts one above the other were not more than 50 cm. apart, the lower cut averaged the greater yield of rubber. For greater distances than this no effect was noticeable. Wounding the tree resulted in a stronger local formation of rubber. Young bast gave more rubber than old. A left-hand cut appeared to have some advantage over a right-hand cut, but there was very little difference in yield between a "V" cut and a left-hand cut.

A test of cuts of various slopes showed that the cut making the smallest angle with the main tapping channel uses up the greatest amount of bast without giving a corresponding increase in rubber yield. Cuts made in a vertical direction gave only about half the yield of a cut making an angle of 50° with the tapping channel. It made no material difference whether cuts were renewed on the upper or the lower side. The opening of one cut above another cut or alongside another cut appeared to affect the yield of the first cut, provided the distance between the two cuts was not great. No effect on yield was noticed from cuts made on opposite sides of the tree.

Experiments in which cuts were renewed twice a day showed that the removal of latex from the capillaries of Hevea trees takes place locally. The equilibrium of the capillary action is broken down about four hours after the first renewal. Examinations of ringed trees showed the presence of tyrosin or the conversion of tyrosin into tyrosinase in the latex above the ring, whereas beneath the ring tyrosinase alone was found. Isolated patches of bast were capable of forming rubber. The circumference of Hevea trees at 10 cm., 85 cm., and 1.35 meters height averaged as 1.6 : 1.13 : 1.

Tapping and the storage of plant food in Hevea brasiliensis, L. E. Campbell (*Dept. Agr. Ceylon Bul. 16* (*1915*), *pp. 26, pls. 6, figs. 8*).—The author presents the results in detail of a study of two trees from the same clearing which were planted in 1906 and tapped first in July, 1913. They were tapped for six months on the full herringbone system, the tapping took place once every third day, and one side only of the tree was tapped.

The results of the study as a whole lead to the conclusion that the effects of tapping on the trees here discussed were almost purely local. Starch was withdrawn from the wood immediately behind the cut and also partially from narrow zones of bark below and on each side of the tapped area. These zones did not exceed 1.5 in. in breadth and in most cases the breadth was considerably less than this. The starch content of the bark was normal in most cases right down to the top of the tapped area. Excepting for the localized withdrawal of starch in the neighborhood of the tapping cut the food supply had not disappeared from below the tapped area.

Attention is called to the fact that care was taken in tapping not to cut the cambium layer. Where careless or heavy tapping has been employed the tapping cut extends down to, or nearly down to, the wood, thus bringing about a complete severance of the channels of food transport at that place. In view of this localized effect of not too deep tapping it is suggested that by changing tapping from one part of the tree to another at intervals, the resting period of each area so tapped is nearly as effective as if the whole tree were rested.

The tapping of an old Hevea tree at Henaratgoda, T. Petch (*Dept. Agr. Ceylon Bul. 13* (*1914*), *pp. 4*).—A further report on a high-yielding Hevea tree at Henaratgoda (E. S. R., 26, p. 444). The tapped tree measured 117 in. in circumference at 3 ft. from the ground in August, 1914. It has been tapped at short intervals over a period of 4 years, 9 months, with a total yield of 392 lbs. 7 oz. of dry rubber of which 220 lbs. 7 oz. was secured from renewed bark.

Notes on the history of the plantation rubber industry of the East, T. Petch (*Ann. Roy. Bot. Gard. Peradeniya, 5* (*1914*), *No. 7, pp. 433–520*).—A compilation from the literature dealing with rubber culture, chiefly in Ceylon. References to cited literature are given.

The naval stores industry, A. W. Schorger and H. S. Betts (*U. S. Dept. Agr. Bul. 229* (*1915*), *pp. 58, pls. 11, figs. 11*).—This bulletin reviews the present status of the naval stores industry and the progress which has been made in improving the methods of collecting and distilling gum. Information is also given on the supply of timber available for turpentine operations.

The subject matter is discussed under the following general headings: Need for improved methods, history of the industry in the United States, statistics of production, commercial utilization of products, formation and flow of resin in the living tree, principles underlying the distillation of crude gum, commercial methods of collecting crude gum, relative yields secured from cups and boxes, relative amounts of scrape formed by the box and cup systems, relative yields from different depths and heights of chipping, effect of turpentine operations on timber, quality of gum from boxed and cupped timber, commercial distillation of crude gum, French methods of collecting gum, French distillation methods, comparison between direct and steam-heated stills, the supply of longleaf pine for turpentine operations, possibilities of western pines as a source of naval stores, special problems investigated, Arizona and California western yellow pine, suggestions for specifications, packing naval stores, cost estimates on a 20-crop turpentine operation, publications relating to the naval stores industry, and patents relating to the naval stores industry.

Records on the life of treated timber in the United States, H. F. Weiss and C. H. Teesdale (*Proc. Amer. Wood Preservers' Assoc., 11 (1915), pp. 501–509*).—A tabular compilation of data showing the life of treated timber in the United States. Various records are given for cross-ties, piling, bridge timbers, mine timbers, poles, posts, and paving blocks.

DISEASES OF PLANTS.

Notes on plant diseases in Virginia observed in 1913 and 1914, H. S. Reed and C. H. Crabill (*Virginia Sta. Tech. Bul. 2 (1915), pp. 37–58, figs. 17*).—Descriptions are given of diseases observed on alfalfa, apple, bean, maple, peach, plum, and potato.

Among the alfalfa diseases of unusual occurrence the authors note yellow top, a disease considered identical with that previously reported in New York (E. S. R., 20, p. 846), and white spot, in which infected plants show white semitranslucent spots on the leaves. Both of these diseases, the causes of which are undetermined, may at times induce considerable injury.

Among apple diseases the authors report the occurrence of blister canker, collar blight, crown gall, and sunburn. In addition a number of unusual troubles are described, the definite causes of which are unknown. Among these are a form of tumor to which the name flap tumor is given. This disease is characterized by peculiar flap-like growths that are developed covering wounds due to various causes. A brief notice is given of punky pulp of Ben Davis, in which the fruits are said to be smaller than normal, punky, brittle, and entirely unfit for consumption. This trouble is believed to have been due to the dry weather of 1914. Root rot of apple trees, which is said to be causing considerable loss, is described, the disease being accompanied by a white mycelium, but as yet no sporophores of the fungus have been found present. A skin crack of the York Imperial apple is described, which is believed to be due to physiological disturbances such as sudden increase of water supply. In this trouble small sunken cracks appear in the skin of the fruit. Usually the cracks are less than 2 mm. in length, but sometimes they are larger and a number of them become confluent, giving the fruit a grayish scabby appearance. Later a soft black rot, caused by *Alternaria mali*, attacks the fruit through the tissue underneath the cracks. Another apple trouble, which is called the York spot, is confined to the variety York Imperial. This in the early stages resembles the disease commonly called Jonathan or Baldwin spot, but later the fruit exhibits sunken, dark green spots, beneath which the tissue is brown-walled, the areas infected resembling the injury due to hail. Later in the season badly infected fruits show soft rot, probably due to saprophytic fungi. No organisms have been grown from the spots until soft rots have set in. The cause of this disease has not been definitely determined.

A brief account is given of a thrombotic disease of silver maple, in which the leaves turn yellow, growth is poor, and the trees become defoliated earlier than usual. An examination of infected limbs showed that the wood was streaked with green, resembling the condition described by Rankin as due to *Acrostalagmus* sp. (E. S. R., 33, p. 249).

Peach scab, plum rust, Rhizoctonia, tip burn, wilt, and hollow heart of potatoes are also briefly noted.

Report of the botanist and mycologist, T. PETCH (*Rpt. Dept. Agr. Ceylon, 1912–13, pp. C7–C9*).—This report includes the mention of Hevea canker (*Phytophthora faberi*), gray blight (*Pestalozzia palmarum*), and bird's eye spot (*Cercospora theæ*) of tea; a disease of stored coconuts, one of plantains, and one of indigo; *Rosellinia bothrina* attacking camphor, also this tea root disease and another, *Poria hypolateritia*, attacking *Tephrosia candida*; a fungus disease of mangosteens; bacterial wilt of tomato; two stem diseases, a root disease, a fruit rot, and two leaf diseases, *Melampsorella ricini* and *Cercosporina ricinella*, of castor oil plant; *Erysiphe polygona* on peas; a Nectria stem canker of *Acacia decurrens; Phragmidium disciflorum* on rose; *Plasmopara viticola* on grape; Cladosporium on sorghum; and a Merulius dry rot on wattle in walls of bungalows.

A list of recent publications is given, as is also a brief account of recent botanical work done by the staff of the herbarium.

Notes upon Washington fungi, J. G. HALL (*Phytopathology, 5 (1915), No. 1, pp. 55–58, pls. 2*).—From a study of Coryneum-like structures on apple and Sambucus, the author is convinced of their identity. Material submitted to Dr. Roland Thaxter resulted in the identification of the fungus as *Hendersonia diplodioides*. In connection with this fungus the author reports an ascosporic stage which is considered to be *Otthia amica*.

Two new species of fungi are described, *Neottiospora yuccæafolia* on withered or dying Yucca leaves and *Tureenia juncoidea* on dead culms of Juncus.

The temperature relations of some fungi causing storage rots, ADELINE AMES (*Phytopathology, 5 (1915), No. 1, pp. 11–19*).—The author has made a study of the thermal relations of some of the fungi causing storage rots, those selected for the investigation being *Glomerella rufomaculans* and *Cephalothecium roseum* from apples, *Thielaviopsis paradoxa* from pineapple, *Penicillium digitatum* from orange, *Rhizopus nigricans* from sweet potato, and *Monilia fructigena* from plums.

The results obtained show that Monilia and Penicillium germinate at 0° C., but growth is very slow. The other fungi do not develop below 5°, but if growth is started at a higher temperature it can continue at this temperature. Aside from Rhizopus none of the organisms were able to germinate above 36°. The optimum temperature of growth for Monilia and Penicillium is 25°, Thielaviopsis, Glomerella, and Cephalothecium 30°, and Rhizopus 36°. The thermal death point of Rhizopus is 60°, of Penicillium 58°, and of the remaining fungi between 51° and 53°.

The results indicate that in refrigerating experiments, temperatures as near zero as possible must be maintained if the development of rot producing fungi is to be entirely avoided.

Further studies on the specialization of Uromyces caryophyllinus, E. FISCHER (*Mycol. Centbl., 3 (1913), No. 4, pp. 145–149*).—The author reports his recent experimentation, held to show that *U. caryophyllinus* from the canton of Valais is capable of infecting *Saponaria ocymoides* as well as *Tunica prolifera*. Previously it was found (E. S. R., 28, p. 149) that *U. caryophyllinus* from the vicinity of Heidelberg lived only on *T. prolifera*, and only in exceptional cases passed over to *S. ocymoides*.

It is concluded that the specialization of this fungus is not the same in Valais as in Baden.

The specialization of Puccinia pulsatillæ, E. FISCHER (*Mycol. Centbl., 3 (1913), No. 5, pp. 214–220*).—In experiments testing the capability for infection by teleutospores of *P. pulsatillæ* developed on *Anemone montana*, more or less complete positive results were obtained with the hosts *A. vernalis*, *A. pratensis*, and *A. pulsatilla*, but only negative results with *A. alpina*, *A. sylvestris*, and *Atragene alpina*, which are thought to present examples of genuine immunity to *P. pulsatillæ* grown on *A. montana*.

The specialization here noted, as connected with systematic classification, is contrasted with the geographical specialization in the case noted above by the same author, the two types of specialization being discussed.

Overwintering of cereal rusts in uredospore form, L. Montemartini (*Riv. Patol. Veg.*, *7* (*1914*), *No. 2*, *pp. 40–44*).—Noting the infection of wheat by Puccinia in the uredospore stage, passing over from grasses in warm autumn weather, the author also records the germination at Stradella and Pavia of uredospores developed on volunteer and other cereals after subjection for some days to temperatures several degrees below the freezing point.

Rust attack of winter cereals, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, *12* (*1914*), *No. 7*, *pp. 81–84*).—It appears from numerous reports received by the author that rust is present in all parts of Bavaria and also in neighboring regions in greater or less severity, affecting varieties of rye as well as wheat. The matter is discussed with reference to varietal resistance and the influence, in this connection, of phosphoric, nitrogenous, and other fertilizers, a right use of these with suitable cultivation appearing to increase resistance.

Yellow rust, which is now said to attack the squarehead variety of wheat, is not controlled by any means yet available. Earlier sowings of rye suffer less from rust than do later plantings. The kind of crop previously grown on the land is said to exert considerable influence. Reports indicate also a connection between abrupt changes in temperature and rust attack.

Treatment of winter grain with corrosive sublimate, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, *12* (*1914*), *No. 8–9*, *pp. 85–89*).—Discussing the results of a large number of practical tests in treating seed grain for autumn sowing, as reported from various localities, the author states that steeping seed wheat in the Sublimoform solution and rye in corrosive sublimate preparation materially reduced injury, not only from stinking smut, etc., but also from snails and mice, but that loose smut of wheat was not prevented by such treatment.

Chinosol and formaldehyde as protection against Fusarium in cereals, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, *12* (*1914*), *No. 7*, *pp. 77–80*, *fig. 1*).—The author has confirmed, with field tests, the results obtained by Gentner (E. S. R., 28, p. 846). The sublimate solution used to steep the seed grain afforded complete protection. Formaldehyde was not so satisfactory. Chinosol is regarded as unsatisfactory in this connection.

Limitation and management of grain for seeding, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, *12* (*1914*), *No. 8–9*, *pp. 90, 91*).—Noting the special importance, at this time, of economical management of the available supply of grain for seeding purposes, the author urges careful selection of seed for germinability, previous treatment of the seed grain with approved solution, and avoidance of too thick sowing.

Use of rusted grain for seed, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, *12* (*1914*), *No. 8–9*, *p. 91*).—Since rust, unlike smut, is not transmitted to the crop through diseased seed, the use of grain from rusted crops is not regarded as dangerous. Cases where yellow rust was particularly severe and where also the output of grain was much reduced were found to show severe attack from foot or stalk disease, or from diseases due to other causes.

Dry spot of oats, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, *12* (*1914*), *No. 3–4*, *pp. 28–41*, *fig. 1*).—The general outcome of the experiments and observations here noted is the confirmation of the view that dry spot of oats is the result of nutritional deficiencies or disturbances, or both, and that the correction of these tends to restore the normal condition and productiveness of the plant. Measures apparently effective in this connection are protection from insect pests and frequent spraying with iron salts.

Hiltner's experiments on the control of dry spot of oats, T. A. C. SCHOEVERS (*Tijdschr. Plantenziekten, 20 (1914), No. 2, pp. 69–73*).—This is mainly a brief review of the work of Hiltner, above noted.

Some observations on ordinary beet scab, B. F. LUTMAN and H. F. JOHNSON (*Phytopathology, 5 (1915), No. 1, pp. 30–34, figs. 4*).—From a study of eight organisms isolated from scabby beets from various parts of Vermont the authors were led to the conviction that the forms were not only identical, but were the same as the organism *Actinomyces chromogenus*, which causes potato scab. This same organism is present in many soils and on many plants, but in explanation of the scabbing of the potato and the beet, in connection with the immunity of many other root and tuber plants, the authors hold that the reason undoubtedly lies in the fact that some sort of a cambium is so close to the surface as to be affected by the toxic substances produced by these bacteria. The parasitism of the organism is said to be dependent on a particular type of root or tuber structure, and when this is not present it is forced to live as a saprophyte.

Beet scab, GRIMM (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 12 (1914), No. 8–9, pp. 100–102*).—Beet scab is said to have caused loss in several localities, particularly in connection with the wet season of 1913. The disease seems to be due rather to bad nutritive conditions than to parasites primarily. The use of seed in propagation and the employment of potassium, superphosphate, and ammonia in fertilizers is recommended.

Rearing beet nematodes on agar, E. BERLINER and K. BUSCH (*Biol. Centbl., 34 (1914), No. 6, pp. 349–356, pl. 1*).—A brief account is given of the rearing of nematodes (*Heterodera schachtii*) on rootlets of various seedlings grown on agar, and of the changes and activities observed. None developed apart from the rootlets or survived long after the exhaustion of the reserve material which was brought forward from the egg stage.

Root scab and other celery diseases, H. M. QUANJER and N. SLAGTER (*Tijdschr Plantenziekten, 20 (1914), No. 1, pp. 13–27, pl. 1*).—The authors' conclusions from studies as described with rust or scab of celery root are said to have confirmed those of Klebahn (E. S. R., 22, p. 746) that *Phoma apiicola* is the cause of this disease. It is thought, however, that infection with this fungus from the seed is rather exceptional, the rule being that the infection is due to material in the soil, fertilizers, etc. Formalin was a very helpful treatment in this connection for the seed bed.

As regards *Septoria apii*, associated with celery leaf spot, Klebahn's conclusion regarding the agency of the seed as a carrier of infection was confirmed. This trouble also was largely prevented by the formaldehyde treatment and benefited by the use of Bordeaux mixture applied to the leaves.

Some new bacterial diseases of legumes and the relationship of the organisms causing the same, T. F. MANNS (*Delaware Sta. Bul. 108 (1915), pp. 44, pls. 20, fig. 1*).—An account is given of a disease of sweet pea due to *Bacillus lathyri*, a previous account of which has already been noted (E. S. R., 29, p. 352); and similar diseases upon clovers, garden beans, and soy beans are described.

The disease on sweet pea is apparently widely spread, having been reported in England, Massachusetts, Maine, New York, Delaware, and also in Ireland. Previous investigators have referred to a number of causes, but the investigations of the author indicate that it is of a bacterial nature, and that the same organism produces somewhat similar diseases on various species of clover, on garden beans, and on soy beans, although only one variety of soy beans grown at the station shows much injury. The disease is said to be most active during the flowering period of the host, and at times almost entirely destroys the crop. The season of heavy dew appears to be a time which favors infection. The morphology, cultural characters, physical and biochemical features, and pathogenicity of the organism are described at length.

A bibliography is appended.

The life history of Ascochyta on some leguminous plants, II, R. E. STONE (*Phytopathology, 5 (1915), No. 1, pp. 4–10, fig. 1*).—In a previous publication (E. S. R., 28, p. 845) the author reported *Mycosphærella pinodes* as the perfect stage of *A. pisi*, and *A. lethalis* as a part of the life cycle of *M. lethalis*.

In the present publication a description is given of *A. lathyri* from the grass pea (*Lathyrus sativus*), which is associated with *M. ontariœnsis* n. sp. The Mycosphærella follows the Ascochyta in the field, and in inoculation experiments typical Ascochyta developed on the plants, followed by Mycosphærella, which is indistinguishable from the original material. In all cases check plants remained free from the disease.

Notes are given of conditions for ascospore development in *M. pinodes* and *M. ontariœnsis*.

The Rhizoctonia lesions on potato stems, F. L. DRAYTON (*Phytopathology, 5 (1915), No. 1, pp. 59–63, pl. 1, fig. 1*).—A report is given of a study of the dark brown lesions occurring on the underground main stems and tuber-bearing stolons of the potato, and generally considered as due to the presence of Rhizoctonia.

The result of the investigation showed the presence of mycelium in the lesions and the permeation of nearly all the tissues, which leaves little doubt that Rhizoctonia is the cause of the trouble. The invasion and plugging of the vascular tissues, diverting the food material going from the leaves to the actively growing parts, account for the production of undersized tubers or none at all. By the stopping of the upward current through the plugging of the vessels, especially in dry weather, a curling of the leaves may be produced, and this is nearly always a symptom associated with the disease.

Puccinia endiviæ and rust of prickly lettuce, L. MAFFEI (*Riv. Patol. Veg., 7 (1914), No. 2, pp. 45, 46*).—It is stated that the "scariola," claimed by Pantanelli and Cristofoletti (E. S. R., 31, p. 746) to be attacked by *P. endiviæ*, is apparently not *Lactuca scariola*, but endive (*Cichorium endivia*).

Protascus colorans, the source of yellow grains in rice, P. C. VAN DER WOLK (*Mycol. Centbl., 3 (1913), No. 4, pp. 153–157, pl. 1*).—The author has investigated the subject of yellow grains in rice kept long in bulk, which is said to cause considerable loss and disturbance in marketing the rice exported from the Indies to Europe.

The trouble is said to be caused by a fungus, hitherto undescribed as to genus and species, which the author has named *P. colorans*, which is said to show a very variable number of ascospores (2 to 15), and which is otherwise discussed. The best development of this fungus requires a very small moisture content in the rice grains, experiments often failing to develop the organism on account of its low tolerance of humidity. Pigment formation is probably a phenomenon of the dying away of the fungus, which fact may explain why it is very difficult to rear this mold from the yellow grains themselves, and this also in turn may explain the rise of a brooding theory of this rice injury.

The simplest means of prevention is first disinfection, and second the maintenance of absolute dryness in the grains, which requires exclusion of insects therefrom and frequent heating.

Rust of fruit trees, A. DESMOULINS (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 11, pp. 253–255*).—Giving results of recent observations and tests on Coryneum rust of peach, apricot, and cherry in the Rhone Valley, the author describes a treatment with Bordeaux mixture rendered adhesive by the addition of molasses (1 kg. per hectoliter). This is said to have proved effective and practical.

Influence of atmospheric conditions on the appearance of downy mildew, J. CAPUS (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 9, pp. 198–200*).—The author gives the results of observations covering several years on the relations between atmospheric conditions and the two early developmental phases of downy mildew.

Infection (penetration of the tissues by the germinative tubes from zoospores) occurs only following precipitation, which may be as small as 1 mm. Contamination (passing out of the stage within which copper fungicides can destroy the fungus) may follow infection immediately, or it may be delayed for several days by unfavorable conditions, such as cold, or by precipitation, which appears to prolong the period during which spraying is effective. The primary invasion or attack is that which first appears in spring (originating in overwintered material), while secondary outbreaks are due to conidia formed as the result of primary or later outbreaks.

It is found to be an unsafe practice to spray early and then await the appearance of the mildew on the newly developed (and hence unsprayed) leaves, to make a second application. In case of both primary and secondary outbreak, the treatment becomes ineffective within a day or two after a rain.

Oïdium of oak and grape, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 4, pp. 86–89*).—Giving a brief résumé of some observations on Oïdium of oak and of grape by Pantanelli, the author directs attention to some preferences and habits noted in regard to portions attacked as regards age of parts exposed, structure, cell content, turgescence, and nutrition.

Report of the plant pathologist, G. L. FAWCETT (*Porto Rico Sta. Rpt. 1914, pp. 27–30*).—An outline is given of work in progress, which included testing various forms of Bordeaux mixture and some studies on diseases of coffee, cacao, and citrus trees.

The experiments with fungicides show that homemade Bordeaux mixture, if properly prepared, is cheaper and as efficient as any of the proprietary forms tested.

Among the coffee diseases reported upon, experiments were carried on to test the relative resistance of different varieties of coffee to the fungi *Stilbella flavida* and *Pellicularia koleroga*. Some difference in susceptibility to these fungi was noticed on the part of different varieties, although complete resistance was not observed.

Notes are given of a new fungus disease of cacao, which is believed to be due to a species of Corticium which has not yet been definitely determined. In addition to occurring on cacao, the fungus also attacks and kills coffee tree branches and has been found parasitic on grapefruit branches, although in the latter case it is thought to have been associated with the presence of a wild vine growing over the tree. Attention is called to the fact that *Phytophthora faberi*, the cause of black rot in the pods of cacao, has never been found in Porto Rico, but that *Spicaria (Fusarium) colorans* has been iso ated from diseased tissues.

The author briefly calls attention to the bla k rot of citrus fruits due to *Diplodia natalensis*.

The known distribution of Pythiacystis citrophthora and its probable relation to mal di gomma of citrus, H. S. Fawcett (*Phytopathology, 5 (1915), No. 1, pp. 66, 67*).—In a previous publication the author reported this fungus as being the causal agent of one form of lemon gummosis in California (E. S. R., 30, p. 51). Since that time the fungus has been isolated from diseased bark from nearly all the important citrus growing localities of California.

In June, 1913, it was isolated from diseased bark of orange trees that appeared to be affected with typical mal di gomma, or foot rot, as it is known in California. Inoculations and cultures of this fungus were made in large crown roots of old orange trees, and in nine months they developed diseased areas which resembled the beginning stages of mal di gomma. The orange bark is said to be somewhat more resistant than lemon bark and reacts somewhat differently toward the fungus. This, it is believed, explains the difference in appearance of mal di gomma and lemon gummosis in California.

In addition to the occurrence of this fungus in California, the author reports having observed it in Florida, Cuba, and the Isle of Pines, and claims to have record of it in southern Europe and in Brazil.

The citrus root nematode (Tylenchulus semipenetrans) in Florida, E. Nelson (*Phytopathology, 5 (1915), No. 1, pp. 72, 73*).—The author reports having examined 35 orange trees, 5 of which had healthy foliage and showed no infestation with nematodes. The leaves of the remaining 30 were affected with a form of chlorosis known as frenching. Twelve of the 30 affected trees showed the presence of root nematodes, but the remaining 18 showed no infestation.

The author believes that further investigations and experiments are necessary before any conclusions can be drawn as to the connection of this nematode with the frenching of citrus trees.

Storm and drought injury to foliage of ornamental trees, C. Hartley and T. C. Merrill (*Phytopathology, 5 (1915), No. 1, pp. 20–29, figs. 3*).—Detailed observations are given showing the effect of drought and storms in the District of Columbia and several places in Pennsylvania and New Jersey.

In the District of Columbia the June and July rainfall in 1913 was much below normal and this period was followed on July 30 by a hail storm, heavy rain, and wind of high velocity. It is said that at least 25 per cent of all Norway maple trees in the District of Columbia were noticeably affected by the drought. Other maples suffered somewhat, but less severely, and drought injury was also noticed on oaks and other trees. The effect of the storm mentioned above was quite pronounced on many different kinds of trees, but so far as observed the drought preceding the storm was not in any way responsible for the storm injury. The leaves of the sugar maple were found most susceptible to injury by the high velocity of the storm. The damage was similar to that produced by drought in that the margins of the leaf and the area between the veins were affected, but the material difference between the two forms of injury is that drought injury is more closely confined to the leaf margins, while storm injury tends to affect areas situated between the veins as well.

New hosts for some forest tree fungi, J. R. Weir (*Phytopathology, 5 (1915), No. 1, pp. 71, 72*).—The author reports the occurrence of *Herpotrichia nigra*, or its related form, *Neopeckia coulteri*, on the giant western red cedar, grand fir, western yew, and red or Douglas fir. It is also reported on the western white pine, the Engelmann spruce, mountain hemlock, lodgepole pine, white barked pine, and alpine fir. *Fomes laricis* is reported for the first time on *Pinus monticola*, *Abies grandis*, and *Tsuga mertensiana*. *F. igniarius* was found on *Rhamnus purshiana* and *Sambucus glauca*. *Armillaria mellea* is reported as attacking *Taxus brevifolia*, and *Polyporus lucidus* was found growing on the mountain hemlock. The mountain hemlock has in many places been seriously attacked by *Razoumofskya tsugensis*. *Echinodontium tinctorium* is also said to be abundant on this species of tree, and a collection of it was made from the Engelmann spruce.

Notes on the chestnut bark disease, J. T. Rogers and G. F. Gravatt (*Phytopathology, 5 (1915), No. 1, pp. 45–47*).—Observations are reported on the infection of the chinquapin in Virginia by the chestnut bark fungus (*Endothia parasitica*). Inoculation experiments indicate that the chinquapin is no more resistant to the girdling growth of the blight fungus than is the chestnut. However, as the former is not so subject to insect and other injuries as is the chestnut, this is considered the reason for its freedom from disease in the field.

Notes are given of observations of the spread of the chestnut bark disease over a small area, observations having been made on a plat containing 140 chestnut trees in May, 1913, September, 1913, and May, 1914. The average rate of diameter growth of the disease cankers was found to be 6.35 in. for the year. At this rate of growth a number of years would be required for the girdling of a large tree by a single canker.

Chestnut blight in Nebraska, R. G. Pierce (*Phytopathology, 5 (1915), No. 1, p. 74*).—The author reports having observed the chestnut bark fungus (*Endothia parasitica*) at two places in Nebraska in 1914. It was on chestnut trees that had been shipped to nurseries from the East.

Notes on chestnut fruits infected with the chestnut blight fungus, Caroline Rumbold (*Phytopathology, 5 (1915), No. 1, pp. 64, 65*).—In order to test the possible infection of chestnut burs and nuts the author collected from a blight-infected orchard fresh, sound nuts and burs containing nuts. These were fumigated and placed in paper bags, kept in a warm room, and later examined.

More than one-third of the nuts were found infected, those remaining in the burs being especially attacked. The fungus was found to have grown from the infected bur through the shell at the base of the nut, where there is close connection between the two and where the hard shell of the nut matures last.

From the comparative ease with which the nuts and burs were infected the author thinks it probable that an occasional infected chestnut might be collected at harvest time, and that this would be a possible means of the dissemination of the disease, as suggested by Collins (E. S. R., 30, p. 543).

Notes on Rhizoctonia, C. Hartley and S. C. Bruner (*Phytopathology, 5 (1915), No. 1, pp. 73, 74*).—The authors report having found Rhizoctonia very commonly present in damped-off pine seedlings, and this is believed to be the chief cause of the loss in beds of *Pinus ponderosa*. The parasite spreads for several weeks after germination of the pines and appears to produce larger single patches of dead seedlings than any other damping-off organism observed in western nurseries, and also to attack seedlings too old to be killed by *Pythium debaryanum* or *Fusarium moniliforme*.

Observations were made on a number of weeds that come up in areas where the pine seedlings have been killed by the fungus, and an examination of the soil showed that Rhizoctonia is very commonly present in groups of *Ambrosia psilostachya*. On account of the perennial habit of this ragweed it is considered an ideal host for the parasitic strains of Rhizoctonia to winter over on.

Observations on Hirneola auricula-judæ, M. J. Le Goc (*Proc. Cambridge Phil. Soc., 17 (1913), No. 3, pp. 225–228*).—The Jew's ear fungus is said to be of very wide distribution and of frequent occurrence in the neighborhood of Cambridge, England, where it is found on elder bushes both living and dead; also on dead portions of elm in moist places.

Cultures were made and studied. Penetration of wood by the fungus is very rapid, its path at first being the vessels and tracheids, with penetration through the pits and more frequent branching in the medullary rays. Later the fungus encroaches upon the cell walls, the xylem becoming delignified and the walls penetrated and consumed. This change renders the tissue spongy and crumbly, examination showing it to consist more of the fungal hyphæ than of the original material of the tree.

Further observations on Hirneola auricula-judæ, M. J. Le Goc (*New Phytol., 13 (1914), No. 4–5, pp. 122–133, figs. 9*).—Concluding a fuller account covering later study than that noted above, the author states that germination of the spores of the Jew's ear fungus takes place readily and occurs even on the fructifications if these are kept moist. Basidiospores developed in nutritive solutions, but less frequently in water. Conidia are produced rarely and only in distilled water, so far as noted. Pure cultures of the fungus grow readily on elder, lime, and elm wood, producing rudimentary fructifications. Penetration, delignification, and almost complete consumption of the wood quickly follow natural infection with the fungus. Inoculations on healthy living twigs of elder were often successful, the hyphæ penetrating slowly at first, but finally killing the twigs.

Some observations on abortive sporophores of wood-destroying fungi, J. R. Weir (*Phytopathology, 5 (1915), No. 1, pp. 48–50*).—Attention is called to the presence of hard, brown, sterile, abortive sporophores which are commonly observed on birches and alders. The author reports having collected these structures from the paper birch, associated with the fertile sporophores of *Fomes igniarius*. Abortive fruiting structures are also said to be occasionally formed by *Echinodontium tinctorium* on old and badly decayed hemlock, and similar structures are produced by *Trametes pini* on the western white pine.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Zoological philosophy: An exposition with regard to the natural history of animals, J. B. Lamarck, trans. by H. Elliot (*London: Macmillan & Co., Ltd., 1914, pp. XCII+410; rev. in Nature* [*London*], *94 (1915), No. 2363, pp. 639, 640*).—This is a translation of the author's Philosophie Zoologique, which was published in 1809, half a century before Darwin's Origin of Species, and is one of the evolution classics.

Some Canadian rodents injurious to agriculture, N. Criddle (*Agr. Gaz. Canada, 2 (1915), No. 2, pp. 110–114, fig. 1*).—This is a brief account of the more important Canadian rodents and means for their control.

How plague may be carried from place to place (*Pub. Health Rpts.* [*U. S.*], *30 (1915), No. 13, pp. 891, 892*).—This article records the finding of a live plague-infected rat at Seattle, Wash., in a large box containing plants imported from Yokohama, Japan.

Rat proofing the public docks of New Orleans, H. P. Letton (*Pub. Health Rpts.* [*U. S.*], *30 (1915), No. 8, pp. 545–555, pls. 4, figs. 5*).—A report on the possibility and cost.

The economy of ground squirrel destruction, J. D. Long (*Pub. Health Rpts.* [*U. S.*], *29 (1914), No. 50, pp. 3317–3321*).—The author points out the various advantages resulting from the destruction of ground squirrels in California.

Cimex pipistrelli, the intermediate agent in the transmission of trypanosomiasis of bats; the nonpathogenicity of Trypanosoma vespertilionis for laboratory animals, E. Pringault (*Compt. Rend. Soc. Biol.* [*Paris*], *76 (1914), No. 19, pp. 881–884; abs. in Rev. Appl. Ent., 2 (1914), Ser. B, No. 11, pp. 173, 174*).—The author's experiments indicate that this bug is the intermediate host of *T. vespertilionis* and that this trypanosome is not pathogenic for mice, rats, guinea pigs, or rabbits.

The bird book, C. A. REED (*Garden City, N. Y.: Doubleday, Page & Co., 1915, pp. 472, figs. 1425*).—Brief descriptions are given of 768 North American birds and additional descriptions of varieties. More than 700 North American birds are illustrated in natural colors and several hundred photographs are given of their nests and eggs.

Forty common birds of West Virginia, E. A. BROOKS (In *Arbor and Bird Day Manual, Charleston, W. Va.: Dept. Free Schools, 1915, pp. 21–79, pls. 2, figs. 39*).—This paper gives popular accounts of 40 birds that occur commonly in West Virginia, including their range, habits, usefulness, song, etc.

Some Pennsylvania birds and their economic value, H. A. SURFACE (*Bi-Mo. Zool. Bul. Penn. Dept. Agr., 3 (1913), No. 5–6, pp. 153–216, pls. 11*).—This bulletin, which deals chiefly with the families including the larks, crows, and sparrows, is based upon the results of investigations by the author and by the Bureau of Biological Survey of this Department.

The practical value of birds, J. HENDERSON (*Univ. Colo. Bul., 13 (1913), No. 4, pp. 48*).—A discussion of the economic importance of birds, based upon a very extensive review of the literature, 208 references to which appear as footnotes to the text. A bibliography of 7 pages is appended.

Some observations on the food of nestling sparrows, W. E. COLLINGE (*Jour. Bd. Agr. [London], 21 (1914), No. 7, pp. 618–623*).—This is a report of work carried on in continuation of that previously noted (E. S. R., 28, p. 450).

During 1913 and 1914 over 280 specimens were examined, 200 having been obtained in fruit-growing districts and 87 from suburban districts. The results of the examinations of the stomach contents are presented in tabular form.

"In a single day 100 nestling house sparrows require nearly 2,000 insects for food in fruit-growing districts and about a third of that quantity in suburban districts. Excepting for a few spiders and earthworms, the whole of the food consists of injurious insects." As regards the house or English sparrow, the author finds that it is extremely difficult to arrive at any satisfactory and convincing conclusion as to its precise economic status. After carefully considering the results obtained from an examination of the stomach contents of 404 adult birds and of 329 nestling birds and also from an examination of the feces, he is of the opinion that if it were considerably reduced in numbers the good that it would do would probably more than compensate for the harm, especially in fruit-growing districts.

Comparative physiology and morphology of the arachnids, I, F. DAHL (*Vergleichende Physiologie und Morphologie der Spinnentiere unter Besonderer Berücksichtigung der Lebensweise. Jena: Gustav Fischer, 1913, pp. VI+114, figs. 223*).—This first part deals with the classification of the arachnids, their anatomy, color, etc.

Bibliography of Canadian entomology for the year 1913, C. J. S. BETHUNE (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 8 (1914), Sect. IV, pp. 53–68*).—An annotated list of 136 titles, with a subject index.

Guide to California insects, C. W. WOODWORTH (*Berkeley, Cal.: The Law Press, 1913, pp. V+360, figs. 361*).—In the introduction to this work the author presents a brief account of the structure and classification of insects. The main part consists of systematic annotated lists of the insects known to occur in California. An appendix treats briefly of the collection, rearing, etc., of insects.

First biennial report of the Montana State Board of Entomology, R. A. COOLEY (*Bien. Rpt. Mont. State Bd. Ent., 1 (1913–14), pp. 50*).—This is the first report of the secretary of the newly created board of entomology. The regulations of the board are first presented. A report of the work of the Bureau of Entomology against spotted fever tick in cooperation with the board is given by W. V. King (pp. 16–27); a review of Rocky Mountain spotted fever eradicative work conducted by the U. S. Public Health Service in the Bitter Root Valley, Montana, is presented by L. D. Fricks (pp. 28–31); and a summary of a Report to the Montana State Board of Entomology Concerning Fly Investigations Conducted in the Yellowstone Valley During the Summer of 1914, is given by R. R. Parker (pp. 35–50).

Report of the entomologist, R. H. Van Zwaluwenburg (*Porto Rico Sta. Rpt. 1914, pp. 31–35*).—The author briefly reports on the occurrence of insects in Porto Rico from October 16, 1913.

The principal work of the past year has been with enemies of coffee and coffee shade trees, including the coffee leaf miner (*Leucoptera coffeella*); a shot-hole borer, *Xyleborus* sp., which works in guamá and guava; an undetermined pink coccus, attended by *Myrmelachista ambigua ramulorum* on the branches of guamá; and a flannel moth, *Megalopyge krugii*, abundant on guamá. The coffee leaf miner is said to be parasitized by two chalcidids, *Chrysocharis livida* and *Zagrammosoma multilineata*. *M. krugii* is very commonly parasitized by *Chalcis ovata* and an undetermined tachinid. *Micrococcus nigrofasciens*, the cause of a disease of May beetles, is said to be native to Porto Rican soils and apparently widespread. A brown "woolly bear" caterpillar, *Ecpantheria eridanus*, was fairly common on orange trees in the Mayaguez district. The small sweet potato weevil (*Euscepes* (*Cryptorhynchus*) *batatæ*) made its appearance in the station planting during the winter months. Silk oak trees (*Grevillea robusta*) are sometimes severely attacked by the fringed scale (*Asterolecanium pustulans*).

Tenth annual report of the state entomologist and plant pathologist for 1914, G. M. Bentley (*Ann. Rpt. State Ent. and Plant Path. Tenn., 10 (1914), pp. 92, figs. 28*).—This is the usual annual report upon nursery inspection and other work (E. S. R., 31, p. 248). Two species of strawberry-root lice (*Aphis forbesi* and *Macrosiphum fragariæ*) have been found to be destructive in Tennessee, one or the other having been found in 25 of the 96 counties of the State. Descriptive and biological notes are given of the two pests.

Injurious insects and other animals observed in Ireland during the year 1913, G. H. Carpenter (*Econ. Proc. Roy. Dublin Soc., 2 (1914), No. 9, pp. 142–160, pl. 1, figs. 8*).—This, the author's usual annual report (E. S. R., 29, p. 555), deals briefly with the occurrence of the more important insect pests in Ireland during the year. Among those mentioned are the frit fly (*Oscinis frit*), the migratory apple aphid (*Aphis fitchii*), the giant willow aphid (*Lachnus viminalis*), the ox warble (*Hypoderma bovis*), etc. The author records the extraction of a fourth stage or mature larva of *H. bovis* from the back of a horse.

[Reports of the entomologist of Southern Rhodesia], R. W. Jack (*Rpt. Dir. Agr. South. Rhodesia, 1911, pp. 46–53; 1912, pp. 50–55; 1913, pp. 43–47*).—These annual reports deal with the occurrence of and work with the more important insect pests in Southern Rhodesia.

[Insect pests in Mauritius], D. d'Emmerez de Charmoy (In *Summary of Investigations Made During the Period July 1 to November 30, 1914. Mauritius: Dept. Agr., 1914, pp. 3, 4*).—This report for the period following that previously noted (E. S. R., 32, p. 449) presents brief notes on the insects of special importance.

The pink sugar-cane borer (*Sesamia nonagrioides*) is said to show remarkable partiality to maize in the deposition of its egg; thus the larvæ may be readily destroyed upon a large scale by the use of maize as a trap crop. The eggs of this pest are said to be parasitized by *Ceraphron beneficiens*. The artichoke moth (*Porbe bjerkandrella*) was particularly prevalent during the period under report. Particular attention was given to the life history of *Pulvinaria gasteralpha*, which attacks cane, and to its parasite (*Aphycus* sp.). The pois sabre or jack-bean borer, which attacks both the plant itself and the pods, is said to have recently come to attention, it even causing the complete loss of a crop of the jack bean (*Canavalia ensiformis*) in the northern part of the island.

Insect notes (*Ann. Rpt. Agr. and Crown Lands Seychelles, 1913, pp. 13–17*).—Among the insect pests noted as of particular importance in Seychelles during the year are the green scale (*Lecanium viride*) on coffee, citrus, and ixora in spite of the fungus parasite *Cephalosporium lecanii;* the barnacle scale (*Aspidiotus ficus*) on coconut, frangipane (*Plumeria acuminata*), breadfruit (*Artocarpus incisa*), pseudo sago palm (*Cycas officinalis*), citrus, and roses; *L. hesperidum* on frangipane trees and water hyacinth (*Eichornia crassipes*) ; and *L. tessellatum* on coconut, takamaka (*Calophyllum inophyllum*), cinnamon, and water hyacinth, which was found during the year to be attacked by *C. lecanii.* It is stated that scales are always attended by ants, the commonest of which is *Technomyrmex albipes.* A list is given of 12 coccids which ants attend and of 7 which they do not attend in the same degree. The coconut beetle (*Melitomma insulare*) is said to be kept under control better than formerly through the destruction of fallen trees and by removing the larvæ from standing trees.

Insect pests of field crops, L. HASEMAN (*Missouri Sta. Bul. 134 (1915), pp. 3–39, figs. 39*).—Popular accounts are given of the more important insect enemies of field crops in Missouri and means for their control.

Insect enemies of lucern, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 18, pp. 555–561, pl. 1; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, pp. 577, 578*).—A brief account of the more important enemies of alfalfa in France, including *Phytonomus variabilis, P. nigrirostris, P. punctatus, Apion pisi, A. trifolii, Colaspidema atra, Lasia globosa, Colias edusa, C. hyale,* and *Agromyza nigripes.* A colored plate illustrating the pests is included.

Injury by tipulids and tabanids in the rice fields of Molinella, Bologna, G. DEL GUERCIO (*Redia, 9 (1913), No. 2, pp. 299–345, figs. 15; abs. in Rev. Appl. Ent., 2 (1914), Ser. B, No. 11, p. 167*).—This paper deals with the biology, occurence, and injury of tipulids (*Tipula oleracea*) and tabanids (*Tabanus ignotus*) in Italian rice fields.

Protecting cabbage and cauliflower from attacks by worms, E. S. TUCKER (*Louisiana Stas. Bul. 154 (1915), pp. 16, figs. 2*).—This bulletin gives directions as to the manner in which the chewing insect enemies of these cruciferous plants can be successfully combated.

The cochylis, eudemis, and pyralid moths and altisa beetle of the vine, I. V. CLARIÓ-SOULÁN (*Cochylis, Eudemis, Piral y Altisa de la Vid. Barcelona: Consejo Prov. Fomento, 1913, pp. 68, pls. 4*).—This work deals with the biology and control of *Cochylis ambiguella, Eudemis botrana, Pyralis vitana,* and *Altica ampelophaga.*

[Insect pests of coconuts and cacao] (*Agr. News [Barbados], 14 (1915), Nos. 333, pp. 42, 43; 334, pp. 58, 59*).—A summary of data on the subject by Copeland (E. S. R., 32, p. 339) and by van Hall (E. S. R., 32, p. 745).

Summary of two years' study of insects in relation to pellagra, A. H. JENNINGS (*Jour. Parasitology, 1 (1914), No. 1, pp. 10–21*).—The conclusions drawn are similar to those by Jennings and King in the article previously noted (E. S. R., 29, p. 756).

Spraying for apple sucker and leaf-curling plum aphis, F. R. PETHERBRIDGE (*Jour. Bd. Agr. [London], 21 (1915), No. 10, pp. 915–919, pl. 1*).—The author reports control experiments with *Psylla mali* and *Aphis pruni* which led him to conclude that lime-salt and sulphur wash, applied as late as possible previous to the hatching of the apple suckers, will control this pest and the leaf-curling plum aphis.

Effect of cyanid of potassium on trees, C. H. Shattuck (*Science, n. ser., 41 (1915), No. 1052, p. 324*).—In continuing the discussion of this subject (E. S. R., 32, p. 754) the author states that his experience with cyanid of potassium, especially on elms and black locusts, has convinced him that it is a valuable remedy. He states that he has used potassium cyanid for several years in eliminating borers from various trees without causing any staining, killing, or in any way injuring the trees. He has prescribed it for the use of others for about 12 years in connection with forestry work and states that he has saved the lives of thousands of trees that have been attacked by boring and girdling insects. "Large groves of thrifty elms and black locusts in Kansas and other parts of the West have been completely rescued from the attacks of boring and girdling insects by means of cyanid of potassium."

New fumigating machines, G. P. Gray (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 2, pp. 68–80, figs. 4*).—Newly invented fumigating machines in which hydrocyanic gas is generated outside and conducted into the tents through hose are described and illustrated and the advantages and disadvantages discussed. The author concludes "that the machines are correct in principle, although there are still some points that need more thorough investigation. There are mechanical imperfections in the machines, but they nevertheless offer many important advantages over the pot system of dosage."

Cyanid fumigation of ships, N. Roberts (*Pub. Health Rpts. [U. S.], 29 (1914), No. 50, pp. 3321–3325*).—This is a description of the method used at New Orleans.

On certain peculiar fungus parasites of living insects, R. Thaxter (*Bot. Gaz., 58 (1914), No. 3, pp. 235–253, pls. 4*).—This paper gives descriptions of 5 genera and 10 species. Of the genera, 3 are very closely allied to well-known genera of Hyphomycetes, one belongs to the Hyphomycetes but is not closely related to any described species, and the other seems to be more nearly related to the Chytridiales than to other known organisms.

An outline of the subfamilies and higher groups of the insect order Thysanoptera, J. D. Hood (*Proc. Biol. Soc. Wash., 28 (1915), pp. 53–60*).—The author calls attention to the fact that within the last several years the number of known genera of Thysanoptera has increased from 45 to 169 and the known species from 175 to 795. With the increase in the size and importance of the group has come the necessity for a more comprehensive classification than that of Uzel proposed in 1895 (E. S. R., 8, p. 69).

The grape leafhopper, D. E. Merrill (*New Mexico Sta. Bul. 94 (1915), pp. 33, figs. 10*).—This account relates to *Typhlocyba comes* and its variety *coloradensis*, which pest is a source of serious loss in yield each year in New Mexico. In addition to the loss in yield, it greatly lessens the vigor of the vines and sometimes they are even killed by it. There are two full broods and a small third each year in New Mexico. Control has been demonstrated to be possible and practicable by means of cultural methods, by spraying the spring brood of nymphs with kerosene emulsion or tobacco extracts, and by capturing the overwintering adults before they lay the eggs in the spring with traps.

Life-history studies of this insect by Quayle in California (E. S. R., 20, p. 557), by Hartzell in New York (E. S. R., 28, p. 855), and by Johnson in Pennsylvania (E. S. R., 30, p. 547) have been previously noted.

Psylla piri and the fight against it by means of a new combined kerosene-lime emulsion, Gudkov (*Turkest. Selsk. Khoz., No. 3 (1914), pp. 263–289; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 7, pp. 422, 423*).—The author reports observations made during the course of an outbreak of *P. piri* in Tashkend in 1913.

Kerosene-lime emulsion is said to have given the best results, both the immature stages and adults being killed by it. This emulsion is made by slaking 1 lb. of lime in 1½ pints of water, and adding 1 lb. of kerosene, with constant agitation. It is stated that the amount of kerosene in the formula may be doubled when the application is to be made to mature leaves.

Spraying for the control of the walnut aphis, A. R. TYLOR (*California Sta. Circ. 131 (1915), pp. 11, figs. 2*).—This paper relates to *Chromaphis juglandicola*, a detailed account of studies of the life history and habits of which, by Davidson, has been previously noted (E. S. R., 31, p. 753).

During years of heavy infestation, which occasionally occur, the size of the European walnut is considerably reduced. The drain upon the tree is said to be heavy as a result of its attack, and the infestation may also increase the dissemination of the walnut blight.

The most effective spray for the control of the walnut aphis during the winter consists of commercial lime-sulphur, 5 gal.; unslaked lime, 25 lbs.; and water, 95 gal., at a cost of about $2.55 per 200 gal. of spray. The spray should be applied before growth starts in the spring, an average of 25 gal. of spray being required for 10-year-old trees and 40 gal. for larger trees. The spray found most efficient for summer control consists of blackleaf 40, 1 pint; whale-oil soap, 4 lbs.; and water, 200 gal., at a cost of $1.80 per 200 gal. of spray, when the materials are purchased in small amounts. About 30 to 35 gal. are required to cover 10-year-old trees. It is stated that the M. A. C. nozzles (E. S. R., 26, p. 49) are the most suitable ones found for spraying walnut trees.

The host plants of Aphis rumicis, J. DAVIDSON (*Ztschr. Wiss. Insektenbiol., 10 (1914), No. 5, pp. 189–190; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 8, p. 494*).—Substantially noted from another source (E. S. R., 32, p. 849).

Preliminary report on spraying of eggs for the control of the purple and green apple aphids of California, P. R. JONES (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 1, pp. 20–30*).—"As far as can be determined at present under western conditions it is believed that dormant treatment for the eggs of the apple and purple aphids should be either commercial crude-oil emulsion 1:9 or 1:10 (where the concentrate contains about 85 per cent crude oil); homemade crude-oil emulsion from 10 to 15 per cent strength made from a crude oil running 19 to 23° B.; commercial lime-sulphur at 1:6 or 1:7, and the application made as late in the winter as possible before the buds start to show green.

"If homemade distillate-oil emulsions are used they should be made from heavy distillate, and the dilution in the tank figured to run 7 or 8 per cent oil."

Notes on the life history and habits of the rose scale, Aulacaspis rosæ, S. NAKAYAMA (*Jour. Ent. and Zool., 7 (1915), No. 1, pp. 45–54, figs. 25*).—This paper is based upon observations made in the vicinity of Stanford University from December, 1912, to April, 1914. Studies of this scale, a common pest of blackberries, raspberries, and roses, by Smith, of New Jersey Experiment Station, have been previously noted (E. S. R., 14, p. 372), but observations of its biology on the Pacific coast have not previously been reported.

The author treats of the egg and its oviposition, the method of hatching, the larval stages, seasonal history, and natural enemies. The natural enemies noted include two lady beetles (*Chilocorus bivulnerus* and *Scymnus marginicollis*) and an undetermined hymenopterous parasite. A bibliography of 9 titles is included.

The San José and oyster-shell scales, L. Caesar (*Ontario Dept. Agr. Bul. 219 (1914), pp. 30, figs. 16*).—A summarized account of the life history and habits, natural enemies, means of control, etc., of the San José scale (pp. 1–25) and of the oyster-shell scale (pp. 26–30) in Ontario.

The San José scale was introduced into Ontario by or before 1894 in shipments of infested nursery stock. There is believed to be no scale in the Province at present north of a line drawn from about Sarnia to Toronto and more than half of the territory south of this line is still free. It is thought that the scale will probably live and thrive wherever peaches will live and bear some fruit, even though not in a commercial way. The first brood of young scales begins to appear about June 20, and there are probably three or nearly three full broods a year in Ontario. While there are a number of native enemies that attack it in Ontario, up to the present time they have been of but little importance. The scale can be readily controlled by a single spraying once a year before the buds have burst in the spring. Badly infested trees should be sprayed twice the first year. A map is given showing the present distribution of the scale in Ontario.

The oyster-shell scale is said to occur in most of the orchards in every fruit district in Ontario.

The citricola scale, H. J. Quayle (*California Sta. Bul. 255 (1915), pp. 405–421, figs. 7*).—The citricola scale (*Coccus citricola*), first described as representing a new species by Campbell in 1914 (E. S. R., 32, p. 57), is one of the most injurious scales attacking citrus trees in California. It not only necessitates the washing of the fruit because of the sooty mold fungus but seriously impairs the vigor of the tree and thereby greatly reduces fruit production. It is stated that in some groves the crop was reduced during the past year to the extent of 50 or 75 per cent as a result of its attack.

The scale was first found in the vicinity of Claremont in 1909 and at about the same time near Riverside and in certain sections of San Bernardino County. It has been known in the citrus sections of Tulare County for the past three or four years. In the countries south of the Tehachapi the citricola scale is found in Los Angeles, Orange, Riverside, and San Bernardino.

A brief account is given of its life history and habits, and a more technical paper is said to be in preparation. The young appear by the last week in April and continue to appear until August. During the summer, fall, and winter, the scales are found on the leaves almost exclusively and grow very slowly. In November and later a few migrate back to the twigs but the greatest migration occurs in March. With the warm weather of spring they rapidly mature and begin to deposit eggs late in April. Thus one full year is usually required for the life cycle.

While the parasites attacking this scale are common they never occur in large numbers. Those reared from it include *Coccophagus flavoscutellum*, *Aphycus flavus*, *C. lunulatus*, and *C. lecanii*. The lady beetle *Chilocorus bivulnerus* has been observed to feed upon this scale.

As regards remedial measures it is stated that fumigation between July 15 and September 15 is the most satisfactory treatment. When applied later the results of fumigation are less certain. Where fumigation is not feasible spraying may be employed.

The efficiency of fungoid parasites of scale insects (*Agr. News [Barbados], 14 (1915), No. 337, p. 110*).—A brief review of the subject, particularly as relates to the West Indies.

The poison glands of the larva of the brown-tail moth (Euproctis chrysorrhœa), Cornelia F. Kephart (*Jour. Parasitology, 1 (1914), No. 2, pp. 95–103,* *figs. 4*).—The author here reports upon studies which have led her to confirm the finding of Tyzzer (E. S. R., 22, p. 55) that a definite poisonous principle is contained in the short barbed hairs of the larva of the brown-tail moth. "This substance is secreted by certain specialized hypodermal cells and is liberated in the blood through the sharp basal point of the hairs when they come in contact with the human skin. The poison glands are larger and fewer in number than the cells which form the hairs, there being one poison cell for each papilla on the tubercle instead of one for each hair."

Life history of the codling moth in Maine, E. H. SIEGLER and F. L. SIMANTON (*U. S. Dept. Agr. Bul. 252* (*1915*), *pp. 50, pls. 2, figs. 9*).—The studies here reported, which form part of an investigation of the codling moth carried on by the Bureau of Entomology of this Department throughout the United States (E. S. R., 33, p. 61), are based upon work at Winthrop, Me., during the seasons of 1913 and 1914. It is stated that the methods of study have been essentially the same for the several States where the work has been undertaken.

The seasonal history studies of 1913 are first reported in detail (pp. 3–28), followed by those of 1914 (p. 28–46). A comparison of the life history of the codling moth during the two seasons, including a diagram of the seasonal history, follows. Much of the data is presented in tabular form.

It was found that in Maine the codling moth has one full generation, a very small percentage (1 to 2 per cent) of the individuals of which transforms to make a partial second generation. Pupation of the overwintering larvæ commences about the middle of May and extends to the first part of July. The length of the spring-brood pupal stage was found to average 21 days. Moths of the spring brood commence to emerge about two weeks after the petals have fallen and continue to issue for a period of about a month. The average time from the date of the emergence of the moths to the first oviposition was about four days. The oviposition of the spring-brood moths averaged 14 days. The average length of life of males of the spring brood was about 12 days, and of the females of the spring brood about 13 days.

"The earliest first-brood eggs were deposited approximately three weeks after the petals dropped. The incubation period of the first-brood eggs averaged eight days. The first-brood eggs began to hatch in from four to five weeks after the petals had fallen. The transforming larvæ of the first brood fed for a period of about 22 days. The overwintering larvæ of the first brood had an average feeding period of 28 days. The female larvæ of the first brood fed for a longer period than the male. The average time spent by the transforming larvæ in constructing their cocoons was about 6 days.

"Approximately from 1 to 2 per cent of the first-brood larvæ transformed to first-brood pupæ. The remainder of the larvæ did not transform until the following spring (spring pupæ). Pupation of the first or summer brood commenced during the latter part of July. The average length of the first-brood pupal stage was 15 days. The first or summer brood of moths began to emerge just previous to mid-August and continued to issue for a period of about one month. Oviposition by moths of the first brood began about mid-August. The life cycle of the first generation was 51 days. The complete life cycle was about 55 days.

"The average incubation period of the second brood of eggs was 11 days. The average feeding period of the second-brood larvæ was 46 days. The female larvæ of the second brood fed for a longer time than the male.

"The hymenopterous parasite *Ascogaster carpocapsæ* was frequently reared. The well-known beetle enemy *Tenebrioides corticalis* was commonly found attacking codling moth larvæ.

"The codling moth in Maine may be controlled with one spray thoroughly applied as soon as the petals drop. Arsenate of lead, paste 2 lbs. or powder 1 lb., to each 50 gal. of water, is recommended."

The sugar cane bud moth (Loxostoma sp.), E. JARVIS (*Queensland Agr. Jour., n. ser., 3 (1915), No. 2, pp. 72–76, fig. 1*).—The Australian sugar cane bud moth (*Loxostoma* sp.), although usually of little economic importance, occasionally proves injurious to seed cane, sometimes as high as 80 per cent of the eyes in soft varieties being destroyed. It also feeds on the leaf sheath, gnaws the surface of the rind close to the buds, and often bores into the cane stalks, thus producing wounds that court disease through the invasion of fungi.

Technical descriptions are given of its several stages, together with a brief account of its habits, natural enemies, and control measures.

The grass moth (Remigia repanda), a pest of sugar cane, rice, and paragrass in British Guiana, G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana, 7 (1914), No. 4, pp. 171–177*).—This moth, *R. repanda* (*latipes*), has been a well-known pest for many years in British Guiana, although this is the first published account of its life history, habits, etc. It may be found throughout the year on sugar cane, rice, para grass, and other grasses throughout the coast lands of the colony. There are certain periods, particularly on the occurrence of rain after a prolonged drought, when it appears in vast hordes, completely destroying whole areas of these crops. It also occurs in several of the interior districts. It recently occurred as a serious pest in Trinidad and is also known as a pest in Jamaica. These are the only available records of the occurrence of the pest in the West Indies and elsewhere.

Technical descriptions of the larval stages of this moth which have been published by H. G. Dyar[a] are included.

Flies in relation to disease.—Bloodsucking flies, E. HINDLE (*Cambridge, England: University Press, 1914, pp. XV+398, figs. 88*).—This volume, with the companion work by Graham-Smith on Nonbloodsucking Flies (E. S. R., 30, p. 552), covers the general subject of flies in their relation to disease. The author's object in preparing the book has been to collocate the more important observations concerning the part taken by biting flies in the transmission of disease. In doing this he has included notes on and tables for the separation of the flies, mosquitoes, etc., concerned and descriptions of the infections transmitted, but no account of the clinical symptoms of the various diseases has been attempted. Particular attention has been given to the life history and bionomics of the more important forms mentioned, to the manner in which the infection is conveyed, and to preventive measures.

After a short introduction follow chapters on the structure and classification of the Diptera, accompanied by a list of biting flies known to transmit any infection. Each family, including any such carriers of disease, is then dealt with separately and in most cases some important member of the family is described in greater detail. Usually the description of the infections immediately follows that of the family concerned in their transmission.

Two extensive lists are included, the one above mentioned giving species of Diptera supposed to convey infective agents, the other tabulating 241 species of known anophelines, their synonymy, and relation to malaria. References to the literature are given at the end of many of the chapters. In preparing the work the author has covered the literature on the subject up to the beginning of 1913.

Dr. A. F. A. King on mosquitoes and malaria, L. O. HOWARD (*Science, n. ser., 41 (1915), No. 1052, pp. 312–315*).—The author reviews the writings and

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[a] Proc. U. S. Nat. Mus., 23 (1901), pp. 276–280.

views of Dr. King in 1881, 1882, and 1883 in which he presented reasons why malaria would be found to be transmitted by mosquitoes.

The biology of the North American crane flies (Tipulidæ).—III, The genus Ula, C. P. Alexander (*Jour. Ent. and Zool., 7 (1915), No. 1, pp. 1–9, figs. 8*).—In continuation of the article previously noted (E. S. R., 32, p. 153) the author deals with the genus Ula and *U. elegans*.

Notes on the life history and anatomy of Siphona plusiæ, W. Bloeser (*Ann. Ent. Soc. Amer., 7 (1914), No. 4, pp. 301–309, figs. 10*).—This article relates to a tachinid, *S. plusiæ*, described by Coquillet in 1897 as bred from a cutworm, and now found by the author to be a parasitic in the larvæ of *Phryganidia californica* taken from oak trees at Palo Alta, Cal.

The house fly (Musca domestica), its structure, habits, development, relation to disease, and control, C. G. Hewitt (*Cambridge, England: University Press, 1914, pp. XV+382, pls. 3, figs. 101*).—This work consists of six parts which deal with the subject as follows: (1) The structure and habits of the house fly (pp. 1–86); (2) the breeding habits, life history, and structure of the larvæ (pp. 87–150); (3) the natural enemies and parasites of the house fly (pp. 151–185); (4) other species of flies frequenting houses (pp. 186–217); (5) the relation of house flies to disease (pp. 218–316; and (6) control measures (pp. 317–335).

In the preparation of the work the author endeavored to review the entire literature relating to this insect. It is not intended as a popular treatise on the subject, but primarily for the use of entomologists, medical men, health officers, and those similarly engaged or interested in the subject. A 36-page bibliography is appended and author and subject indexes are included.

A popular handbook on this subject by the author has been previously noted (E. S. R., 28, p. 560), as have several papers reporting investigations upon which this work is based in part (E. S. R., 24, p. 356; 31, p. 455).

Observations on the feeding habits of the stable fly, Stomoxys calcitrans, C. G. Hewitt (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 8 (1914), Sect. IV, pp. 37–42, pl. 1*).—The author deals with this subject under the headings of method of feeding, period of digestion, examination of fecal deposits, and frequency of feeding.

The author reports that he was unable, except in one case, to induce the flies selected for the purpose to take their first feed for at least 24 hours, although they were repeatedly placed on the skin. They usually fed readily between 24 and 48 hours after emergence. Records show that the average length of time occupied in feeding, based upon 22 engorgements, was 8.9 minutes when undisturbed. A summary of the results of feeding experiments conducted are presented in tabular form.

Cherry fruit flies, L. Caesar and G. J. Spencer (*Ontario Dept. Agr. Bul. 227 (1915), pp. 30, figs. 18*).—Two species of cherry fruit flies, namely, *Rhagoletis cingulata* and *R. fausta*, for which the names white-banded cherry fruit fly and black-bodied cherry fruit fly, respectively, are proposed, are said to cause much loss to cherry growers in Ontario. The insects are distributed here and there all over the Niagara district and probably in many of the other cherry districts of the Province. The percentage of wormy cherries in infested orchards varies from 5 to 99, many otherwise good orchards sometimes being so badly infested that the fruit can not be picked. Varieties like Early Richmond and early sweet cherries are almost exempt from attack, but all later sour and sweet cherries are infested, especially Montmorency and Morello. So far as known no other orchard fruit is subject to injury from the pest.

The black-bodied cherry fruit fly appears on the trees about a week earlier in the spring than the white-banded cherry fruit fly. In Niagara the former may usually be seen about the end of the first week in June, the latter about June 11. The adults are thought to live on an average about three weeks. Oviposition commences ten or twelve days after the adults emerge, the eggs being deposited just under the skin of the cherries. They hatch in about five days and the maggots become full grown in about 14 days. On leaving the fruit the larvæ work into the soil about an inch or go down cracks, if the surface is hard, and soon change to the puparia. They then remain dormant until the next June, when they change to flies and move about through the orchard.

Experiments in 1913 and 1914, both on large orchards and on caged trees, show that the insects can be easily and cheaply controlled by poisoning the adults before they can lay their eggs. "The best mixture to use is from 2 to 3 lbs. arsenate of lead (paste) to 40 gal. of water, sweetened with 1 gal., or nearly 1 gal., of cheap molasses (black strap). Arsenate of lead without the molasses will probably give almost as good results. Until the pest is nearly annihilated two applications should be given each year in badly infested orchards, the first about June 8, or about a week before Early Richmonds begin to ripen, the second application ordinarily about June 20, or about the time the Montmorencies are showing the first symptoms of the red blush. It is well to spray plum, apple, and pear trees that happen to be among or very close to the cherry trees, as the flies rest and feed on their foliage also. Early varieties of cherries should not be given the second application, as they are then too near picking time.

"Two years' treatment should free an orchard of the pest, unless fresh infestation comes from outside sources. . . . The cost of spraying trees 14 years of age twice should not be more than 5 cts. per tree. This includes cost of mixture, labor, and horse. . . . Close observations for two years in five orchards, along with some special tests, show that bees are not attracted to the poison, and that there is no danger of poisoning them if the directions given above are followed."

A bulletin by Illingworth reporting studies of these pests in New York has been previously noted (E. S. R., 29, p. 55).

The ravages, life history, weights of stages, natural enemies, and methods of control of the melon fly (Dacus cucurbitæ), H. H. P. and H. C. Severin and W. J. Hartung (*Ann. Ent. Soc. Amer., 7 (1914), No. 3, pp. 177–212, figs. 57*).—A report of studies based upon observations in Hawaii in which the authors consider the native home, field observations in a pumpkin patch, food plants, life history, natural enemies, methods of control, etc. A report of studies of this pest by Back and Pemberton has been previously noted (E. S. R., 32, p. 452).

A bibliography of 11 titles is appended.

The progress of Scymnus bipunctatus, H. S. Smith (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 12, p. 535, fig. 1*).—A colony of several thousand adults of this lady beetle, reared from specimens obtained in the Philippines by the author in the fall of 1913 and liberated in June, 1914, at Alhambra, is said to have been found breeding by thousands on lemon trees. It is expected that it will be of considerable value in controlling the citrus mealy bug (*Pseudococcus citri*).

Some notes on life history of lady beetles, Miriam A. Palmer (*Ann. Ent. Soc. Amer., 7 (1914), No. 3, pp. 213–238, pls. 2*).—Biological notes are here presented on the more common coccinellids found in Colorado, namely, *Hippodamia convergens, Coccinella 5-notata, C. monticola, C. 9-notata, Adalia melanopleura A. annectans, A. coloradensis, A. humeralis, Olla abdominalis, H. sinuata, H. parenthesis, C. sanguinea*, and *Scymnus* sp. Special attention is paid to the duration of the life cycle and the habits regarding egg laying and feeding, with incidental observations on injurious influences and other points. Descriptions are given of the beetles in all stages, which are also illustrated in color.

The violet rove beetle, F. H. CHITTENDEN (*U. S. Dept. Agr. Bul. 264* (*1915*), *pp. 4, fig. 1*).—*Apocellus sphæricollis*, known as the violet rove beetle, has been reported from time to time since 1901 as an enemy to violets and other succulent ornamental plants in the District of Columbia and at St. Louis, Mo. The injury is caused by its feeding on the flowers and leaves. Since the beetle lives normally, like others of its kind, on old dead leaves or in soil covered by leaves over winter, the use of decaying leaves deposited in piles at regular intervals about infested plants will serve as a trap for them, and they may be readily destroyed by dipping in hot water or otherwise. Sterilization of the leaves used as a mulch will bring about the destruction of the insect and prevent its introduction into the greenhouse or flower bed.

The small sweet potato weevil (Cryptorhynchus batatæ), L. A. WHITNEY (*Mo. Bul. Com. Hort. Cal.*, *4* (*1915*), *No. 3*, *pp. 162–164*, *figs. 5*).—While this pest has not become established in California it is said to have been taken in quarantine repeatedly; in some shipments inspected fully 50 per cent of the tubers examined had been riddled by the larvæ.

Recent studies of the Mexican cotton-boll weevil, B. R. COAD (*U. S. Dept. Agr. Bul. 231* (*1915*), *pp. 34*, *fig. 1*).—This is a report of investigations conducted by the author in connection with and in continuation of those previously noted (E. S. R., 31, p. 458).

Among the more important observations noted are those relating to longevity of adult weevils, it having been found in an experiment during 1914 at Washington, D. C., that they may be kept in a dormant state for more than a year; reproduction, including the length of periods in the life of the adult weevil; rate of oviposition, etc.; incubation period of the egg; total developmental period; generations; important food adaptations, etc.

Bee keeping for profit, W. S. MORLEY (*London: Cassell & Company, Ltd.*, *1914*, *pp. 124*, *pls. 8*).—A popular handbook.

The orientation of ants and the orientation problem in general, R. BRUN (*Die Raumorientierung der Ameisen und das Orientierungsproblem im allgemeinen. Jena: Gustav Fischer, 1914, pp. VIII+234, figs. 51*).—A critical experimental study and a contribution to the mneme theory. A bibliography of 124 titles is included.

Chalcidids of the genus Isosoma injurious to grain crops in Russia, M. N. RIMSKY-KORSAKOV (*Trudy Bi͡uro Ent.* [*St. Petersb.*], *10* (*1914*), *No. 11*, *pp. 84*, *pls. 3*, *figs. 50*; *abs. in Rev. Appl. Ent.*, *2* (*1914*), *Ser. A*, *No. 7*, *pp. 470–473*).—This is a report of investigations conducted in the Government of Kherson. Five species of Isosoma were found of which two are described as new. It is pointed out that but little is as yet known of the biology of members of this genus in Europe.

[Studies of the Siphonaptera or fleas], C. FOX (*Pub. Health Serv. U. S.*, *Hyg. Lab. Bul. 97* (*1914*), *pp. 31*, *pls. 22*).—Three papers are here presented. The first relates to Some New Siphonaptera (pp. 7–17); the second consists of A Further Report on the Identification of Some Siphonaptera from the Philippine Islands (p. 18); and the third takes up The Taxonomic Value of the Copulatory Organs of the Females in the Order Siphonaptera (pp. 19–22).

A synopsis of the British Siphonaptera, N. C. ROTHSCHILD (*Ent. Mo. Mag.*, *3. ser.*, *1* (*1915*), *No. 3*, *pp. 49–112*, *pls. 8*).—The author recognizes 45 species of fleas representing 16 genera as occurring in Great Britain. The paper includes a synonymic catalogue of the species.

FOODS—HUMAN NUTRITION.

Composition of the grain, flour, and milling offals of four varieties of wheat, H. Hunter (*Dept. Agr. and Tech. Instr., Ireland Jour., 15 (1915), No. 3, pp. 550–562*).—Analytical data are reported regarding the composition of the grain, flour, and various milling by-products of Red Fife, Square Head Master, White Queen, and White Stand Up wheats. From the results obtained it is concluded that the differences in composition of these four wheats are the direct cause of differences in the flours and offals obtained in milling.

Durum wheat as a substitute for other varieties of grain in bread making, A. Caselli (*Agr. Colon.* [*Italy*], *9 (1915), No. 4–5, pp. 217–227*).—Analyses and baking tests reported of flours made from durum wheat and other grains indicate that this variety of wheat is very satisfactory for bread making.

The chemical composition of some corn-meal products and the digestibility of protein, Rammstedt (*Arch. Hyg., 81 (1913), No. 6, pp. 286–306; abs. in Hyg. Rundschau, 25 (1915), No. 3, p. 108*).—The results of a number of analyses are reported comprising the chemical composition of corn, wheat, and rye flours. Values are also given for the digestibility of the protein content of flours prepared from peas, lentils, beans, corn, wheat, buckwheat, and rye, as determined by artificial digestion at from 38 to 40° C., for 24 hours, with a pepsin-hydrochloric acid solution.

The chemistry of rice polishings, H. Fraser and A. T. Stanton (*Lancet* [*London*], *1915, I, No. 20, pp. 1021, 1022*).—The experimental data previously reported (E. S. R., 31, p. 555) are reviewed in the light of recent investigations by other workers.

On the nature of the sugars found in the tubers of sweet potatoes, K. Miyake (*Jour. Biol. Chem., 21 (1915), No. 2, pp. 503–506*).—An analytical study of the nature of the sugars in the sweet potato is summarized as follows:

"Sugar of the sweet potato tubers is made up of both reducing and nonreducing sugar. The reducing sugar consists of both glucose and fructose, while the nonreducing sugar is sucrose. The presence of pentose, galactose, and mannose molecules is excluded. The presence of maltose is also excluded."

On the nuclein bases found in the shoots of Aralia cordata, K. Miyake (*Jour. Biol. Chem., 21 (1915), No. 2, pp. 507–509*).—The results are reported of a study of the chemical nature of the nuclein bases found in the shoots of *Aralia cordata*. The presence of guanin and xanthin was detected; adenin and hypoxanthin were not found present.

Are the hardened fats suitable food for man? P. O. Süssmann (*Arch. Hyg., 84 (1915), No. 2–3, pp. 121–145*).—Results are reported of the analysis of a number of samples of hardened sesame, peanut, and cotton-seed oils, which were found to contain from 1 to 1.1 mg., 1.6 to 6.3 mg., and 0.07 to 0.4 mg. of nickel per kilogram of fat, respectively. Larger amounts of iron were detected, but these were regarded as having no hygienic significance.

In a series of feeding experiments with dogs as much as 0.75 per cent of the body weight of hardened fat was eaten daily without noticeable disturbances. The author concludes that the amount of nickel present in the hardened fat is too small to produce any ill effects, and that these fats are in every way suitable for human food.

Does butter fat contain nitrogen and phosphorus? T. B. Osborne and A. J. Wakeman (*Jour. Biol. Chem., 21 (1915), No. 1, pp. 91–94*).—A more or less controversial article, which presents further analytical data in support of the contention that the growth-stimulating properties of butter fat are not due to the presence of nitrogen or phosphorus. Earlier work has been noted (E. S. R., 33, p. 262).

Chemical composition of Hungarian flower honeys, S. Weiser (*Kísérlet. Közlem., 18 (1915). No. 2, pp. 365. 366*).—Analytical data are given regarding a number of samples of honey made from several different flowers.

Molasses, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 312 (1915), pp. 21*).—Analytical data are given regarding 140 samples purchased in Canada as molasses. Of these, 75 contained less than 40 per cent of cane sugar, and are questioned by the author as to their suitability for food purposes. In his opinion they should be sold under the name of black strap rather than molasses. Thirty-eight samples contained more than 5 per cent of ash. The need for a legal standard for molasses is urged.

Economical electric cooking.—Competition of electricity with gas and coal requires conservation of heat energy and utilization of economical temperature, P. W. Gumaer (*Engin. Mag., 49 (1915), No. 4, pp. 580–583, figs. 6*).—From the results of an extended series of experiments as to the economy of electric cooking the author gives the ranges of temperature at which the oven should be maintained for the most economical baking of bread and cakes and the roasting of meats.

Report of the Committee on Terminals and Transportation of the New York State Food Investigating Committee, W. C. Brown, F. W. Stevens, and G. M. Tucker (*Albany: J. B. Lyon Company, 1913, pp. 39*).—A report of an investigation to determine the effect of railroad rates, railroad terminal facilities, and railroad service upon the cost of foodstuffs in New York City, Albany, Syracuse, and Buffalo during the past 10 years. One conclusion drawn from the data presented is that the tendency of railroad rates has been downward, and that they represent a very small part of the ultimate price of foodstuffs. A number of recommendations are made as to improvement in methods of freight distribution.

A statistical study of the relation of pellagra to use of certain foods and to location of domicile in six selected industrial communities, J. F. Siler, P. E. Garrison, and W. J. McNeal (*Arch. Int. Med., 14 (1914), No. 3, pp. 293–373, figs. 29*).—This statistical study was made in six cotton-mill villages in Spartanburg County, South Carolina. Records were obtained of the frequency of use of certain elements of diet and of the general sanitary condition of the houses, as well as information regarding the association with pellagra of the inhabitants. The following conclusions are drawn by the authors:

Pellagra spread from a preexisting case as a center in the six villages here studied. It was transmitted to new victims only through very short distances and chiefly to those immediately associated in the home with a preexisting case of the disease.

Frequent use of corn meal as an article of diet was not a factor in the causation of pellagra in these villages, and there was discovered no evidence that canned goods have anything to do with its causation. The frequent, even daily, use of fresh meat and of eggs afforded no relative protection. The daily use of milk seemed to diminish to some extent the danger of contracting pellagra in 1912 and 1913, although its use did not fully insure against the development of the disease.

Studies on the digestion of cooked meat in the case of dogs, E. Zunz (*Biochem. Jour., 9 (1915), No. 1, pp. 17–35*).—In continuation of previous work (E. S. R., 32, p. 256), the author reports further analyses of the stomach contents of laboratory animals (dogs) after the ingestion of meat to determine the character of the protein decomposition products as an index to the protein metabolism.

Contribution to the knowledge of the utilization of vegetable protein by the animal organism, H. Boruttau (*Biochem. Ztschr., 69 (1915), No. 3–4, pp.*

225–244).—Feeding experiments with laboratory animals (dogs) are described from which the author concludes that vegetable proteins are equal to animal proteins in supplying essential amino acids, provided the protein of the bran is rendered available and a sufficient variety of plant food is supplied.

The specific heat of muscle protein and its significance with regard to the heat of combustion, O. KRUMMACHER (*Ztschr. Biol., 65* (*1915*), *No. 7–8, pp. 355–364*).—The author reports a number of measurements of the specific heat of muscle protein from which it is deduced that its heat of combustion at 37° C. is 0.15 per cent greater than at 17°.

The digestion and absorption of protein and fat in normal and depancreatized animals, E. W. H. CRUICKSHANK (*Biochem. Jour., 9* (*1915*), *No. 1, pp. 138–155*).—In feeding experiments with laboratory animals (dogs) the absorption of nitrogen was studied in the case of normal animals given low and high protein and low and high fat diets. The variations from these results when the animal was partially depancreatized, totally deprancreatized, and when raw pancreas was added to the diet were also determined.

The results obtained showed that the removal of the pancreas caused an immediate and serious disturbance of the digestion of both protein and fat.

The metabolism of creatin and creatinin.—VII, The fate of creatin when administered to man, V. C. MYERS and M. S. FINE (*Jour. Biol. Chem., 21* (*1915*), *No. 2, pp. 377–381*).—Two feeding experiments are described in which the authors served as subjects. Living on meat and meat extract free diets for 12 and 13 days, they ingested 1 gm. of creatin on the seventh day and increased the amount until on the eleventh day 5 gm. was taken. From the increased excretion of creatinin in the urine, it is concluded that the increase in the creatinin excretion actually comes from the administered creatin.

The metabolism of creatin and creatinin.—VIII, The presence of creatinin in muscle, V. C. MYERS and M. S. FINE (*Jour. Biol. Chem., 21* (*1915*), *No. 2, pp. 383–387*).—Results are reported of analyses to determine the creatinin content of fresh muscle from the rabbit, cat, and dog, and from human bodies. The authors conclude that these results strongly support the view held by others and themselves that the urinary creatinin originates chiefly in the muscle tissue.

The metabolism of creatin and creatinin.—IX, The creatin content of the muscle of rats fed on isolated proteins, V. C. MYERS and M. S. FINE (*Jour. Biol. Chem., 21* (*1915*), *No. 2, pp. 389–393*).—In this paper data are given showing the creatin content of the muscle of rats fed on isolated proteins (casein, edestin, and lactalbumin). The results indicate, in the opinion of the authors, that the creatin content of rat muscle varies within comparatively narrow limits, and that the concentration of muscle creatin is only slightly influenced by feeding proteins containing varying quantities of arginin.

Does the cholesterin of the diet exert an influence on the excretion of cholesterin in the bile? L. D'AMATO (*Biochem. Ztschr., 69* (*1915*), *No. 3–4, pp. 217–224*).—Feeding experiments are reported in which dogs having an artificial gallic fistula were maintained on a diet rich in lipoid material. A constant, although very small, increase in bile cholesterin and bile salts was noted.

Bodily changes in pain, hunger, fear, and rage, W. B. CANNON (*New York and London: D. Appleton & Co., 1915, pp. XIII+311, figs. 39*).—This book brings together and discusses the results of recent investigations in this field of physiology. The chapters on the effect of the emotions on digestion and the nature of hunger are of special interest to students of nutrition.

A study of prolonged fasting, F. G. BENEDICT (*Carnegie Inst. Washington Pub. 203* (*1915*), *pp. 416, pls. 7, figs. 46*).—This publication reports observations made upon a human subject who underwent a continuous fast for 31 days.

The subject of the experiment subsisted entirely without food, but ingested 750 cc. of water daily. In order to investigate completely the physiological and psychological conditions prevailing at intervals during the fasting period, measurements were made of body weight, body temperature, pulse rate, and blood pressure. These were supplemented by frequent blood tests and determinations of the mechanics of respiration by measuring the ventilation of the lungs, the alveolar air, and the respiration rate. In addition to these tests, records were kept of examinations of the urine, for the direct determination of nitrogen, acid and basic radicles, carbon, and energy. It was possible also to study the subject's mental attitude during the fast and to make psychological tests.

By means of the universal respiration apparatus was studied the influence of various factors upon the respiratory exchange, observations being made while the subject was at rest, while doing light work (writing), and while breathing air rich in oxygen. The metabolism was also studied by means of the respiration calorimeter, the subject sleeping each night in a body calorimeter.

The data are summarized to describe the nature and extent of the catabolism, including both material and energy losses from the body.

Basal metabolism and body surface—a contribution to the normal data, J. H. MEANS (*Jour. Biol. Chem., 21 (1915), No. 2, pp. 263–268, figs. 2*).—Determinations are reported of the basal metabolism of 16 normal subjects, using the Benedict universal respiration apparatus. The surface area was also calculated by the formulas used by other investigators, and the accuracy of these formulas is discussed.

The water content and temperature of expired air, G. GALEOTTI (*Pflüger's Arch. Physiol., 160 (1914), No. 1–3, pp. 27–41, fig. 1*).—This paper reports a study of the actual water content of expired air under normal conditions and as affected by the humidity and temperature of the environment. The temperature of the exhaled air was studied with regard to its humidity, the regularity of breathing, the influence of inhaling warm air, and the effect produced by a cold bath.

The temperature of the expired air was found to vary from 34.4° to 35.7° C. at a room temperature of from 16° to 25°. Both the temperature and the humidity of the environment influenced these factors in the expired air. The effect of the cold bath was to lower the temperature of the air. As a result of these observations the author concludes that the vasomotor condition of the lungs influences the temperature and consequently the water content of the expired air.

The temperature of expired air, G. GALEOTTI, V. SCAFFIDI, and O. BARKAN (*Arch. Ital. Biol., 62 (1914), No. 3, pp. 411–420*).—Measurements are reported of the temperatures of the body and of the expired air under normal conditions, after fatigue, and under the influences of cold and cutaneous vaso-dilation.

At a room temperature of 10° C., that of the expired air was 33 to 34°. By increasing the temperature of the environment (16 to 25°) the temperature of the expired air was raised somewhat (34.4 to 35.7°). After fatigue this value remained within normal limits. These experiments are supplementary to those reviewed above.

Researches on the exchange of energy in live animal tissues.—I, Microcalorimetry applied to animal tissues, A. O. DEALMEIDA (*Amer. Jour. Physiol., 37 (1915), No. 3, pp. 505–514, figs. 2*).—The author describes the technique and apparatus employed in experiments designed to measure the heat developed by animal tissue separated from the organism.

Investigations at the nutrition laboratory of the Carnegie Institution of Washington, Boston, Massachusetts, F. G. BENEDICT (*Science, n. ser., 42*

(*1915*), *No. 1072, pp. 75–84, fig. 1*).—In this address the author discusses various phases of the work of the laboratory and describes some of the apparatus used. The results of experiments, most of which have been noted from other sources, are briefly summarized.

ANIMAL PRODUCTION.

Foodstuffs for animals and their valuation, F. A. STOCKDALE (*Mauritius: Dept. Agr., 1915, pp. 5*).—Analyses are given of cane tops, manioc, sweet potatoes, wheat bran, rice bran, coconut meal, cotton-seed meal, and molasses.

Some facts about concentrated feeds, W. H. STROWD (*Wisconsin Sta. Bul. 253* (*1915*), *pp. 60, fig. 1*).—Analyses are given of oil meal, cotton-seed meal, gluten feed, distillers' dried grains, hominy feed, bran, wheat, middlings, shorts, flour middlings, red dog flour, germ middlings, rye middlings, rye bran, barley shorts, buckwheat bran, dried brewers' grains, dried brewers' yeast, malt sprouts, alfalfa meal, tankage, blood meal, meat scrap, bone meal, tankage, molasses feed, corn, corn-soy bean silage, alfalfa hay, dried potato peelings, wet vinegar refuse, and various mixed and proprietary feeds.

Vine prunings as fodder, F. DE CASTELLA (*Jour. Dept. Agr. Victoria, 13* (*1915*), *No. 5, pp. 310–314*).—Successful experiments in feeding vine prunings to cattle, sheep, and horses are reported.

Silage feeding, C. I. BRAY (*Oklahoma Sta. Circ. 36* (*1914*), *pp. 2–8*).—This circular gives general information on the feeding of silage to live stock.

The comparative values of cotton-seed, cotton-seed meal, and corn, as shown by chemical analyses, C. K. FRANCIS (*Oklahoma Sta. Circ. 37* (*1914*), *pp. 4*).—Data as to the composition and digestible nutrients of raw cotton-seed and cotton-seed meal are given. Suggestive rations for beef cattle and dairy cows are included.

Coconut cake and palm-nut kernel cake (*Jour. Bd. Agr.* [*London*], *21* (*1915*), *No. 11, pp. 1025–1032*).—Data are summarized as to the average composition of coconut cake and palm-nut cake and digestibility coefficients, and a general résumé of experiments in feeding these products is included.

It is said that palm-nut kernel and coconut cakes or meals are valuable feeding stuffs, particularly for milch cows. They are also useful for replacing oats for horses, but are probably of less value for fattening steers, sheep, and pigs.

The feeding value of refuse brewers' yeast: Hungarian experiments, J. SCHANDL (*Köztelek* [*Budapest*], *24* (*1914*), *No. 76, pp. 2658, 2659; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 2, pp. 276, 277*).—The composition of brewers' yeast is given as moisture 87.67 per cent; protein, 6.69; fat, 0.14; nitrogen-free extract, 4.49: and ash, 1.01.

It is said that the product can not be used for feeding purposes as it comes from the brewery, owing to the danger of abnormal or excessive fermentation in the stomach of the animal, and to its bitter taste and strong smell. After subjecting it to a simple cooking process it was readily accepted by sheep and pigs, but cows and horses refused to touch it until after 24 hours, when the disagreeable taste and smell had disappeared.

In an experiment in which two rams were fed 1.5 lbs. of chopped clover and 0.5 lb. of yeast the digestibility coefficients of the yeast were dry matter, 89 and 54 per cent; protein, 97 and 86 per cent; and nitrogen-free extract 82 and 86 per cent, respectively.

In experiments with five cows fed in three periods of 30 days each, as follows: First and third periods 4.4 lbs. of sunflower cake, second period 2.2 lbs. of sunflower cake and 11 lbs. of yeast, it was found that the yeast exerted no specific influence on the yield of milk.

It is said that the following quantities of the yeast per 1,000 lbs. live weight may safely be fed: Horses, 4 lbs.; cows, 10 lbs.; sheep, 5 lbs.; and pigs, 10 lbs.

The action of taka-diastase on the digestive power of the healthy animal, S. SAWAMURA (*Jour. Col. Agr. Imp. Univ. Tokyo, 5 (1915), No. 3, pp. 271–281*).—From feeing trials with a sheep it is concluded that the addition of 0.5 gm. of taka-diastase to a basal ration of hay, bran, and starch did not increase the digestibility of the starch, but that of crude fiber was slightly augmented. The quantity of digestible protein was practically the same as where the basal ration alone was fed, from which it is concluded that the addition of taka-diastase did not increase the secretion of digestive enzyms in the animal body.

In a second trial with two sheep in which 1 gm. of taka-diastase was added to the basal ration, the digestibility of the starch was increased, as was also that of the crude fiber and protein. The addition of the taka-diastase apparently slightly diminished the secretion of the digestive enzyms.

The results of these experiments indicate that the addition of a very small dose of a digestive enzym to the feed of a healthy animal has no effect on the digestion, but that when taka-diastase is given in a quantity corresponding to the $\frac{1}{40,000}$ part of the live weight the digestion of starch is somewhat augmented by it, and that of protein is also increased. However, as the increase of the digestibility of starch is very small, it is not deemed economical to use any digestive enzym in the feeding of domestic animals.

A new method (Kjelleström) for the determination of the live weight of cattle, E. MASCHERONI (*Indus. Latt. e Zootec., 13 (1915), No. 7, pp. 100–102, fig. 1*).—A method for the determination of the live weight of cattle is described, certain measurements of length and heart girth being used.

The cost of maintenance of cattle as influenced by condition, previous plane of nutrition, age, season of the year, length of time on maintenance, type, and size of animal, P. F. TROWBRIDGE, C. R. MOULTON, and L. D. HAIGH (*Missouri Sta. Research Bul. 18 (1915), pp. 5–62, figs. 17*).—These studies were made with 26 steers. A portion of the steers were selected as calves, full fed for four months, and assigned to lots. Lot 1 was full fed and crowded, lot 2 was fed for maximum growth without laying on appreciable fat, and lot 3 was fed for retarded growth, about ½ lb. grain daily when yearlings. Collectively the three lots were known as the "use of food" group. Another portion of the steers belonged to a group known as the "regular-maintenance" group. A third group was called the "special-maintenance" group. They were full fed until 11 months old, when they were divided into three lots, one lot being held at maintenance, a second lot being allowed to gain ½ lb. per day, and a third lot losing ½ lb. per day.

Three other steers were full fed for several months. Then followed 30 days of submaintenance or loss of weight, and then maintenance for 60 days. One of these steers was then full fed for four months and nine days, put on maintenance for 240 days, again full fed for five months, and finally put on maintenance for 110 days. This trial ended one month before slaughtering. A second steer, after the above treatment, for three months was fed a maintenance ration plus one-half the productive feed above maintenance fed to the first steer, was then put on maintenance for 290 days, again fed as above for five months, and finally put on maintenance for 110 days. This trial ended about five months before slaughtering. The third steer, after the same preliminary treatment accorded the two preceding steers, was for three months and nine days fed a maintenance ration plus one-fourth of the productive feed above maintenance fed the first steer. Then followed 280 days of maintenance, a second feeding period of five months, and a final maintenance period of 110 days, which ended three months before slaughtering.

The "use of food" steers were fed half as much hay (alfalfa) as grain, and the grain consisted of corn chop, whole oats, and linseed meal 6 : 3 : 1. The other two groups were fed four-tenths as much hay as grain, and the grain consisted of corn chop and linseed meal 8 :1. Weights, measurements, and analyses were made.

The authors conclude from their studies that "the mass of active body tissue, measured by the active body nitrogen, is a good medium of reference for maintenance costs. The relative surface area of cattle is a measure of the relative energy needs. The proportion of surface area to the two-thirds power of the live weight is shown to vary with the condition of the animal, but to be fairly constant for a given condition. The specific gravity of the blood of beef cattle is shown to be fairly constant with an average value of about 1.0510. Poorer nutrition seems to give a lower specific gravity. The proportion of blood to animal is shown to vary with the condition of the animal, but to be fairly constant for a given condition.

"An average consumption of 0.826 gm. of digestible nitrogen and 170 metabolizable calories of energy per 100 gm. of active body nitrogen per day are sufficient for maintenance. The consumption of energy per square meter of surface was 2,435 calories per day. Per kilogram of blood it required 3.31 gm. of digestible nitrogen and 667 calories of energy. In the customary units per 1,000 lbs., 0.889 lbs. of digestible protein and 12.92 therms of metabolizable energy sufficed for maintenance.

"Condition alone seems to have no effect upon the cost of maintenance. The cost of maintenance is high after a previous full-fed period, and the higher the previous plane of nutrition the greater this increase in cost. The cost of maintenance decreases with increasing age. The cost of maintenance is least in the spring and greatest in the winter. During the other seasons it is intermediate. A long maintenance trial seems to cause a lowering cost, but age and previous treatment are strong contributory causes. Great activity causes a higher maintenance cost. Poor thrift and high cost of maintenance seem to go together. The heavier the animal the greater the cost of maintenance in energy per unit of surface area. This is due to a relatively smaller surface area as well as to the heavier weight sustained."

Growth of pasture animals, FALKE (*Arb. Mitt. Deut. Gesell. Weidew. u. Viehzucht Leipzig, No. 1 (1914), pp. 31, fig. 1*).—The advantages of raising spring calves are pointed out, it being shown that during the first six months the most rapid and cheapest growth is made, that a summer's feeding on pasture puts calves in a position to undergo a rigorous winter, and that their subsequent gains are more rapid.

Calf-feeding experiment, 1914, P. H. FOULKES, A. ANDREWS, and J. B. GARNETT (*Field Expts. Harper Adams Agr. Col., Salop and Staffordshire, Rpt. 1914, pp. 19–21, fig. 1*).—Four lots of 4 calves each were fed 10 weeks as follows: Lot. 1, 6 qt. of new milk daily per calf; lot 2, new milk gradually replaced by a gruel made from a home-mixed calf feed consisting of oatmeal, linseed meal, and corn meal 2 : 1 : 2; lot 3, new milk gradually substituted by a calf meal consisting of ground linseed, linseed cake meal, flour, and bean meal 5 : 14 : 2 : 2; and lot 4, 6 qt. separated milk, 2 to 3 oz. cod liver oil, and ½ to 1 lb. crushed oats per day per calf. The average weekly gains per calf were 11.45, 7.1, 8.65, and 10.17 lbs., respectively, costing 7.25, 8.06, 5.34, and 2.8d. per pound of gain.

[Sheep-breeding experiments], P. H. FOULKES, A. ANDREWS, and J. B. GARNETT (*Field Expts. Harper Adams Agr. Col., Salop and Staffordshire, Rpt. 1914, p. 22*).—Ewes of the Improved Welsh breed were mated with pure-bred Ryeland, Romney Marsh, and Improved Welsh rams. The Ryeland cross proved to be the most desirable, both as to vigor and fattening qualities.

Effect of dips on wool, B. G. ENSLIN (*Union So. Africa Dept. Agr. Rpt. 1913–14, pp. 69–73*).—Experiments in which sheep were treated with various dips are reported. It is said that while wool treated with caustic soda and sulphur in certain proportions will be dissolved, a dipping fluid made of the proper proportions will not damage the wool. The effect of all alkaline soda salts, when they are used improperly, is to destroy the spinning qualities of the wool, but it is said that the damage caused by the improper use of alkalis is hardly likely to be greater than that caused by the scab mites, for wool from sheep which have suffered from scab is brittle and structureless and has lost both its spinning and felting qualities.

[Pig] feeding experiments, O. W. H. ROULSTON ET AL. (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Dept. Com. Irish Pig-Breeding Indus., 1914, pp. 12, 13*).—It was found that the average daily gain in weight made by a large number of pigs fed on barley, bran, or corn was practically the same. The pigs fed on barley produced a better quality of pork than those fed on corn.

In a feeding trial with 159 pigs, some fed during the summer and some in winter, on the average 4.13 lbs. of corn meal were consumed to produce 1 lb. of live weight, the maximum being 5.2 lbs. and the minimum 3.24 lbs. of meal. Pigs were fattened with less feed in summer than in winter. It was found that in a mixed feeding ration 4 lbs. of potatoes were approximately equivalent to 1 lb. of meal for fattening pigs. Though theoretically separated milk is about one-sixth of the value of corn meal, it was found that when it was fed to pigs with meal and potatoes it was actually worth almost one-third more than its theoretical feeding value, probably due to the greater relish with which the pigs consumed their feed.

A larger increase of weight was obtained in the early stages of fattening for the amount of feed consumed than in the later stages. Pigs fed either in summer or in winter on raw meals (steeped in water for from 1 to 12 hours) gave a higher daily gain than those fed on cooked meal, and the quality of pork was equally as good.

Swine-feeding experiments with a sugar feed, RICHARDSEN (*Landw. Ztschr. Rheinprovinz, 16 (1915), No. 23, pp. 374, 375*).—Successful experiments are reported in which 24 kg. of a sugar feed daily per 1,000 kg. live weight were fed in addition to a basal ration of corn meal and fish meal and blood or meat meal. The sugar appeared to increase the digestibility of the entire ration and to improve the quality of the flesh.

The value of fish and meat meals for fattening pigs, G. MARTINOLI (*Rev. Centro Estud. Agron. y Vet., 7 (1914), No. 72, pp. 258–270; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 445, 446*).—From results obtained in experiments comparing the relative feeding value of fish and meat meals it was concluded that in fattening pigs from the earliest age fish meal proved of value in developing the skeleton and in stimulating the appetite and the processes of assimilation. The animals fed on fish meal grew more rapidly than those fed on meat meal, and they were of superior quality. Neither the fish nor meat meal imparted any particular smell or taste to the flesh.

Artificial impregnation of mares, O. VON NEMESHEGNI (*Deut. Landw. Tierzucht, 18 (1914), No. 32, pp. 383, 384, fig. 1*).—A number of successful trials in artifically impregnating mares are reported. The results show that 5 cc. of the spermatic fluid is sufficient to impregnate one animal.

Care and training of trotters and pacers, A. C. THOMAS and W. H. SHIELDS (*Chicago: Chicago Horseman Newspaper Co., 1915, 3. ed., pp. 176, figs. 6*).—

The topics discussed in this book are the suckling colt, the weanling colt, making speed with yearlings, preparing for 2-year-old futurities, 3-year-olds, shoeing colts, defects in gait, types of shoes, feeding, grooming, and other related subjects.

The historical development of poultry husbandry in Germany, A. BEECK (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 8, pp. 57–60, 61, 62*).—A résumé of the development of the poultry industry in Germany.

A poultry survey of the city of Ithaca, O. B. KENT (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 6, pp. 45–47*).—Data are given on the sources of supply and the consumption of eggs and poultry in Ithaca, N. Y.

Animal food for poultry, H. W. JACKSON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 7, pp. 53, 54*).—The author reviews available experimental work on feeding animal food to poultry, in which it appeared that meat-fed chicks made quicker and cheaper gains than others, regardless of size, and that chicks started on a ration deficient in animal food never regained their lost ground. He also reports his own experiments, in which hens without meat generally began laying before meat-fed hens and maintained their position for weeks and even months on such rations. He concludes that although the work done by most investigators has usually shown a decided superiority for the meat-fed laying hens, there is sufficient evidence the other way to warrant further investigation. In the fattening of fowls animal food has appeared to be essential to the best results, except when milk has been used, but of the various sources there seems to be little preference aside from convenience or economy.

The substitutes for animal food in common use are milk, milk albumin, or dried milk, vegetable sources of protein, and bone ash or phosphate sources. Milk albumin has not generally given good results. Milk, sour or otherwise, has given conflicting results. Vegetable protein when used under favorable conditions has often given as good results as when protein from animal sources has been used. Results of feeding bone ash or some carrier of phosphorus indicate that some of the advantage that has been claimed for animal protein may possibly be due to the mineral matter contained in the meat scrap or cut bone.

The value of mineral elements in poultry feeding, M. A. JULL (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1914), No. 2, pp. 1–3*).—Experiments are cited which show that mineral elements are essential for the functioning of the vital processes as well as for the development of bone and eggs.

A résumé of chick feeding, CLARA NIXON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 6, pp. 47, 48*).—This summarizes the principal results of chick feeding experiments at the various experiment stations.

Report of second twelve months' poultry laying competition, 1913–14, at Harper Adams Agricultural College, Newport, Salop, W. BROWN (*Field Expts. Harper Adams Agr. Col., Salop and Staffordshire, Rpt. 1914, pp. 83, figs. 6*).—This reports a second egg-laying competition (E. S. R., 31, p. 472) in which the various breeds of poultry were compared.

It was found that a steady, though small, amount of fish meal tends to produce a constant supply of eggs. The amount used was only 2.4 per cent of the total feed given. It is believed to be a mistake to give a full meal in the afternoon, since this tended to increase the number of soft-shelled eggs. The birds yielded a larger number of eggs if they were fed gradually during the day and given only a light feed at night. They consumed about 89.05 lbs. of feed per bird during the 12-months period, the heavy breeds consuming 91.07 lbs. per bird and the light breeds 86.55 lbs.

Inbreeding.—Its effect on vigor and egg laying, J. DRYDEN (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 3, p. 19*).—The author reports the results of his studies at the Oregon Experiment Station.

"From different matings where the son was bred to the mother, the pullet offspring showed a lower average egg yield than others not inbred. There was greater variability in production from the inbred pullets; that is, there was a wider range between the highest and lowest individual records than was the case with those not inbred. The vigor of the laying stock as shown by the mortality records was lowest in the inbred stock. The vigor of the offspring as shown by the mortality records of the chicks was lowest in the inbred stock. There was a lower fertility of eggs in the inbred stock. So far as fixing the character of egg production is concerned, inbreeding proved a failure."

The author states that in all his experiments with heavy layers, with one or two exceptions, a high record hen has never been secured by inbreeding or line breeding. The average result from inbreeding has been lower than from outbreeding.

Additional data on effect of castration in domestic fowl, H. D. Goodale (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 3, pp. 23, 24*).—This continues work conducted at the Oregon Experiment Station and previously noted (E. S. R., 29, p. 69).

It was found that "castration of the male brings about comparatively small changes in the secondary sexual characters. A capon is externally like the male, except that the comb and wattles remain small for a long time. Moreover, they do not as a rule crow or tread the hens. However, in some capons kept for a number of years the comb and wattles began to grow after eighteen months of age, eventually reaching a large size. These birds crow and exhibit sexual reactions. Castrated drakes, too, develop the plumage of the normal male. Those castrated completely possess one peculiarity, however, in that they do not assume the summer plumage, but, although molting frequently, always retain the so-called breeding plumage.

"On the other hand, the female, whether duck or fowl, from which the ovaries have been completely removed always develop male characters in large measure, though the degree to which these characters develop varies somewhat. In some individuals of each species the assumption of the male plumage has been practically complete. The castrated pullets look very much like capons, but have short legs. Sometimes, however, the comb and wattles become relatively large. The reason for this, perhaps, is to be found in a compensatory hypertrophy of the Wolfian body and duct observed in one instance, which seems to persist in some normal females for some months at least. It is quite possible, too, that the comb and wattles of the male owe their development not so much to the spermatogenetic tissue as to the epididymis. In ducks, after the removal of the ovary, the plumage sometimes becomes exactly like that of the male. However, in no instance has it been observed that the color of the upper mandible became like that of the drake, nor has a duck been observed which developed the male's voice, though in some instances they are unable to produce a normal 'quack.' In some instances, too, the castrated ducks develop the summer plumage. There is, however, a class of females which after castration do not develop typical male plumage, but acquire a distinctive type, which is made up of numerous feathers of the male breeding plumage type and a second type bearing a close resemblance to the feathers of the male's summer plumage. In some sections these last are often like those of the female. These females are undoubtedly constitutionally different from the others. Thus far all pure-bred females have belonged to the types just described, while those females which develop the most perfect male plumage have always been hybrids.

"In a number of instances the complete removal of the ovary has not been effected, but minute portions remained behind. In these instances the new feathers which developed immediately after the operation were like those of the male, but those which developed still later were female. Many were partly male and partly female, the male portion in some instances being separated by a clear-cut transverse line from the female part. A regenerated ovary has been found in all such instances. In birds which were molting when completely ovariotomized the partly grown feathers exhibited the first sign of male characters about ten days after the operation, so that it seems probable that the change in the mode of development must take place almost immediately. . . .

"We may conclude, therefore, that while both the ovaries and testes produce internal secretions, their effect is quite different, that of the ovary being the most striking in that it is responsible for development of the female secondary sexual characters. Possibly, as a working hypothesis for birds, we may assume that the secondary sexual characters of the male, subject, of course, to the above observations on the comb, wattles, and crowing instinct, are common to each sex, but are modified in the female, under the influence of the ovary, into her characters. Hence, after castration the male characters develop while in the male no comparable change takes place."

On the ryhthm of egg production, H. D. GOODALE (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 3, pp. 18, 19*).—It has been observed at the Massachusetts Experiment Station that most hens lay for a period of several days and then skip one. The first day of a series the hen lays early in the morning. The time she lays the next day depends largely on the character of her particular rhythm. If the rhythm is such that she lays only every other day, she usually lays about the same time each day, i. e., 10 a. m., 0, 11 a. m., 0, 10 a. m., 0, 11 a. m. If she lays two days out of three, the first egg is laid during the morning and the second during the afternoon, i. e., 10 a. m., 3 p. m., 0, 10 a. m., 2 p. m., 0, 9 a. m., 1 p. m., 5 p. m., 0. As the period lengthens the number laid in the morning increases until the larger proportion are laid before noon. Thus, 8 a. m., 9 a. m., 10 a. m., 10 a. m., 10 a. m., 10 a. m., 9 a. m., 10 a. m., 9 a. m., 5 p. m., 11 a. m., 11 a. m., 5 p. m., 11 a. m., 11 a. m., 2 p. m., 2 p. m., 4 p. m., 0. There is, however, much variation.

Some hens lay every other day, or we may say, a $\frac{1}{2}$ rhythm, others $\frac{2}{3}$, that is, two days out of three, others $\frac{3}{4}$, and so on. None of these types are characteristic of any one hen. Many individuals, however, seem to center about a particular rhythm.

On the basis of winter egg production birds fall into three clases—high, mediocre, and zero producers. The dividing line between the high and mediocre producers came at about 30 eggs. There is great variation in the number of eggs laid by birds in the over-30 class. Broodiness, age, and time at which laying commences in the fall all influence the number of eggs laid. But aside from these factors birds of the same age, beginning to lay at approximately the same time, and which do not become broody, do not lay at the same rate.

With regard to rhythm and very high egg production, the curve of the winter egg production did not slope evenly to the base line, but formed a shoulder at 70 to 80 eggs. This shoulder is taken to be an indication, from a genetic standpoint, of a group of individuals differing genotypically in their capacity for egg producton from the remainder of the high class. The existence of this group is thought to be due in part to the high-frequency pullets.

Various causes may interfere with the normal rhythm, such as environment, season, method of management, and internal factor, as broodiness.

It has been found that there are hens which never lay an egg, but which visit the nests according to a very definite rhythm. The hours of such visits fall into the same sort of rhythm as normal hens. These facts point to the existence of some mechanism other than the formation and deposition of an egg which controls the extrusion of the egg. It is said that laying hens often visit the nest at the proper day and hour, but fail to lay. Such hens usually lay the day previous and the day after in regular routine, though at times they may pay two or more such nonproductive visits in succession.

The amount of carbon dioxid thrown off by eggs during the incubating process, H. Atwood and C. E. Weakley, Jr. (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 4, pp. 26–28*).—Work is reported from the West Virginia Station in which the carbon dioxid thrown off by nine eggs from three hens during incubation was determined.

It was found that as the incubating process goes on the carbon dioxid thrown off increases very rapidly. The loss of carbon dioxid during the last five days of incubation was about five-eighths of the total loss of carbon dioxid, twice as much as that given off in the third five days, ten times as much as that in the second five days, and almost fifty times as much as that in the first five days. In an incubator this carbon dioxid must be removed or at least kept below a certain maximum, which some investigators (E. S. R., 31, p. 172) have found to be 150 parts in 10,000. If this maximum is not to be exceeded, 100 fertile eggs will require 165 cu. ft. of fresh air to be passed over and around them on the twentieth day to keep the embryos from smothering.

A considerable excess of air was used in this test with no ill effect.

Peacock-guinea fowl hybrids, D. Brentana (*Mod. Zooiatro, Parte Sci., 25 (1914), No. 11, pp. 1001–1009, figs. 2; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 280, 281*).—An account is given of the hybridization between two guinea fowl hens and a peacock.

The hybrids resembled the peacock more in their general slender form, especially in the head and neck, although there was a noticeable absence of all the characteristic appendages of the head and the train was much reduced. The plumage exhibited striping, which is to be considered as the primitive type. It was of a dark fawn with black stripes in the lower part of the neck, becoming paler fawn with black specks in the region of the thorax, abdomen, and flanks.

Bibliography [of poultry literature] (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1914), No. 2, pp. 5–7*).—A bibliography of poultry literature published between July, 1913, and July, 1914.

DAIRY FARMING—DAIRYING.

The value of barley for cows fed alfalfa, G. H. True, F. W. Woll, and E. C. Voorhies (*California Sta. Bul. 256 (1915), pp. 423–445, figs. 7*).—Two lots of seven cows each, as nearly alike as possible with reference to breed, age, weight, and production, were fed during three periods of three weeks each by the reversal method, one lot receiving 30 lbs. per day of green alfalfa and alfalfa hay ad libitum, while the other lot received in addition approximately 1 lb. of barley to every 5 lbs. of milk produced by the cow.

During the alfalfa-barley periods the cows consumed an average of 210 lbs. of green alfalfa, 141 lbs. of alfalfa hay, and 42 lbs. of barley per head per week, and produced 183.3 lbs. of 3.6 per cent milk, or 6.65 lbs. of milk fat; during the alfalfa periods, 210 lbs. of green alfalfa and 153 lbs. of alfalfa hay, and produced 157.6 lbs. of 3.7 per cent milk, or 5.87 lbs. of milk fat.

Comparing the net increase in the cost of the rations incurred by feeding barley with the increased value of production, a profit of $4.78 was secured as a result of adding barley to the alfalfa ration, on the basis of selling milk at 16 cts. per gallon and including the value of the gain in weight by the cows at 5 cts, per pound. On the basis of butter fat sold at 33⅓ cts. per pound, a loss of $5.62 for the cows during the actual feeding of barley was obtained.

In a second and similar experiment with two lots of nine cows, fed during two periods of four weeks each by the reversal method, during the alfalfa-barley periods the cows consumed an average of 440 lbs. of green alfalfa, 95 lbs. of alfalfa hay, and 40.3 lbs. of barley per head per week, and produced 134.9 lbs. of 3.78 per cent milk, containing 17.3 lbs of solids and 5.08 lbs. of butter fat; during the alfalfa periods, 523 lbs. of green alfalfa and 98 lbs. of alfalfa hay, and produced 119.1 lbs. of 3.76 per cent milk, containing 15.1 lbs. of solids and 4.48 lbs. of butter fat. Larger gains in weight of the cows were made during the barley periods than when rough feed only was fed. The increase in the value of the products obtained as a result of feeding barley was not sufficient to pay for the grain fed, whether the calculations be based on whole milk at 16 cts. per gallon or butter fat at 33⅓ cts. per pound.

The results of the two experiments show that "an immediate increase in production will be secured as a result of the grain feeding, but that this increase will not, as a rule, pay for the extra cost of the ration. On account of the increased production obtained and the residual effect of the grain feeding, as well as its favorable influence on the condition of the cows and their offspring, it may be concluded, however, that the practice of feeding grain to cows on alfalfa is economically sound and may be recommended. This holds true, especially, for heifers and young cows, as well as for heavy-producing animals which can not be brought to a maximum production on roughage only, even if this be as excellent and palatable a feed as green alfalfa or good alfalfa hay."

Prolificacy in the breeds of dairy cattle (*Guernsey Breeders' Jour., n. ser., 7 (1915), No. 7, pp. 18, 19, fig. 1*).—A comparison of the various breed associations as regards number of registrations, increases in registration during the past decade, and extent of importations.

Holstein makes new world's record (*Breeder's Gaz., 67 (1915), No. 25, p. 1207*).—It is said that the world's record for fat production has been broken by the Holstein cow Finderne Pride Johanna Rue, which has completed a record of 28,403.7 lbs., of milk containing 1,176.47 lbs. of milk fat in one year. This cow produced in seven days, at the close of her yearly test, almost as much fat as in her best seven days at the beginning of the test.

The dairyman versus the dairy, C. E. North (*Amer. Jour. Pub. Health, 5 (1915), No. 6, pp. 519–525, fig. 1*).—This article relates the circumstances of a demonstration which had as its purpose a comparison of the work of two groups of dairy farmers producing milk at different times in the same dairies.

It is concluded that the dairyman is the chief factor and the dairy of secondary importance. The clean dairyman may be transported from dairy to dairy and can make clean milk wherever he goes. It is said that if all nonessentials or matters of secondary importance are eliminated, the factors which even alone are sufficient to produce under the conditions found in ordinary dairies a milk so clean that it will have with great regularity a bacterial count of less than 10,000 bacteria per cubic centimeter are as follows: Milking with dry hands into covered milking pails, the proper washing and sterilization of milking pails and milk cans, cooling the milk by placing the cans in tanks of cold water or ice water, regular laboratory testing of the milk for bacteria, and payments based on the laboratory tests.

The score-card system for the inspection of dairy farms (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 22 [1915], pp. XV+18, fig. 1*).—Part 1 of this bulletin consists of a discussion of the score-card system by J. Mackintosh, and part 2 contains a score card with explanatory notes.

A survey of the milk situation in Kansas, L. A. CONGDON (*Bul. Kans. Bd. Health, 11 (1915), No. 4, pp. 81–128, figs. 7*).—The topics discussed in this bulletin are bacteria in milk, adulteration, dairy inspection, the milk sediment test, pasteurization, analyses of milk, influence of foot-and-mouth disease on milk, etc.

The importance of milk sugars for the hygienic judging of milk, A. GABATHULER (*Ztschr. Fleisch. u. Milchhyg., 25 (1915), Nos. 7, pp. 97–100; 8, pp. 113–119; 9, pp. 135–140*).—It is stated that the least functional disturbance results in a lowering of the milk sugar content of the milk. At the beginning and end of the lactation period the milk sugar content is the lowest, while the middle milk is the highest, decreasing toward the end. Œstrum has little effect upon the production of milk sugar, and castration is without any noticeable effect. A salty flavor of milk is due not so much to the presence of sodium chlorid or other salts as to the diminution of the milk sugar content. It is recommended that in judging milk from a hygienic standpoint its lactose content should be taken into account.

On an epidemic of sore throat and the virulence of streptococci isolated from the milk, E. C. ROSENOW and V. H. MOON (*Jour. Infect. Diseases, 17 (1915), No. 1, pp. 69–71*).—An account is given of an epidemic of streptococcal sore throat, traced to an infected milk supply, which subsided when pasteurization of the milk was instituted.

"Virulent streptococci isolated from the milk showed selective preference for certain animal structures, such as joints, muscles, gall bladder, etc., as had the streptococci in strains isolated from articular and muscular rheumatism in man, and in certain 'laboratory' strains after they had acquired a certain grade of virulence. Furthermore, the organisms from milk resembled the rheumatic strains culturally and morphologically. Involvement of muscles and joints occurred in patients who were infected by the milk. These observations strongly suggest that infected milk, in addition to causing epidemics of sore throat, in which the symptoms are acute and marked, may be the source of streptococci of such virulence as to cause rheumatism and allied conditions in human beings."

The advantages and disadvantages of preservatives in food, W. G. A. ROBERTSON (*Jour. State Med., 23 (1915), No. 6, pp. 176–182*).—The author cites experiments and other authorities tending to show that the addition of small amounts of boric acid (0.2 per cent) to milk is not deleterious to the human economy. He suggests that the addition of this preservative to milk in minute amounts be allowed, thus avoiding the possibility of using milk which is undergoing decomposition.

Tables for blending milk and cream or different percentages of cream, MARGUERITE J. MCNALLY (*[New Castle, Pa.]: Miller, Pyle & Graham, 1915, pp. 25*).—This is designed for the use of creamery and ice cream factory operators, milk dealers, and condensers. It contains complete tables for making an 80-lb. blend of any percentage from 8 to 30, inclusive. This is done by mixing cream testing from 15 to 46 per cent of fat with skim milk, or with any percentage of milk or cream from skim up to 30 per cent.

How to make creamery butter on the farm, W. J. and MRS. MCLAUGHLIN (*Minneapolis, Minn.: The Lakeland Press, 1915, pp. 96, pls. 3, figs. 8*).—A discussion of dairy-farm management methods, together with instructions for butter making on the farm.

The manufacture of cheese with selected ferments, F. SAMARANI (*Ann. R. Staz. Sper. Caseif. Lodi, 1913, pp. 13–23*).—The application of pure lactic ferments in the manufacture of Grana and some other cheeses is discussed. The milk is cooled, a culture of a lactic bacillus of great strength which has been developed in whey is added at the rate of 1:1,000, and a temperature ranging from 35 to 40° C. maintained for at least 24 hours.

Blue-veined cheese, or Dorset "Vinny" (*Dairy, 27 (1915), No. 318, p. 154*).—The method of making blue-veined cheese, known as Dorset Vinny, is described.

Chemical examination of ghee, K. H. Vakil (*Jour. Soc. Chem. Indus., 34 (1915), No. 7, p. 320; abs. in Analyst, 40 (1915), No. 471, p. 284*).—Fresh samples of ghee, mainly from buffalo's milk, gave the following average analytical results: Butyrorefractometer at 40° C. 44.35, saponification value 226.9, Reichert-Meissl number 23.05, and acid value 2.14.

Bibliography of dairy literature, compiled by A. Brosch (*Mitt. Deut. Milchw. Ver., 31 (1914), Oct., pp. 223–233*).—This gives a bibliography of dairy literature published during a portion of 1914.

VETERINARY MEDICINE.

Epizootic abortion, S. Stockman (*Jour. Compar. Path. and Ther., 27 (1914), No. 3, pp. 237–246*).—It is stated that practically all of the domestic animals can be infected with *Bacillus abortus*, but that bovine abortion under natural conditions of infection is almost entirely confined to the bovine species. Although an animal of the bovine species may be experimentally or naturally infected with the ovine disease (vibrio of McFadyean and Stockman) it is unusual, so far as experience goes, to find a large number of cases of natural infection in bovine animals due to the vibrio. It appears that abortion in mares is due to members of a group of micro-organisms totally different from those which usually cause abortion in other species, but as yet the equine disease has not been the subject of as much study as the disease in other species.

Serum from an animal affected by Bang's bacillus will cause agglutination of the bovine bacillus, but it will not agglutinate the vibrio. The same is true with the other biological tests. The disease in bovines is essentially of a chronic nature. "Bovine abortion assumes epizootiological characters, while the ovine and equine diseases usually occur as enzootics, but this seems to arise more from the trade transactions and method of breeding to which the different species are subjected than from other causes. . . .

"No great accumulation of virulent material occurs in any part of the body with the exception of the pregnant uterus of an affected animal. It follows from this that gross infection of pastures, stables, or cowsheds only takes place just before, during the act of, or subsequent to abortion." Infective material in the bovine disease may remain virulent for a period of many months outside the body of the living animal, on the pastures, or in the cowsheds. The infective material from the uterus of a cow is not excreted any considerable time before the act of abortion. In the ewe, however, a discharge containing vibrios may pass out on to the pastures from the genital organs a few days after infection, and many weeks before the animal is known to be infected. How long an animal which has aborted may remain infective (virulency of the causal microbe in the genital organs) has not been accurately determined. With regard to the cow, a large number of animals have got rid of the infected material from the genital organs from two to three months after the act of abortion.

Artificial immunization was made on several thousand animals. When a colossal dose of bacilli was injected subcutaneously into a nonpregnant animal and that animal became pregnant some two months later it did not abort. This finding might, however, be interpreted to mean that although bacilli may still be in the body the organism has become so resistant to them that they can not flourish even in the pregnant uterus.

The disease is believed to be disseminated in the bovine by way of the alimentary tract, but it is also theoretically possible that the cow may be infected when served. It seems very doubtful if the pregnant uterus of a noninfected cow can become infected by the bacillus of bovine abortion traveling up the genital organs from without as the bacillus of Bang is nonmotile. With the ovine disease the genital avenue of infection seems more probable.

For the diagnosis of the disease the complement fixation and agglutination tests give satisfactory results. See also previous notes (E. S. R., 29, p. 481; 30, p. 684). "In the application of serological methods to a herd or flock with the object of picking out the infected animals, weight must be given to the same considerations as in the case of the tuberculin test for a similar purpose."

As regards prevention, it is thought that state measures based on effective restrictions on the movements of infected animals would be ruinous to the business of farmers. By the serological methods it would be possible to establish infected cows in a herd, and where trained men are not available for this work or where there are no provisions for isolating infected animals before they abort or calve, an effort should be made to prevent gross infection by the immediate removal of infective material and by thorough disinfection of barns, etc.

Immunization, however, in addition to the above-mentioned general measures of prevention, is deemed the best method for solving the difficulty. Since trouble was experienced in regard to the transport and injection of large quantities of liquid culture and abscess formations were liable to follow its use, massive cultures are now prepared by growing on potato meat extract peptone bouillon agar containing salt, glucose, and glycerin. To wash the bacilli from the agar contained in ordinary medicine bottles, about 30 cc. of saline solution is added with a sterile hypodermic syringe. The bottle is shaken violently in order to rub all the bacilli from the agar, which breaks up into small portions, and the bacillary emulsion obtained in this way is passed through a strainer. Some thousands of animals have been inoculated without abscess formation due to extraneous contaminations during the operations.

"Two kinds of vaccine have been tried: Antiabortion A, consisting of living bacilli, and antiabortion B, consisting of bacilli killed by exposure to a temperature of 65° C. for half an hour. Only nonpregnant animals have received A. Only one dose of A was given, and the animals were not put to the bull, except in certain cases by error, for at least two months after inoculation. Antiabortion B was given to cows already pregnant, and a dose (half the growth on a culture bottle) was injected each month up to the sixth month of pregnancy. In both cases only badly infected herds were chosen for the observations. The herds were taken in groups in different parts of the country, and a local organization was set up in each case consisting of members of farmers' societies and veterinarians. . . .

"Over 3,000 inoculations have been carried out, but it has so far been possible to collect and tabulate the completed results in only one or two groups. The trials with vaccines A and B were in most cases carried out on the same farms, and the controls acted as such for both methods." The best results were obtained with vaccine A, although the animals inoculated with vaccine B showed a greater percentage of normal calving than did the controls or nonimmunized animals.

The biology of pseudoanthrax bacilli.—Contribution to the differential diagnosis of anthrax and pseudoanthrax bacilli, N. POKSCHISCHEWSKY (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 2, pp. 16, 17*).—Two types of pseudoanthrax bacilli are described, (1) typus pseudoanthracis which gives a luxuriant growth in agar and gelatin stab cultures in the shape of thick branchings and on potatoes grows as a red-brown layer, and (2) typus anthracoides which grows in agar and gelatin stab cultures as button-like colonies and on potatoes as a dirty-gray layer.

Anthrax precipitating sera react positively with both anthrax and pseudoanthrax bacilli, consequently the test can be regarded only as a group test. Anthrax and pseudoanthrax antigens show positive by the complement fixation test with pseudoanthrax and anthrax sera. On blood medium the pseudoanthrax bacilli show a definite hemolysis while anthrax bacilli do not. Pseudoanthrax bacilli are not pathogenic except possibly for mice. Passage tests did not increase the virulence of the bacteria.

A butcher slaughtering one of the hogs examined became infected and died, having all the symptoms of anthrax. The significance of pseudoanthrax bacillus infection in man is discussed.

An unusual result following anthrax vaccination and a lesson, M. P. Ravenel (*Amer. Vet. Rev., 46 (1915), No. 6, pp. 634–638*).—An account of the death of 41 animals treated with anthrax vaccine. The courts decided that the manufacturers of the vaccine were not at fault.

Eradication and treatment of the foot-and-mouth disease according to my system, IV, L. Hoffmann (*Heilung der Kranken und Vertilgung der Maul und Klauenseuche nach meinem System, IV. Stuttgart: Stähle & Friedel, 1914, pp. 409–502*).—A description of the author's experience in treating and eradicating foot-and-mouth disease with euguform in the community of Zuoz (Graubünden).

Further observations on the effect of quinin in rabies, V. H. Moon (*Jour. Infect. Diseases, 16 (1915), No. 1, pp. 58–62*).—This is a report of experiments in continuation of those previously noted (E. S. R., 29, p. 883).

It is concluded that quinin has failed to be regularly effective as a cure or preventive of rabies in animals. Given in the latter stages of hydrophobia in two human cases, it produced no significant results, but it appears to retard somewhat the development of street rabies if given in large doses during the incubation period. "The results indicate that the organism which causes rabies is influenced in some degree by quinin. This is significant as showing that the organism is susceptible to therapeutic measures, and gives reason to hope that some drug may be found which will be of value in the treatment of hydrophobia."

Experimental study of the distribution and habitat of the tetanus bacillus, W. Noble (*Jour. Infect. Diseases, 16 (1915), No. 2, pp. 132–141*).—"The tetanus bacillus appears in the intestines of many normal animals, especially of the herbivora, but apparently it seems impossible, with the methods at our disposal, to detect it there unless it is present in relatively large numbers. Experimental evidence shows that the tetanus bacillus may multiply in the intestines of such animals. The intestines, or rather the intestinal contents of certain individual animals, seem to offer especially favorable conditions for the growth of the tetanus bacillus; such animals are 'tetanus carriers' comparable, in regard to the distribution of the organism, with typhoid or cholera carriers among human beings.

"The presence of tetanus spores in soils, street dust, fresh vegetables, and on clothing and the skin is undoubtedly due to fecal contamination."

Some further investigations on hog cholera, K. Uhlenhuth, H. Gildemeister, and K. Schern (*Arb. K. Gsndhtsamt., 47 (1914), No. 2, pp. 145–239*).—A continuation of investigations published in 1907.

In the work previously reported no cognizance was taken of the fact that disinfectants act less effectively in solutions, etc., containing protein substances than they do in aqueous solutions. In these experiments phenol, corrosive sublimate, antiformin, ozone (all used in the previous experiments), and milk of lime, calcium hypochlorite, cresol soap solution, lysol, soda and soap solution were tested on urine filtrates from diseased animals and serum (virus) filtrates. After the urine or virus was kept in contact with the disinfectant for specified lengths of time, it was injected intramuscularly into shoats about eight weeks old.

One per cent corrosive sublimate solution was not able to destroy the virus, a protein-containing fluid, with certainty by a three-day exposure. The virus in the urine, however, was considerably weakened on a 15-minute exposure and in one case was destroyed. Carbolic acid (5 per cent) did not affect the virus in urine on a 15-minute exposure. No tests were made with the virus serum because it had been previously found by Uhlenhuth and others that the virus is not killed after several days of exposure. A 2 per cent antiformin solution will kill the serum virus in two hours and a 5 and 10 per cent solution will kill after one hour. The urinary virus was killed within 15 minutes by 2 per cent antiformin, but with a 5 or 10-minute exposure it was still fully virulent. In one-half hour exposure to a 3 per cent solution of cresol soap solution, the serum virus filtrate was almost or entirely destroyed, while the urinary virus was regularly destroyed in 15 minutes. Three per cent lysol solution did not regularly kill the serum virus filtrate in one hour. Milk of lime, used in the same proportion as virus, killed the urinary virus in 15 minutes but gave irregular results with the serum virus. Calcium hypochlorite (1:5 and 1:20) destroyed the virus from both sources in 15 minutes. Virus was not killed by either soda or soap solution. The findings as regards the value of 6 per cent cresol soap solution confirmed those of Dorset reported some time ago.

The filtered urinary virus when kept outside of the animal body is much less stable than the serum virus. There are instances, however, where the serum virus, a protein-containing fluid, when kept in the ice box loses its virulence much sooner than the urinary virus. This may in part be due to the copresence of antibodies in the serum. The virus in urine filtrates was destroyed by heating to 65 and 58° C. for one hour, but heating one-half and two-thirds hour at 58° did not destroy its disease-producing power for shoats. The virus in both urine and serum was very labile toward putrefactive processes. Five and nine-hour exposures to sunlight had no noticeable effect on the virus. In the carcasses of pigs stored in a cool place the virus was still active after 33 days. Exposure of virus to an oxygen-free atmosphere (carbon dioxid, hydrogen, or illuminating gas) in most instances did not affect the potency of the virus.

In experiments on the behavior of the virus in the body it was found that the urine of a pig collected five days postinfection was capable of infecting shoats. The purulent material from the skin lesions of experimentally infected shoats when transferred to healthy shoats produced the disease. This as well as the nasal secretion is deemed of particular importance as to contact infection.

The development of the trachoma-like bodies was studied morphologically, and scrapings from the conjunctivas of affected pigs were implanted in the conjunctivas of healthy pigs and other animals, i. e., monkeys, rabbits, guinea pigs, goats, dogs, horses, bovines, and an ass. In all animals, with the exception of the pig, the results were negative. One hundred sound normal shoats were examined for the presence of trachoma bodies. Cellular inclosures were also found in 3 per cent of pigs free of hog cholera. The eye secretions as well as serum virus filtrates and fresh feces from cholera hogs when smeared on the conjunctivas of pigs apparently will produce the disease.

No immunity could be produced by introducing vaseline virus ointment into the conjunctival sack of pigs or by rubbing it in the skin. Ununiform results were obtained by injecting virus in the ligated tail. Tests made for obtaining an attenuated virus were tried on immune pigs, but the results were unsatisfactory. Somewhat better results for obtaining attenuated virus were given by the simultaneous method. The animals were infected by way of the conjunctiva with virus and were given immune serum intramuscularly.

With the idea of preparing immune serum at lower cost the urinary filtrate of cholera hogs was tried. The results with horses were negative, but in the case of hogs antisera were obtained which were as potent as the ones produced with virus serum filtrates. Uremic symptoms were noted in some of the animals treated with large amounts of urine filtrates. Organ extracts were also tried.

The lungs, liver, spleen, kidneys, lymphatic glands, mucosa of intestines, and intestinal contents of all hogs coming to autopsy were given bacteriological examination. The bacteria were studied in milk, litmus milk, Löffler's malachite green, Barsiekow's solution I and II, Hetsch's solution, glucose and lactose bouillon, and neutral red and orcein agar, and as regards their biological and serological behavior. Out of 90 animals segregated in special cages only 14 showed the *Bacillus suipestifer*, while 15 out of 20 pigs which were allowed to run with other infected hogs showed it. The organisms at first did not agglutinate with pestifer and paratyphoid B sera. It seems possible that secondary bacteria present in hog cholera migrate into the blood stream of affected animals.

In addition to the paratyphoid group of bacteria, the bacteria of the hemorrhagic septicemia group may also be present. The greatest percentage of *B. suipestifer*, *B. enteritidis* (Gärtner), and *B. suisepticus* were found in the stables where the animals were allowed to run together. The *B. suisepticus* isolated was virulent for mice, guinea pigs, rabbits, and pigs. Variable results were obtained with *B. suipestifer* and *B. enteritidis* (Gärtner) with shoats. In some cases the injection of *B. suipestifer* produced a disease similar to hog cholera, especially the intestinal changes. *B. suipestifer* (Voldagsen), according to Dammann and Stedefeder (E. S. R., 24, p. 390), and the Glässer bacillus, i. e., *B. typhi suis*, do not produce indol, nor is litmusmannite-nutrose solution (Hetsch) affected. The organisms were pathogenic for pigs, but large doses were necessary. The best route of infection was per os. Shoats rendered immune against the filterable virus could only be infected (either by the intravenous or os route) in a few instances. Spontaneous infection tests showed that these bacteria are not in any way infectious, as one is led to believe from the work of Pfeiler and Kohlstock (E. S. R., 32, p. 378) and Weidlich (E. S. R., 32, p. 83).

The bacteria isolated could be differentiated by culture studies and the agglutination tests. Notwithstanding this, some Voldagsen cultures were found labile in their behavior when examined culturally as well as serologically. In some cases Voldagsen strains were influenced soon after isolation by paratyphoid B and pestifer sera.

The behavior of Glässer bacteria with specific sera is also discussed.

When to vaccinate against hog cholera (*California Sta. Circ. 132* (*1915*), *pp. 4, fig. 1*).—This circular gives advice concerning the early recognition of hog cholera, the methods for immunization, means of preventing the spread of the disease, and an announcement of the sale of antihog-cholera serum by the University of California.

Some diseases of the respiratory tract of the horse which resemble glanders, E. Joest (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16* (*1915*), *No. 4, pp. 239–263, figs. 10*).—The pathological changes in the upper respiratory tract dealt with include tuberculosis of the mucous membrane of the nares, cicatrices of the nasal mucous membrane, tumor-forming amyloidosis of the nasal vestibule, tubercle-like hemorrhagic centers of the nasal mucous membrane in purpura hemorrhagica, and marantic ulcers caused by pressure in the larynx.

Microfilariasis of the horse in Turkestan, W. L. YAKIMOW, N. I. SCHOCHOS, P. M. KOSELKIN, W. W. WINOGRADOW, and A. P. DEMIDOW (*Ztschr. Infektionskrank. u. Hyg. der Haustiere, 16 (1915), No. 4, pp. 275–286, fig. 1*).—An account of studies of the disease termed by the authors Turkestan microfilariasis, including its clinical appearance, hematological investigations, description of the microfilaria, and remedial measures. The form occuring in Turkestan apparently represents a new species, to which the name *Microfilaria ninæ kohl-yakimovi* is given.

A list of 21 references to the literature is included.

RURAL ENGINEERING.

Tenth biennial report of the state engineer to the governor of Idaho (*Bien. Rpt. State Engin. Idaho, 10 (1913–14), pp. 422, figs. 5*).—This report covers the operations of the state engineer's office for 1913 and 1914, paying special attention to irrigation and measurement of stream flow and including a report on duty of water investigations by D. H. Bark, noted below.

Irrigation investigations in Wyoming, 1913–14, AUGUSTA F. JOHNSTON (*Cheyenne: State of Wyoming, 1915, pp. 14*).—This report, based on cooperative irrigation experiments carried on by the Office of Experiment Stations of this Department and the State of Wyoming, reviews the work at the experimental farms and discusses irrigation extension work in the State.

Water conservation and irrigation (*Rpt. Comr. Water Conserv. and Irrig. [N. S. Wales], 1912–13, pp. 72, pls. 4*).—This report covers government work relating to irrigation and water conservation for the years 1912 and 1913.

Duty of water investigations, D. H. BARK (*Bien. Rpt. State Engin. Idaho, 10 (1913–14), pp. 63–177, figs. 5*).—These investigations (E. S. R., 29, p. 180) have been continued and conducted in cooperation with the Office of Experiment Stations of the U. S. Department of Agriculutre, to cover four seasons. Points not brought out in the previous report are summarized as follows:

Factors and conditions tending to decrease the duty are "porous soil, infertile soil, cheap water, careless use, poorly prepared land, small irrigation heads, poorly constructed leaky ditches, continuous-flow method of delivery, lack of cultivation, and large acreages of alfalfa and pasture and other crops with large water requirements." Factors and conditions tending to increase the duty are "deep soil of fine texture, an underlying strata of hardpan, expensive water, careful, skillful use, well-leveled land, large irrigation heads, short runs, use of rotation systems, diversification of crops, well-constructed irrigation systems with small transmission losses, fall plowing and intensive surface cultivation, and large acreages of winter grain, cultivated crops, and orchard and other crops of low-water requirements.

"The amount of water required by a project depends upon the duty of water at the land, losses in reservoirs where water is stored, transmission losses from the point of diversion to the land to be irrigated, and the proportion of a project that is ultimately irrigated. The required duty for a crop on any soil can be roughly determined by ascertaining how many irrigations the crop will require during the season and the amount of water the soil will require per irrigation. . . . A sufficient quantity should be delivered to each individual over and above 2 acre-feet, so that he may, if unavoidable, waste not to exceed 12.5 per cent of the water delivered to him. . . . The light summer rainfall common to south Idaho has but little effect on the amount of irrigation required. . . . Fall plowing tends to increase materially production and decrease water requirements. Grains and cultivated crops in general require less irrigation water than the other common crops of south Idaho. . . . Grains require the largest amount of water at the flowering or soft-dough stages. . . . Alfalfa has a decided tendency to increase in yield as the amount applied is increased until at least as much as 4 acre-feet per acre have been applied. While some crops increase in yield as the amount of water applied is increased, the increase in yield is rarely proportional to the increase required in the amount of water. The average waste from grain fields has been 35.3 per cent and 19.1 per cent from alfalfa. . . . The average length of the irrigation season for alfalfa for the four years of the investigation was 97.6 days, and 42.5 days for grain. . . .

"Sufficient water for the production of profitable and nearly maximum crops must be delivered to the individuals in order that a project may be successful, but a higher duty is justified in cases where water is very valuable and land comparatively cheap than where water is cheap and the land is valuable. . . .

"Ninety per cent of a normal Idaho project is irrigated each year. The total waste and unirrigated areas seldom equal 10 per cent. Where rotation systems are used the interval between rotations should seldom exceed from ten to fourteen days.

"There are now at least 163 electrically operated pumping plants in the vicinity of Weiser and Payette. The plants tested during 1913 pumped varying amounts of water, the amounts pumped per acre ranging from 0.4 to 5.99 acre-feet. The costs of the power for pumping varied from 54 cts. per acre-foot to $6.50, and per acre irrigated from $1.77 to $7. There is not sufficient incentive to save water where a flat season rate is paid for power. The investigation indicates that the cost of lifting water over 100 ft. with small plants is at present prohibitive. Serious loss and waste of power is now taking place in many instances due to faulty design and cheap, careless installation of the plants. Small and medium-sized plants should develop efficiencies of at least 50 per cent, and only such plants as can be guarantied to do this or better should be installed.

"Successful irrigation in Idaho under present economic conditions demands that at least 2 acre-feet per acre be supplied for, and retained upon, each irrigated acre."

Irrigation works in Italy, L. Luiggi (*Jour. Dept. Agr. Victoria, 12 (1914), No. 10, pp. 577–600, figs. 11; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 1, pp. 43–45; Jour. Roy. Soc. Arts, 62 (1914), No. 3228, pp. 940–943*).—This article reviews the irrigation situation in Italy, with particular reference to the storage, distribution, and economic use of irrigation water.

About 3,458,000 acres of land are under irrigation, derived from wells, streams, and stored rain water. Where land can be superirrigated, it is stated that about 284.210 to 355,263 cu. ft. of water are required per acre, at a cost of about $1.50 to $3.50. The water is applied in rotations every 15 to 20 days at the rate of from 11,368 to 14,210 cu. ft. per acre. Water is applied at the rate of about 213,158 cu. ft. per acre to irrigated meadows. In the Roman Campagna where the land is less permeable than in Lombardy the water necessary during the dry season for irrigated meadows varies from about 245,000 to 350,000 cu. ft. per acre, and is applied at the rate of about 17,500 to 21,000 cu. ft. every 10 to 12 days. In the southern Provinces which receive 7 to 8 in. of rain during the growing season between March 15 and May 15 it is stated that irrigation water may be profitably applied at the rate of about 28,000 to 35,000 cu. ft. per acre in four irrigations.

The conclusion based on Italian experience is that irrigation prevents a complete loss of the crops in years of drought. "In normal years it affords a very substantial profit to the farmers who cultivate meadow lands, and this increase of profit is certain, even if only grass can be grown, provided that the water can be got at the rate of $1.90 to $2.30 per acre per year, but where cereals can be cultivated, even with water at $5.40 to $7 per acre, there is still a good profit, besides the advantage of never completely losing a crop. On the other hand, irrigation works on a large scale are not profitable to the administration of the canals during at least the first thirty years, thus these undertakings require great help from the state during this trying period."

Working data for irrigation engineers, E. A. Moritz (*New York: John Wiley & Sons, Inc., 1915, pp. XIII+395, figs. 46*).—This is a handbook of working data, intended for the use of irrigation and hydraulic engineers.

The major portion of the book consists of tables and diagrams. Before entering into a detailed explanation of these, the various features of irrigation engineering are briefly discussed, particularly with reference to gravity irrigation. "To this end, the usual steps in the development of an irrigation project are taken up in the order of their sequence, and data are presented that are of assistance in arriving at the proper conclusions."

The subject matter is presented in the following chapters: Examination and reconnoissance, investigations and surveys, design of irrigation structures, hydraulic diagrams and tables, structural diagrams and tables, miscellaneous tables and data, and specifications.

The author states that a considerable portion of the material is original and that most of the remainder was taken from the publications and records of the U. S. Reclamation Service. Some of the material has been noted from time to time in the *Record* from engineering periodicals.

Land drainage, J. L. Parsons (*Chicago: The Myron C. Clark Publishing Co., 1915, pp. XI+165, figs. 36*).—It is the author's purpose to cover the subjects connected with the successful drainage of agricultural lands by open and closed drains. The information is intended for both experienced and inexperienced drainage engineers, drainage contractors, landowners, and drainage district officials. The subject matter is presented under the following chapter headings: Preliminary drainage surveys; the design of tile drains; tile drain outlet walls and inlets; design and maintenance of open drains; plans, reports, and records; the estimate of costs of drainage systems; the preparation and enforcement of drainage specifications; the division of costs of drainage systems; and the quality and inspection of drain tile.

Florida Everglades (*U. S. Senate, 63. Cong., 2. Sess., Doc. 379 (1914), pp. 148, pls. 7, figs. 63*).—This is the report of the Florida Everglades engineering commission to the board of commissioners of the Everglades drainage district and the trustees of the internal improvement fund of the State of Florida.

The commission's conclusion, based on its study of ascertained facts, is "that the drainage of the Florida Everglades is entirely practicable and can be accomplished at a cost which the value of the reclaimed land will justify, the cost per acre being very small. The solution of the Everglades drainage problem is primarily dependent upon the disposition to be made of the flood waters entering Lake Okeechobee from the north. These flood waters under present conditions pass over the south rim of the lake and spread over the Everglades, placing that great area under servitude of the surplus waters of the northern watershed. . . . The Everglades can best be relieved of this servitude by diverting the flood waters through a canal of adequate capacity occupying the shortest practicable route to the Atlantic Ocean or an inlet thereof. . . . With these extraneous flood waters diverted as indicated, the problem of draining the Everglades is reduced to proper provision for carrying off the precipitation upon them. This can be accomplished by adding to the main canals which now traverse this territory—canals now surcharged with waters flowing out of Lake Okeechobee."

The suggested improvement includes 390 miles of canal draining 2,095 square miles.

Maps, tables, and charts showing in detail the data obtained by the investigation are also included.

Water conveyance and drainage works (*Verslag Burgerl. Openb. Werken Nederland. Indië, 1911, pt. 4, A, pp. VIII+279, pls. 32*).—This report describes drainage works, including river improvements, and deals also with the conveyance of water in channels, both for drainage and irrigation.

Preliminary estimating of canal excavation, L. M. Hammond (*Engin. Rec., 71* (*1915*), *No. 5, pp. 146, 147, figs. 6*).—Three typical prism sections are worked out in detail, formulas are derived, and tables and forms of notes are suggested to expedite the work.

Rock-fill dam with some extraordinary foundation problems, M. C. Hinderlider (*Engin. News, 73* (*1915*), *No. 14, pp. 660–664, figs. 7*).—The construction of a rock-fill irrigation dam across a narrow gorge in southern Colorado is described. As originally designed, the spillway was over an adjoining ridge which on investigation proved to be of porous formation with the bedrock sloping way from the dam.

"For the purpose of intercepting the seepage from the reservoir through this material overlying bedrock, a concrete diaphragm 2 ft. thick at the base and 1 ft. thick at the top was carried from bedrock upward to a point 10 ft. below high-water line in the reservoir. . . . Above this concrete diaphragm the trench was filled to the surface with equal parts of clay and sand mixed in a concrete mixer and run into the trench in the form of puddle."

The spillway was transferred to the dam proper.

Concrete chute drops water 130 feet from canal to reservoir, D. W. Cole (*Engin. Rec., 71* (*1915*), *No. 15, pp. 456, 457, figs. 6*).—A lined channel of the Truckee-Carson project in Nevada has a cantilever upturn at the discharge end and a long weir at the head to regulate the water level in the main canal within the desired limits. A curious hydraulic phenomenon is the disappearance of the back-water wave when the chute begins to operate normally.

New type of gate for regulating adjacent water levels operates automatically (*Engin. Rec., 71* (*1915*), *No. 10, pp. 304, 305, figs. 4*).—A type of automatically operated regulating gate which has been used in drainage canals by the drainage department of the Province of Buenos Aires, Argentina, is described and diagrammatically illustrated.

"The design is based on the principle of momentary points of rotation, so that for each rise in water level, dh, above a predetermined elevation, the gate has a rotation $d\phi$ in respect to a momentary point. Consequently, when the gate is full open, that is, when the water level has risen a height h, it has turned an angle ϕ and the point of rotation has traveled a distance s along an arc. To prevent the gate from overtravel, and to insure the automatic closing, a stopping arrangement limits the tilting of it."

A modified type of this gate substitutes a roller on a piece of curved track for the lower lever arm.

Water supplies, S. and E. K. Rideal (*London: Crosby Lockwood & Son, 1914, pp. XII+274, pls. 24, figs. 10*).—It is the purpose of this book to summarize the science and practice of modern water supply and water purification, and it deals primarily with the purification, filtration, and sterilization of water supplies.

The subject matter is presented under the following chapters: Pure water—inorganic constituents of natural waters, animal and vegetable impurities, sources of water supply, distribution, storage, preliminary purification, sand filtration, mechanical filtration, softening of water, sterilization, electrical modes of sterilization, and analysis and interpretation of results.

Water supplies in the Philippine Islands, A. J. Cox, G. W. Heise, and V. Q. Gana (*Philippine Jour. Sci., Sect. A, 9 (1914), No. 4, pp. 273–411, pls. 5*).—It has been attempted in this paper to classify and arrange the information regarding the general status of water supplies in the Philippine Islands which has been collected up to date.

The data first show that "water from surface streams, no matter how well guarded, is not entirely satisfactory, since it is always subject to sudden contamination." Analyses of the water from shallow wells showed that nearly every well examined was dangerously polluted. It is stated that the best natural potable water is at present furnished by artesian wells. "The high chlorin content is one of the most notable general features of Philippine artesian waters. This does not necessarily indicate sewage pollution, but rather seepage from the ocean or contact with some underground salt deposits or impregnated rocks. The water from some of the artesian wells has been found to be too salty to drink." Flowing wells are deemed preferable because of the decreased danger of pollution, and artesian water has in general been quite satisfactory, both from the chemical and biological points of view. "In many instances where the quality left something to be desired the water was so much better than any other available supply that its use has been permitted."

Water-borne diseases are said to be more prevalent in the Philippines during the rainy season than at any other time, due to the washing of accumulated surface débris into the water courses. The three most important water-borne diseases are said to be typhoid, cholera, and entamœbic dysentery.

Methods for the purification of water supplies discussed are distillation, boiling, filtration, and the use of ultraviolet light, copper sulphate, and calcium hypochlorite. Boiling is considered to be the simplest and the most universal safeguard in so far as contamination of water due to living organisms is concerned. Tests of the copper sulphate method showed that in order to safeguard the supply against cholera the addition of copper sulphate in the ratio of 1 part per 150,000 parts of water (a strength considered undesirable for drinking purposes) acting over a period of four hours would be required.

Further data report in detail on water supplies for industrial purposes. It is stated that the need of a systematic water survey in the Philippine Islands is strikingly apparent and that "by combining the geologic information with all available chemical and biological data concerning the water occurring in any one district, it should not be difficult to establish safe limiting values for the normal constituents of water to serve as a basis in determining its fitness for any particular purpose."

The influence of the forest on the water supply, Henle (*Jour. Gasbeleucht., 57 (1914), pp. 742–750; abs. in Wasser u. Abwasser, 9 (1914), No. 2, pp. 50, 51*).—From a critical review of the literature on the subject it is concluded that ground water does not originate solely through seepage of precipitation, but in many cases is formed only by the condensation of water vapor. It is pointed out that the transpiration of rainfall by forests often reaches 400 mm. (about 15.7 in.) annually and that this moisture is returned to the soil in the form of vapor and there condensed.

The importance of forests with reference to the water supply, K. E. Ney (*Wasser, 10 (1914), No. 18, pp. 521–524; abs. in Wasser u. Abwasser, 9 (1914), No. 2, p. 51*).—The author disagrees with the assumption that the heavy forest-ing of a region has a directly favorable influence on its water supplies and quotes data to substantiate his conclusion.

Hypochlorite treatment of water supplies, H. A. WHITTAKER (*Pub. Health Rpts. [U. S.], 30 (1915), No. 9, pp. 608–618, pl. 1, figs. 8*).—A small portable plant for the hypochlorite treatment of polluted water supplies is described and illustrated which consists of one mixing and two storage barrels, a mixing apparatus, a solution controlling device, and the necessary valves and connections.

Water and sewage, H. C. MÜLLER ET AL. (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen, 1913, pp. 15–20; abs. in Wasser u. Abwasser, 9 (1914), No. 2, pp. 39–41*).—Chemical and biological studies of public and private water supplies and soils and crops injured by sewage from industrial works showed that in country communities ditch water could not be used in place of ground water on account of the turbidity and color caused by brown coal particles. The water for artificial rain irrigation, it is stated, should be as nearly like actual rain water as possible.

Out of 27 samples of drinking water only 13 were unobjectionable, and of the remaining samples 7 were grossly polluted, 2 were doubtful, and 5 were highly impregnated with mineral matter. Three samples of water used for stock were too highly polluted for safe use. Out of 10 samples of dairy water supplies only four were unobjectionable.

Mixing sewage containing salts with ground water samples caused a marked deterioration in the quality of the latter in 3 out of 11 cases. Analyses of samples of brook and pond waters receiving the drainage from potash works showed the contamination to increase with the depth of the water, thus indicating that the safe dilution of such drainage is not always a certainty.

Water from brown coal ditches showed a high salt content, as did also brook water receiving such drainage. The contamination of brook water by the sewage from a dairy and a brewery was evidenced by the development of typical sewage organisms.

Plastic colloidal clay was found to be unsatisfactory for sewage purification purposes.

Report of the state highway commission of Minnesota for 1914 (*Rpt. Highway Com. Minn., 1914, pp. 235, pl. 1, figs. 38*).—This report includes the history of the Minnesota state road laws, a description of the Koochiching County fire breaks, and tabulated reports of road and bridge operations for each county.

Concrete roads versus macadam, E. H. MCALISTER (*Univ. Oreg. Bul., n. ser., 10 (1913), No. 5, pp. 16, fig. 1*).—It is concluded that concrete is considerably superior to macadam for Oregon highways which must withstand modern traffic. Tests also indicate the value of blends of puzzolanic material and cement.

The design of concrete highway bridges with special reference to standardization (*Engin. and Contract., 43 (1915), No. 12, pp. 268–270, figs. 5*).—This is a discussion by C. B. McCullough of the various factors influencing the design of concrete highway bridges, particularly standard types. Specific data and diagrams are given showing the effect of stream behavior, loadings, temperature stresses, etc., and illustrating some standard types of the Iowa Highway Commission.

The economic design of culverts for various depths of fills, P. K. SHEIDLER (*Engin. and Contract., 43 (1915), No. 13, pp. 288–290, figs. 7*).—This article discusses the economic length of road culverts and gives comparative costs of culverts constructed with long and short barrels.

Results of some tests to determine the effect of normal and low temperatures on the strength of cement mortar (*Engin. and Contract.*, *43* (*1915*), *No. 9, pp. 196, 197*).—In tests of 1:2 cement and sand briquettes it was found that subjecting the briquettes to freezing temperatures after allowing them to set four days at temperatures above freezing materially reduced their strength. The use of a 5 per cent salt solution in place of water slightly increased the strength after 14 days of setting. Briquettes subjected first to freezing temperatures and then to nonfreezing temperatures apparently regained their original strength.

Use of electricity for irrigation and on the farm, C. H. WILLIAMS (*New York: Nat. Elect. Light Assoc.* [*1912*], *pp. 59, figs. 22*).—After a general review of the situation relative to the use of electricity for irrigation pumping and for farm power purposes, the author summarizes by stating that "from the viewpoint of the farmer the introduction of electricity into farm methods reduces the cost of production of farm products. The chief saving is in labor and the ability to apply scientific and systematic methods to the industry. From the central station viewpoint it means an off-peak load, a high kilowatt-hour current consumption, and a satisfied customer."

When the gas engine will not start, E. N. PERCY (*Power*, *41* (*1915*), *No. 9, pp. 299, 300*).—Directions are given for systematically following up the trouble when an engine refuses to start, with suggestions for remedying it when located.

Progress in small farm tractors, L. W. ELLIS (*Sci. Amer.*, *112* (*1915*), *No. 14, pp. 306–308, figs. 10*).—This article touches briefly upon tendencies in construction, general principles, and the present status of the small tractor industry. "In the face of such evident disagreement as to the eventual type the safest course in buying is to investigate all claims thoroughly and insist that the product shall be past the experimental stage and the firm behind it permanent and substantial."

Report of international competition of motor tillage machines at Chaouat, Tunis, in 1914 (*Compte Rendu du concours International d'Appareils de Labourage à Moteurs à Chaouat. Tunis: Dir. Gén. Agr., 1914, pp. 59, pls. 30; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 11, pp. 1485–1487*).—This article has been previously noted (E. S. R., 32, p. 189).

Tests of two milking machines, B. MARTINY and P. VIETH (*Arb. Deut. Landw. Gesell., No. 271* (*1914*), *pp. 41, figs. 6*).—After thorough testing the judges reported more or less favorably in both cases.

A shearing shed, sheep yards, and dip, J. S. MCFADZEAN (*Jour. Dept. Agr. Victoria, 12* (*1914*), *No. 10, pp. 601–605, figs. 2*).—Plans are shown of a shearing shed, sheep yards, and dip, which it is claimed have given complete satisfaction.

A shearing shed for small flocks, J. W. MATHEWS (*Agr. Gaz. N. S. Wales, 26* (*1915*), *No. 1, pp. 5–10, figs. 6*).—A sheep-shearing shed to provide accommodation for the shearing of 6,000 sheep is illustrated in plan, section, and detail.

Fences and fencing (*Dept. Agr. N. S. Wales, Farmers' Bul. 74* (*1914*), *pp. 32, figs. 25*).—This bulletin reports a number of experiments with different types of fences and gates, giving specifications for the experimental fences and describing them in detail.

In experiments with reference to the use of posts and droppers, several different fences were constructed which are classified in two sections as follows: "In section 1, which deals with the number of posts necessary for efficiency, pattern A has the posts 8 ft. 3 in. apart (640 per mile); pattern B has the posts 16 ft. 6 in. apart (320 per mile), 1 dropper between the posts; pattern C has the posts 22 ft. apart (240 per mile), 2 droppers between the posts; pattern D has the posts 33 ft. apart (160 per mile), 3 droppers between the posts. In section 2, which aims at determining the most suitable dropper to use, the posts are 33 ft. apart with 3 droppers between the posts. Pattern D has wooden droppers, i. e., rigid droppers; pattern E has the plain ('Anchor') No. 6 B. W. G. wire droppers; pattern F has the crimped ('Cyclone') No. 6 B. W. G. wire droppers."

It is stated that after seven or eight years' service the fence consisting of posts only was the most efficient of all, but the most costly, and that efficiency decreased as the number of posts per mile decreased. The fences in which the posts were 33 ft. apart proved too weak for big stock, especially when the strain imposed by wind and weather was considered. The fences with three or more posts to the chain proved satisfactory.

The most efficient dropper was found to be the wooden type, but it was also the most costly. The next best was the crimped dropper, and the least efficient was the straight wire dropper.

Sections are included describing and illustrating different types of gates and gateways and a cheap sheep and cattle proof fence, and instructions are given for squaring a gatepost.

In experiments with concrete fence posts made of a mixture of 1 part cement, 2½ parts sand, and 5 parts gravel and reinforced with four pieces of No. 6 wire, it was found that concrete is a suitable material for fence posts in the climate of New South Wales. It is estimated that where suitable gravel and sand are easily obtained, concrete fence posts can be made for about 25 cts. each. Concrete gateposts are said to have decided advantages over wooden ones, especially in that they do not require painting to keep them in good order.

A final section by R. H. Gennys gives hints on fencing for settlers.

Country plumbing practice, W. HUTTON (*New York: David Williams Co., 1914, pp. 310, figs. 229*).—It is the purpose of this book "to offer some assistance in designing and installing the various appliances necessary for the supply of water by gravity or mechanical power and for the disposal of sewage and kitchen wastes by the biological process. The maintenance of the appliances in proper repair has also received consideration, and it has been the intention throughout to arrange the subjects treated in a manner which would appeal to the men who are most likely to require assistance—the plumbers who are called upon to install or repair any of the hundred and one appliances which the requirements of local conditions may entail."

Owing to the smaller number of fixtures in country than in city buildings, it is stated that the plumbing may be made much more simple. "In the design of plumbing construction in various types of buildings these conditions have received full consideration and the simplification of the systems of waste and vent lines has been advised wherever possible."

In addition to the strictly sanitary engineering features, the author has taken up at some length the more important mechanical and structural features involved in obtaining running water, such as pumping, power for pumping, well digging, the operation of special types of water-supply systems, and plumbing installations. The following chapters are included: Engines used for water-supply systems; mechanical details of gasoline engines; sources of electric current, cooling, governing, and repair of engines; setting gasoline engines and pumps; hot air engines, windmills, and electric motors; steam driven pumps; hydraulic rams; selection of a water supply, determining quantity and quality, filtration, relative corrosion of pipes; water suppy from wells and springs, methods of raising water; distribution of water supply to buildings; water supply by air pressure, fire protection, sprinklers; sewage disposal from isolated buildings, various methods of liquefaction, filtration and disposal; methods of laying tile and iron drains from house to sewer or outfall at septic tank; collection and storage of rain water; covering sink drip boards with sheet metal; roof connections, bubbling fountains, plumbing tests; structural features of country plumbing systems; examples of work in country schools, office buildings, stations, and other public buildings; and installing plumbing in old buildings.

Farm sanitation, C. H. Wright (*Jour. Dept. Agr. Victoria, 11* (*1913*), *Nos. 4, pp. 215–220, figs. 11; 5, pp. 306–311, figs. 12; 7, pp. 410–413, figs. 4; 12* (*1914*), *No. 4, pp. 228–230, figs. 3*).—Methods of arranging plumbing for the disposal of sewage from farmhouses are described and illustrated and the biological action in septic tanks and filters is discussed. The author advocates the use of a house sewer trap, on the ground that the seals in fixture traps may be destroyed at times, thus permitting the escape of sewer gas.

Methods of sewage disposal for country homes, O. M. Ball and H. Cassiday (*Agr. and Mech. Col. Tex.* [*Ext. Ser. Bul. 1*] (*1914*), *pp. 3–10, figs. 3*).—This bulletin gives the usual description of the process of sewage disposal by means of sewage tanks and filters and illustrates two types of septic tank. The Kentucky sanitary privy is also described and illustrated. In opposition to the usual statement, it is stated that "the septic tank, when properly constructed and not overloaded, will work automatically and will deliver an effluent about 80 per cent pure."

Sewage disposal in the country (*Bul. Vt. Bd. Health, 15* (*1915*), *No. 3, pp. 33–45, pls. 2, figs. 2*).—It is the purpose of this paper to describe simple methods for disposing of farm sewage, the usual discussion of the process of sewage disposal by sewage tanks and filters being included.

It is stated that a common misunderstanding exists regarding the action of a septic tank. "It is thought that this tank completely purifies the sewage and that the overflow from such a tank can be freely discharged into a stream used for drinking purposes. Such, however, is far from being the true condition, as the work of this tank is a preliminary process, and must be followed up by other processes if full purification of the sewage is required."

Investigations on the disposal of canning factory wastes at Washington, Illinois, D. Englis (*Univ. Ill. Bul., 11* (*1914*), *No. 38, pp. 339–373, figs. 12*).—A general discussion of the subject of the disposal of canning factory wastes and a brief review of the work of others bearing on the subject is followed by a report of experiments on the purification and disposal of corn and pea canning wastes.

Such crude liquid wastes are high in color, carry more or less suspended matter when fresh, have an odor characteristic of the vegetable being canned, and when in a putrescible condition have a very foul odor. The corn wastes putresce less rapidly than do the pea wastes.

It was found that the bulk of the coarser solids in both wastes may be removed by a suitably designed screen chamber. Plain settling basins remove a comparatively small quantity of solid matter by sedimentation. "Generally speaking, it would be better to make no effort to settle the solids after they have passed the screens, but rather pass them through a skimming chamber or through fine screens before the liquid enters the dosing chamber or reservoir. The entire contents of the dosing chamber or reservoir, including such sludge as may settle, can best be disposed of on filters or broad irrigation beds. Experience during the experiments would indicate that the storage reservoir or dosing chamber should be of sufficient capacity to cover a single filter unit to a depth of about 3 in., and this quantity should be applied within an hour."

For actual working conditions it is believed inadvisable to apply sewage at a rate greater than 40,000 gal. per acre per day. "The cultivation of the beds is an important feature in securing success, and this cultivation can best be carried out by harrowing. . . . The use of contact beds does not appear promising, whereas sand beds may be used to great advantage where sand is available in sufficient quantity and at sufficiently low cost."

It is concluded that the problem of cannery waste disposal in this particular instance has been adequately solved by the use of broad irrigation beds. "On the other hand, such methods must be regarded as of special applicability, dependent upon the availability of suitable soil, and it must be emphasized that no specific problem of cannery waste can be properly solved without taking due cognizance of local conditions."

RURAL ECONOMICS.

Agricultural cooperation and rural credit in Europe (*U. S. Senate, 63. Cong., 2. Sess., Doc. 261* (*1914*), *pts. 1, pp. 29; 2, pp. 15*).—Part 1 of this report is a summary and digest of the information and evidence secured by the American Commission (E. S. R., 28, p. 301), and describes the general agricultural conditions in Europe, long, short-term, and cooperative credit, cooperation in production and distribution, and the organization of agriculture and rural life. Among the conclusions of the commission are the following:

"One of the most pressing economic needs of American agriculture is the opportunity to secure, on better terms than at present prevail, the necessary capital, and, consequently, the necessary credit demanded by modern conditions of farming. In order that there may be a uniform and nation-wide system of long-term credit, it would seem wise to secure the enactment of a federal law permitting the organization of farm-land banks, either on the joint-stock or the cooperative plan, authorized to issue long-time bonds secured by farm mortgages, required to do business on a narrow margin of profit, to allow payment of principal on the amortization plan, and carefully and fully supervised by the federal government. There is no objection whatever to the enactment of proper legislation by the different States for this same purpose.

"In case the existing system of banks—national, state, savings, and private—is not able or not disposed to grant farmers increased and more liberal facilities for procuring short-time loans, there should be enacted state laws permitting the organization of cooperative credit associations by means of which the farmers of a given community may be enabled to meet their own needs for short-term or personal credit.

"Every encouragement should be given the movement for organizing other forms of cooperative endeavor among farmers. This movement should proceed cautiously but rapidly. The main reliance of the American farmers in meeting economic disadvantages and handicaps must be their own intelligence and their capacity for united action. . . .

"In order to give national scope and direction to the campaign for rural community building, there should be organized a National Committee on Rural Federation, whose task would be to hold national conferences on rural progress, to seek to unify or correlate the many important and useful agencies already at work for rural advancement, and to give direction to the ultimate welding together, in one great forward-looking movement, of all the forces designed to insure on American soil better farm practice, better farm business, and better farm life."

Part 2 is a report of the minority members of the American Commission, pointing out that the difference in economic, social, and religious conditions among farmers in European countries prevent the adoption of the European system of agricultural credit in the United States. The minority members outline a system whereby it is proposed that the farmers cooperate with the stock-holders of banks in rural communities in the organization in their respective localities of small unit land-mortgage associations. Each association would be organized upon the share capital plan, cooperative or noncooperative as might be desired. It is to become affiliated with and have close interrelationship with the rural bank, which may be owned by some of the same shareholders, in that it may have its office with the affiliated bank and be officered, managed, and directed by some of the same men, to which could be added other desirable farmer directors, if such rural banks are not already dominated by that interest. (See also previous notes E. S. R., 30, p. 792; 31, pp. 293, 389.)

Agricultural cooperation and rural credit in Europe, III (*U. S. Senate, 63. Cong., 1. Sess., Doc. 214, pt. 3* (*1913*), *pp. 95*).—Part three of the report noted above contains a brief statement submitted to the American commission by the different States of the United States and Provinces of Canada regarding their agricultural needs, especially as they relate to the furnishing of proper credit facilities to the farmers. Rural credit laws of Texas, Wisconsin, New York, and Massachusetts are included, together with a description of the work of the Jewish agricultural aid societies.

Report of the Irish Agricultural Organization Society, Limited, 1914 (*Rpt. Irish Agr. Organ. Soc., 1914, pp. 163*).—This report reviews the work for the year and points out methods that may be used to meet the exigencies caused by the war. The report is mainly devoted to statistical tables indicating the extent of the business transacted during the year.

Social and economic survey of a community in the Red River Valley, L. D. H. Weld (*Univ. Minn. Current Problems, No. 4* (*1915*), *pp. IV+86, figs. 32*).—The author gives a historical sketch of the community and describes the general farming conditions, the methods of living on the farm and in the village, the methods of marketing farm products, and the stores and industries in the village. He found that the community was dependent mainly upon grain crops which meant a more or less fluctuating income and a partial exhaustion of the soil. These facts had an important bearing not only on the economic well-being and standard of living of the farmers, but also upon the social activities of the community.

He points out that the long distances between farmhouses, the mixture of nationalities and religions, the cold winters, and the long hours of work, all stand in the way of the development of social intercourse among farmers. The flour mill has an important and beneficial influence on the local wheat market, and the local elevators offer a satisfactory market for grains, yet some saving might be obtained through a cooperative company which could purchase supplies in carload lots for its farmer members. Too much butter is made on the farm and not enough cream is hauled to the creamery. Eggs are still traded at the store with little attention to production, grading, etc. The number of stores in the village is much larger than necessary to supply efficiently the population of the section. The mail-order business amounts to only about 3 per cent of the total business of those stores which are open to this sort of competition. The social life of the village is very pleasant and the people form close friendships, yet they seem to be divided into well-defined groups and lack contact with the outside world. Their standard of living is high and their homes comfortable and attractive. The cost of living is considered lower than that of larger cities.

The study of a rural parish, R. A. Felton (*New York: Bd. Home Missions Presbyterian Church, 1915, pp.* [*232*]).—This book contains directions and forms for making and summarizing a rural survey, and a brief bibliography relating to special features of country life.

Mortality statistics, 1913 (*Bur. of the Census* [*U. S.*], *Mortality Statis., 14* (*1913*), *pp. 631, figs. 7*).—Among the statistics contained in this report are the following relating to the rural population: Total number of deaths, general death rate, death rate per 100,000 persons from specific causes for the registration area of the United States and for individual States within that area, and total number of deaths by causes for rural parts of registration States.

National subsistence and agricultural colonization, H. KRANOLD (*Massenernährung Agrarpolitik Kolonisation. Munich: G. C. Steinicke, 1914, pp. 95*).—This report discusses changes in German agriculture relative to its making the nation self-sustaining, and indicates the extent and the control of the national deficit in agricultural products and its social and hygienic effect upon the people. A number of statistical tables are included showing changes that have taken place.

[Agriculture in Norway] (*Statis. Aarbok Konger. Norge, 34* (*1914*), *pp. 26–35*).—These pages continue statistical data previously noted (E. S. R., 31, p. 192), to include 1913.

Agriculture in Serbia, F. O. WALDMANN (*Fühling's Landw. Ztg., 64* (*1915*), *No. 2, pp. 55–60*).—The author briefly summarizes the agricultural conditions in Serbia by describing the climatic conditions, area and kinds of crops grown, and types and number of live stock.

Estimates of area and yield of principal crops in India, 1913–14 (*Dept. Statis. India, Est. Area and Yield Princ. Crops India, 1913–14, pp. 25, pl. 1*).—This report gives for 1913–14 the area and total and average yields by Provinces for the principal crops, and explains the methods of making estimates and collecting statistics. Comparative data are given for earlier years.

Pineapple-canning industry of the world, J. A. SHRIVER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 91* (*1915*), *pp. 43*).—This report describes the extent of this industry, methods employed in conducting canneries, the labor problems, and factory systems.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop. Rpt., 1* (*1915*), *No. 3, pp. 12, figs. 6*).—This number gives the usual monthly estimates of the acreage, condition, and yield of the more important agricultural crops, the farm prices of important products, and the range of prices at important markets, with miscellaneous data, including charts showing the monthly variation in live-stock prices.

An inquiry as to the use of corn for silage shows that approximately 8 per cent of the corn acreage last year was cut for silos, 11 per cent cut green for feed, and 81 per cent matured for grain. Detailed percentages and acreages are shown by States.

An inquiry as to the extent of this year's reduction in the use of commercial fertilizers for cotton, as indicated by the sales of fertilizer inspection tags to June 25, 1915, compared with the sales for the last year to that date, shows that there was a reduction of 25 per cent for North Carolina, 45 for South Carolina, 44 for Georgia, 32 for Florida, about 50 for Alabama, 26 for Mississippi, 19 for Louisiana, and 70 for Arkansas.

It is pointed out that the reduction in the absolute quantity of commercial fertilizers used does not measure the full extent of the loss in the productive powers of the plant, since the quality of the fertilizers sold is much inferior to last year's supply because of the lack of available supplies of potash. It appears, however, that the southern farmers have exerted themselves to a hitherto unknown extent in the utilization of home-produced composts and natural manures.

Farmers' market bulletin (*North Carolina Sta., Farmers' Market Buls. 1* (*1914*), *No. 3, pp. 15; 2* (*1915*), *No. 3, pp. 16*).—Suggestions are given on marketing apples and butter, with a list of the butter and egg dealers who desire quotations on North Carolina butter. The second bulletin criticizes the methods used in marketing North Carolina corn and cotton, and discusses the feasibility of county, state, and national cooperation in grading cotton. Both bulletins contain the usual list of products which farmers have for sale.

AGRICULTURAL EDUCATION.

First annual report on vocational education in Indiana, W. F. BOOK (*Ann. Rpt. Vocational Ed. Ind., 1 (1914), pp. 169–230, figs. 4*).—This report deals with the vocational education law of Indiana, types of vocational schools to be established, progress made in vocational instruction, instruction in agriculture, domestic science, and industrial arts in the regular schools, work of county agents of agriculture, and agricultural clubs, and school and home gardening work.

The state board requires that at least two regular recitation periods a week in the seventh and eighth grades be devoted to the study of agriculture, industrial arts, or domestic science, and that township, town, and city high schools offer at least one year's work of five recitations a week in domestic science and a full year's work in agriculture or industrial arts. Last year 39,810 students in Indiana studied elementary agriculture and 46,985 domestic science. The amount of time devoted to instruction in these subjects ranged from 50 to 80 minutes a week in the grades and from 90 to 450 minutes in the high school. Instruction in agriculture was given by 5,928 teachers, of whom 747 had studied agriculture, and instruction in domestic science by 4,575 teachers, of whom 610 had studied the subject for from 6 to 18 weeks.

Thirty-four township and district supervisors of agriculture were employed last year in 12 counties and 59 township and district supervisors of domestic science in 16 counties. The agricultural extension department of Purdue University has contributed the services of 3 men to assist the state superintendent of public instruction in supervising agricultural instruction in the regular schools; 27 county agents prepared special outlines for work in agriculture in the schools, issued bulletins on helps for teachers, gave instruction in agriculture at 134 township and county institutes, and visited 935 schools, in some instances directing the field and laboratory exercises and during the summer months supervising the club projects; and 2,500 boys and girls were enrolled in club work during the summer of 1914, and a similar number in home projects in corn and potato growing, poultry raising, and gardening and canning.

State-aided vocational agricultural education in 1914 (*Ann. Rpt. Bd. Ed. [Mass.], 78 (1913–14), pp. 274–312; Bul. Bd. Ed. Mass., No. 40 (1915), pp. 40*).—This is a detailed report on the organization and activities of the vocational agricultural schools and departments in Massachusetts, including statistical tables showing reimbursements as to salaries and tuition, the vocational agricultural instructor's preliminary survey for home projects prior to approval of admission of pupils, examples of the income of pupils from farm work during attendance at school, etc.

Agriculture in the New York state high schools, L. S. HAWKINS (*Cornell Countryman, 12 (1915), No. 7, pp. 559–562, figs. 3*).—The author gives a general description of the agricultural work extending through 4 years in the 48 high schools in New York receiving state aid for agriculture.

[Agricultural education in the Philippines] (*Philippine Craftsman, 2 (1914), No. 8, pp. 535–644, figs. 83*).—This issue is devoted to a survey of agricultural education in the Philippines given in the following special articles: Spain's Contribution to Philippine Agriculture, by A. Craig; What the Philippine Public Schools are Doing in Agriculture; School and Home Gardening, by N. H.

Foreman; The Villar Settlement Farm School, by W. J. Cushman; The Lumbayao Settlement Farm School, by G. C. Kindley; The Mailag Agricultural School, by J. C. Scott; The Indang Farm School, by J. A. Cocannouer; The Central Luzon Agricultural School, by K. O. Moe; Food Campaigns Through the Medium of the Philippine Public Schools, by N. H. Foreman; The College of Agriculture, by E. B. Copeland; and Notes on the Work of the Bureau of Agriculture, by W. K. Bachelder.

A new year in agricultural instruction (*Agr. Gaz. Canada, 2 (1915), No. 1, pp. 28–51, figs. 11*).—An account is given of the organization and development of agricultural instruction in Prince Edward Island, together with notes of work planned for the coming year in other Canadian Provinces.

Elementary agricultural instruction (*Agr. Gaz. Canada, 2 (1915), No. 2, pp. 151–170, figs. 7*).—The plans and policies of organization of elementary agricultural instruction in the schools of Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, are described.

Vocational education in Europe, E. G. Cooley (*Chicago: Com. Club Chicago, 1915, vol. 2, pp. 177, pls. 8*).—This is a report based on personal visits and studies by the author on the historical development and present status of agricultural instruction in Denmark, Ireland, Holland, and Germany, schools of country housekeeping in these countries, vocational guidance in London, and welfare of the working youth in Germany. A résumé of the report of the Swedish royal commission on elementary technical instruction is included.

Regulations for grants in aid of agricultural education and research in England and Wales, 1915–16 (*London: Bd. Agr. and Fisheries, 1915, pp. 25*).—This pamphlet deals with the conditions under which grants under the Development Act are awarded. See also a previous note (E. S. R., 31, p. 794). A letter authorizing the payment of grants from the Development Fund for agricultural research and a memorandum on agricultural education in connection with farm schools and farm institutes are appended.

Agricultural training for women in Holland, S. R. von Ramult (*Land u. Forstw. Unterrichts Ztg., 28 (1914), No. 3–4, pp. 225–233*).—This account is similar to but more extensive than the one previously noted (E. S. R., 32, p. 92).

Education for efficiency, E. Davenport (*Boston: D. C. Heath & Co., rev. ed., 1914, pp. V+196*).—In this revision of this text (E. S. R., 22, p. 593) the author includes in the preface a series of propositions on vocational education published in a recent report of the Illinois Educational Commission. He also substitutes for the proposed high-school course in the first edition a more modern course from the report just mentioned, and for the discussion of "agricultural development and public investment" a chapter on The Meaning of Agriculture, including its importance and evolution, the balance of trade, the ultimate condition, the need for a rural credit system, the meaning of land tenure, and the people of the farm.

The proper preparation and equipment, academic and professional, of teachers in schools of agriculture, C. G. Maphis (*[University, Va.: Author], 1915, pp. 13*).—The author discusses the need of properly trained agricultural teachers and their qualifications, and refers to the policy of teacher training for secondary schools in Germany and to the joint recommendations of the Committee of Seventeen on the professional preparation of high-school teachers. In his opinion teacher training involves broad academic knowledge as a basis, leadership, professional knowledge, and specialized knowledge of the particular subject to be taught. Academic training of teachers in the secondary schools of agriculture should not be less than four years of standard college work, the group system should prevail, and several groups of subjects allied with agriculture should be extensively studied. English should not be neglected and a sufficient number of other courses of general culture should be pursued. The theoretical and practical professional training should not be less than specified and in addition at least a year in practical experience on a farm should be insisted upon.

School credit for home work, L. R. ALDERMAN (*Boston: Houghton Mifflin Co., 1915, pp. X+181, pls. 8*).—The author narrates the working out of the school credit for home work idea, including illustrative home credit plans in elementary and high schools. An appendix contains the essential features of a bulletin of the Kansas State Agricultural College entitled, School Credit for Home Work, and a brief report by the California Teachers' Association on credit for work done outside of school.

Teaching agriculture in rural and graded schools, E. C. BISHOP, R. K. FARRAR, and M. H. HOFFMAN (*Off. Pub. Iowa State Col. Agr., 13 (1914), No. 20, pp. 175, figs. 30*).—In this revision (E. S. R., 31, p. 298) references to literature, etc., have been brought up to date and poultry studies added.

Lessons in elementary agriculture for Alabama schools, E. A. MILLER (*U. S. Dept. Agr. Bul. 258 (1915), pp. 36*).—This series of lessons adapted to Alabama conditions has been prepared for the use of rural school teachers. A monthly sequence plan is followed and practical and correlation exercises are suggested in connection with each lesson. References to bulletins of the Alabama Polytechnic Institute and to Farmers' Bulletins of this Department are also included to supplement the text-book material and provide a reading course for the teacher.

Pre-vocational agricultural courses of the public schools of Indiana (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 15 (1915), pp. 223*).—Minimum courses in soils, crops, animal husbandry, dairying, poultry, and horticulture, prepared by the state board of education, are outlined, in seasonal sequence, for the seventh and eighth grades 1915–16 and 1916–17, and for high schools, the latter including also vegetable gardening, farm mechanics, civics, and history. Lists of agricultural reference books and of apparatus and equipment are included.

Elementary principles of agriculture, A. M. FERGUSON and L. L. LEWIS (*Chicago: Ferguson Publishing Co., 4. ed., 1913, pp. X+390, pls. 7, figs. 232*).—The fourth revised edition of this text contains as new matter, 10 chapters on crops and an appendix giving the annual rainfall in the United States for the years 1898–1907, inclusive (E. S. R., 29, p. 193).

Practical lessons in agriculture, L. S. IVINS and F. A. MERRILL (*New York: American Book Co., 1915, pp. VI+223, figs. 96*).—This is a text-book and laboratory manual for use from the seventh to the tenth grades. The lessons, most of which are laboratory or field exercises and are arranged in seasonal sequence, treat of sources of food, clothing, and shelter; the atmosphere; seeds; soils; fertilizers; plant production; insects; weeds; field crops; vegetables; fruits; school and landscape gardening; farm forestry; school grounds; birds; feeding, housing, and care of farm animals; selection of meat animals; milk and its products; poultry; packing and marketing products; farm buildings and machinery; farm drainage; good roads; a census of neighborhood farm crops, animals, and weeds; distribution of cotton, corn, hogs, and cattle in the United States; farm cooperation, etc.

A study of Indian corn (Zea mays), J. C. RUNDLES (*Philippine Agr. and Forester, 3 (1915), Nos. 9–10, pp. 228–243, fig. 1*).—The author describes the method of studying Indian corn in the Philippine College of Agriculture, discusses the advisability of corn standards, and outlines and explains the score card in use.

Poultry keeping, H. R. Lewis (*Philadelphia and London: J. B. Lippincott Co., 1915, pp. XVIII+365, pl. 1, figs. 182*).—This text for rural and graded schools, which with slight adaptations may be used in high schools, consists of an introductory discussion of different grades and methods of instruction in poultry husbandry and a treatise dealing with the different breeds, hatching and rearing, housing and feeding, products, health, diseases and enemies, and management of poultry. Each chapter is followed by laboratory exercises, a list of review questions, and references to literature. Lists of reference books and of colleges and stations giving attention to poultry problems, a plan and rules for boys' and girls' poultry contests, score cards, and data on the composition and digestibility of common feeding stuffs, etc., are appended.

Poultry keeping project study outline (*Bul. Bd. Ed. Mass., No. 36 (1914), pp. 139*).—This poultry keeping project outline consists of questions and references for producing and disposing of live poultry, eggs, turkeys, ducks, and geese.

Housekeeping, Alice M. Fuller (*Manila: Bur. Ed., 1914, pp. 298, pls. 3, figs. 59*).—This text-book for girls in the public intermediate schools (grades 5 and 6) of the Philippines consists of reading lessons and practical exercises in housekeeping and cooking, sewing and textiles, hygiene and home sanitation, and ethics.

Agricultural economics, E. C. Sedlmayr (*Land u. Forstw. Unterrichts Ztg., 28 (1914), No. 3–4, pp. 203–219*).—The author gives an outline for instruction in agricultural economics, and discusses the relations of agricultural economics to agricultural production and to political economy, as well as the use of monographs, statistics, and farm experiments in the promotion of instruction in agricultural economics.

Observations on legal instruction in secondary agricultural schools, F. A. Scholz (*Land u. Forstw. Unterrichts Ztg., 28 (1914), No. 3–4, pp. 220–224*).—Observations are made on instruction in constitutional, civil, and administrative law, including its relation to agrculture, in the secondary agricultural schools in Austria, all of which devote 2 hours a week to this subject in the third year, and 2 hours a week to political economy in the second year.

Outline of nature-study, G. H. Trafton (*Nature-Study Rev., 11 (1915), No. 3, pp. 94–169, figs. 2*).—The author gives a detailed outline of the nature-study course, arranged according to seasons, in use in the elementary school of the State Normal School at Mankato, Minn., together with a study of the aims, available materials, and methods of teaching nature study and its relation to other subjects.

Course III. Home gardening, E. C. Bishop and G. R. Bliss (*Iowa State Col. Agr. Ext. Circ. 17 (1912), pp. 3–16, figs. 4*).—General regulations and directions are given for conducting the work of the individual home garden.

Yard and garden contests, C. L. Fitch (*Iowa State Col. Agr. Ext. Bul. 32 (1915), pp. 16, figs. 12*).—This is a description of the methods employed by a civic organization in the improvement of gardens and yards in Davenport, Iowa.

Suggestions for boys' acre corn club contest, P. C. Taff (*Iowa State Col. Agr. Ext. Dept., Junior Circ. 28 (1915), pp. 15, figs. 9*).—Suggestions are given for selecting, testing, planting, and cultivating corn.

School gardens, 1915, edited by R. L. Templin (*Cleveland, Ohio: The Children's Flower Mission, 1915, pp. 48, figs. 31*).—Information and suggestions are given on planning and conducting school and home garden and junior clean-up work, and annual exhibitions.

School gardening and school fairs (*Agr. Gaz. Canada, 2* (*1915*), *No. 1, pp. 52–61, figs. 2*).—Accounts are given of the present status of school gardening and school fairs in Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta.

School-ground improvements, N. H. FOREMAN (*Manila: Bur. Ed., 1914, pp. 56, figs. 4*).—A 4-weeks' course of 13 lessons is outlined for teachers of all grades in the Philippines for the purpose of giving them instruction in improving the school grounds with student labor. Directions are given for presenting the course at division normal institutes.

School and home gardening, N. H. FOREMAN (*Manila: Bur. Ed., 1914, pp. 56, figs. 2*).—This is an outline of a 4-weeks' course in school and home gardening for teachers of elementary grades in the Philippines, together with the method of presentation of the course at division normal institutes.

Home gardens, field crops, and home canning for boys' and girls' club work, O. H. BENSON (*Ann. Rpt. Missouri Bd. Agr., 46* (*1913*), *pp. 286–295, figs. 2*).—The author dicusses essentials, objects, and evidences of good club work, school credit, leadership, relations, projects, prizes and premiums, follow-up work, and club work as related to markets and consumers.

Boys' agricultural clubs, W. H. KENDRICK (*W. Va. Univ., Agr. Ext. Dept. Circ. 2* (*1915*), *p. 15, figs. 11*).—Instructions are given for organizing boys' and girls' corn, pig, potato, and poultry club work.

Annual report of the School Garden, Association of America (*Ann. Rpt. School Gard. Assoc. America, 4* (*1014*), *pp. 30, figs. 19*).—This report contains, among other data, a list of books on home canning, domestic science, poultry, and birds of interest to city people, plans of a model garden, and excerpts from addresses and papers presented at the 1914 annual meeting.

MISCELLANEOUS.

Twenty-first Annual Report of Montana Station, 1914 (*Montana Sta. Rpt. 1914, pp. 383–408*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, a report of the director on the work and publications of the station, and a summary of meteorological observations for 1914. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of Porto Rico Station, 1914 (*Porto Rico Sta. Rpt. 1914, pp. 35, pls. 3*).—This contains the organization list, a summary by the special agent in charge as to the investigations conducted at the station during the year, and reports of the chemist and assistant chemist, horticulturist, assistant horticulturist, plant pathologist, and entomologist abstracted elsewhere in this issue.

Annual Report of South Dakota Station, 1914 (*South Dakota Sta. Rpt. 1914, pp. 26*).—This contains a report by the director on the organization, work, and publications of the station, a list of exchanges, a financial statement for the fiscal year ended June 30, 1914, and departmental reports.

General review [of the Fourth Scientific Congress], E. POIRIER (*4. Cong. Cient.* [*Santiago de Chile*], *1908–9, Reseña Gen.* [*pub. 1915*], *pp. 304, pls. 4, figs. 60*).—This is a general review of the Fourth Scientific Congress (First Pan-American Scientific Congress), held at Santiago, Chile, December 25, 1908, to January 5, 1909, which has been previously noted (E. S. R., 20, pp. 608, 695).

NOTES.

Illinois University and Station.—Plans are completed for the erection of a special genetics building of somewhat temporary construction. It will be a one story brick structure, 40 by 100 feet and will provide, besides three offices, class rooms and laboratory accommodations for 50 students at a time in undergraduate instruction and also separate laboratories for graduate and experiment station work.

Donald McIntosh, professor of veterinary science since 1886, died at Portland, Me., September 5.

Maryland College and Station.—A. C. Stanton has been appointed instructor in the manufacture of dairy products in the college and assistant in dairy investigations in the station, beginning September 1.

Nebraska University and Station.—P. B. Barker has resigned as professor of instructional agronomy and associate agronomist to become associate professor of farm crops in the extension service of the University of Missouri, beginning September 1.

North Dakota College and Station.—The board of regents provided by the recent legislature to take charge of all the higher educational institutions in the State, including the station and the substations, has been appointed by the governor with the consent of the senate as follows: L. F. Crawford president, J. A. Power, Frank White, J. D. Taylor, and Emil Scow. The new board assumed control July 1.

Oregon College.—A system of farm surveys to determine factors contributing to success or failure in Oregon farming is being conducted by H. F. Keyes under a cooperative arrangement between the extension division of the college and the Office of Farm Management of the U. S. Department of Agriculture.

Texas College and Station.—The increasing popular interest in the station is indicated by the material increases in appropriations during the past few years. Six years ago there was no state appropriation for the main station and but $5,000 per annum with which to operate two substations. For the next two years the appropriation was $25,000 to operate ten substations. Four years ago it was increased to $55,000 per annum; two years ago to $87,500; and the present legislature granted $140,582.50 for the first year and $135,000 for the second year of the biennium. This appropriation has been approved by the governor without curtailment. Steps have also been taken for the erection of a station building, to be paid for from the feed-control-service revenue.

Other appropriations include a stock-judging building to cost $40,000; $2,000 to remodel the dairy barn for horses and beef cattle; $1,500 each for a sheep and hog barn; $21,000 for the purchase of live stock and the maintenance of the animal husbandry department; and $12,000 for a new dairy barn. A substation is to be established in west Texas for studies in goat breeding.

Bailey O. Bethell, D. V. M. (Ohio State University, 1915), has been appointed instructor in veterinary science, beginning July 1.

Wyoming Station.—Considerable new laboratory equipment has been installed in the various departments, especially those of engineering chemistry, agronomy, and wool investigations. P. T. Meyers has been appointed assistant agronomist, beginning September 1.

The Agricultural Experiment Stations of the United States.

U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. XXXIII NOVEMBER, 1915 No. 7

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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State College: Institute of Animal Nutrition; H. P. Armsby.[a]
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EXPERIMENT STATION RECORD.

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LIBRARY NEW YORK BOTANICAL GARDEN

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[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

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The extent to which the element of chance figures in agricultural experimentation and investigation is a large one. It is at once the inspiration and the distraction of the seeker after new truth. It accounts for many efforts which are in part futile for the time being, and for frequent negative or unenlightening results, as well as for occasional findings of great significance.

This recognition of the uncertainties in the situation is not opposed to the idea that agricultural investigation is of an exact nature and is based on the best available light of the time, but it expresses the groping nature of the effort, the inadequacies of methods, and the inability to control conditions which may be adverse to a conclusive result. While these difficulties are common to other branches of science, they are perhaps especially conspicuous in agricultural experimentation and investigation, owing to the very complex nature of the problems and the conditions under which they are studied. The acknowledgment of them is not a sign of weakness or of doubt, but rather of a clearer insight which has come with the extended experience of our stations in that field.

The very nature of research and experimentation implies the element of doubt, the uncertainty as to the ultimate outcome. If there were no question there would be no need for experiment. While not a random effort, it involves novel and often abnormal factors and conditions which can not be fully depended upon and are in part undetermined.

No one can predict the result of an experimental inquiry, or prophesy as to its success. It is an attempt to find out something that is not known. While it is not a leap in the dark it is an excursion into the unknown, and the paths are not clearly charted. The method of approach is suggested by analogies, but it requires some adaptation to each particular case and it may prove inadequate or present stumbling blocks. In that case it calls for ingenuity and a careful consideration of all known facts and factors. In many instances the successful attack of a class of problems calls for an original conception as to the nature of the project and the way in which it might be successfully attacked. In any event it requires close application. There is a difference between working upon a question and working at it. One has an objective, constructive aim, and a method which embodies all that the best knowledge and experience and ingenuity can suggest; the other works around the edges of the question, searching for a lead and waiting for something to turn up.

While some of this uncertainty is manifestly unavoidable, and arises in a measure out of the general deficiencies of knowledge, it is increased by haste, deficient preparation, insufficient attention to details, and other matters which have a pronounced effect. It results from insufficient planning, from undertaking more than can be done thoroughly, and from failure to study the data as they need to be studied. In some cases it is a result of following the practical phase of the problem too closely and exclusively.

A recent writer in commenting upon the experimental inquiry in a given line said: "Unfortunately the trail of the 'practical man' was followed somewhat too closely in the investigations which were made before the end of last century, with the result that many field experiments have expressed the natural result of many conflicting factors, and have given but little indication as to the components." There is much truth in this statement, and it probably applies to considerable of the experimental work of the present. It results from the attempt to meet the expectations of the public by giving direct answers to practical questions as speedily as possible. But in this attempt it fails to realize that "the principle underlying an agricultural problem must first be studied before the problem itself can be solved." This is why at the outset close analysis of a practical agricultural question is essential, and the devising of a plan which will give an intelligent and satisfying answer as far as it goes.

The object of an experiment or an investigation is to secure definite information—to establish a fact, to test a theory, or to determine the application of certain results. The aim and the plan, therefore, should be to give as distinct and conclusive an answer as is possible. It may not be complete but as far as it goes it ought to be authentic and reliable. It should not be forgotten that the genuineness of discovery is of first importance, and furthermore, that, as a great lawgiver has said, to know the law we must understand the law. Both are opposed to haste and superficiality.

In some of our undertakings the element of chance is at times unnecessarily large. It does not fully take account of the experience and the teachings of experimental work. Occasionally the prophecy might almost be made at the outset that neither final nor probably illuminating results would follow. The difficulty may be inherent in the subject, because of lack of insufficient information leading up to it; investigation may not have progressed far enough to enable constructive and conclusive work. This accounted for much of the unproductive work on the biology of the soil in years past, and to some degree this general lack of information apparently still blocks progress.

Science rarely progresses by leaps and bounds, but piece by piece. Chance discoveries of great moment are seldom made at random. Knowledge advances by a process of accumulation and through a deeper insight which suggests more effective methods of attack.

In a certain class of station work there is considerable collection and accumulation of data merely on the chance or in the hope that it may develop something of interest, or shed light on the nature of some class of phenomena. It is rarely a promising method where a definite ultimate object is in view, and unless something definite is being looked for the point of importance may escape notice. Where the first essential step is to get a substantial basis of data or a record of natural phenomena the case is, of course, quite different.

Some workers are more willing than others to take chances. They unnecessarily admit the element of doubt, partly because they may not be fully conscious of it, and partly because they are impatient of slow methods. Inexperience and overconfidence in the capabilities of experiment are often responsible for this. Someone has said that a spirit of experiment and a contempt for the past "has made us credulous of quick improvement, hopeful of discovering panaceas, confident of success in every new thing."

There is a kind of experiment which deals with matters superficially—which seeks only the answer without regard to how it is derived or how it may be limited—in fact, without determining just what it means. It does not aim at the real underlying question and go to the bottom of it, but it conducts hasty tests and trials which are incapable of giving more than a partial, superficial answer; it mistakes a comparative result for an absolute answer, and ventures a deduction or generalization which later is found unwarranted.

Happily this type of work has quite largely passed. It has been found inadequate and dangerous. It has no place in an enterprise which seeks illuminating and dependable facts. But there is still a considerable body of work which is superficial and incomplete in that it does not go to the kernel of the matter and contents itself with results which are at best temporary and tentative, without planning studies which will make them more logical and stable. Much of this work gives only comparative results, tentative and empirical at best, but the chance is taken of generalizing from it broadly. And there is some disposition to perpetuate work of this kind instead of engaging in a type which is more thorough and conclusive. It is in part a matter of training and of insight, and to some extent it is because such grade of work meets with quick response and appreciation. For this reason it is countenanced, although its limitations are not unknown, and the higher standards are not made a requirement.

We realize, for example, that many of the field experiments so extensively conducted are less accurate and dependable than such studies ought to be, because of their inherent crudeness and because of factors which are not checked or controlled. A considerable experimental error is recognized, dependent upon a variety of factors, and the limitations of such work have been widely demonstrated. Furthermore, in outdoor experiments the chance factors of the season have a very large effect. But field experiments unsupported by more refined studies continue to form a large feature of the work in agronomy. Considerable of our breeding work with plants rests on chance. It seeks the chance result, a product and not an idea, and contrives to increase the probability of its appearing. This is its primary object rather than an attempt to find out why, how, and under what conditions these exceptional things occur. Instead of studying correlations with a view to a greater elimination of chance in breeding, emphasis is placed first and foremost on the attempt to get something better, and there the undertaking often rests.

Feeding experiments made from the commercial or economic viewpoint are subject to market fluctuations, and hence embody an additional chance element. And it frequently happens in such experiments that untoward conditions or accidents occur which make a clear interpretation of results impracticable.

Haste is responsible for another element of uncertainty in various kinds of experiment, which in the end is wasteful of time and energy. It is supposed to be a common attribute of Americans. The Englishman has accused us of acceleration as a national characteristic—of haste in all things, instead of inquiring whither. Scientific progress in agriculture has never been as rapid at any period as at the present, but this apparently has served to increase expectation and resulted in a speeding up. Rapid as the progress is, there are those who seem to feel that the great questions which have been before the world for centuries should now be answered without much delay.

Referring to the necessity for the exercise of patience in regard to research, Dr. D. P. Penhallow, in an address delivered several years ago, pointed out that nature's processes, although exceedingly certain of fulfillment, are nevertheless exceedingly slow. "If it has taken five hundred million years to shape this earth and render it a fit habitation for man, man himself must not be impatient if he is required to spend a few years of arduous toil that he may unlock some of the doors which so carefully guard nature's secrets.

Sixty-three years sped on their way from the time when Boussingault first endeavored to ascertain the source of nitrogen in plants, until a satisfactory explanation was reached through our knowledge of the action of root tubercles; and for more than sixty years Lawes and Gilbert sought the solution of plant nutrition without gaining the end in view.

"The laws of nature are not kept on draught, as it were, to be drawn in large or small quantity, according to the demand. To present a problem to an investigator and expect an immediate solution, or an immediate practical application, is to be prodigal of a costly equipment, to sacrifice unnecessarily the best and most carefully trained intellectual strength, and to bring discouragement and invite failure.

"It is, no doubt, true that when a commonwealth has invested a large amount of capital in specially trained men and expensive apparatus, it is reasonable to ask for results, and with this no fault can be found. The danger lies in the fact that sufficient opportunity is not allowed for the careful working out of a problem in all its scientific aspects. Under conditions of haste and undue pressure, the results, if worth anything, are very likely to be incomplete and unsatisfactory, and in too many cases they must be subject to costly revision."

There is abundant confirmation of the truthfulness of these views in our own experiment station work. It is no disparagement but a note of caution. The necessity for less haste and for patience with the more thorough and leisurely methods ought to be understood. Most of the simpler things have been done. From now on the progress may be more slow, but it ought to be more sure.

The element of chance in a certain type of experiments is further increased and multiplied by a large amount of repetition, because of inadequacy of the methods or the means of attack. The error involved is not eliminated, and hence the chance of misinterpretation is accumulated and increased. Mere imitation will mark but little advance, for it lacks the critical attitude and the searching spirit essential to improvement and progress. What is most needed is new thought and ideas, and new insight, rather than more experiments which mark no special progress. These are now essential as a means of successfully attacking problems which, although much worked upon, have not yielded to the experimental method, or at least only in part. In some lines the attempt is still being made to work out through relatively crude experiments, unaided by more refined methods, problems which will require quite different treatment. One value of earlier experiments lies in disclosing the weaknesses and limitations of methods, which continued repetition and study from the same point of view serve mainly to confirm.

Not all topics which it is desirable to know about are profitable ones for study at the present time. The element of uncertainty is too great; they wait on further advancement in the field of general science. How futile it now seems to have experimented on the control of a plant disease until we knew something of the history, habits, and manifestations of the organisms causing it. It was like prescribing remedies in human medicine before the real nature of the disease was known. In much the same way some of our work at present attempts to attack complex problems too directly. It seems unpromising, for example, to attempt a direct study of the effect of a course of soil treatment on the fertility of the soil until we can measure more accurately the different elements that go to constitute fertility and correlate them so as to trace a direct relation between the treatment and the complicated nature of the manifestation. It is obvious that in agricultural investigation, as in all kinds of research, the scientist should not compare effects without studying causes or enlarge upon results without examining their origin and source.

Our knowledge and our ability to conduct profitable researches go forward step by step, and agricultural research is so dependent on the advance of general science that it can rarely do more than keep pace with it. We should not, therefore, take unnecessary and unreasonable risk in selecting topics for study. This does not mean that the easy things should be selected, but those whose profitable study is practicable—the things it is feasible to do or which give promise of being solved. Such a selection implies close critical study of the station's program of work.

The element of chance may be increased by the way in which the station program is made up. It seems at times to be itself something of a matter of chance. It lacks evidence of system or a general plan. It skips from one thing to another without continuity or visible connecting link. The work in one department does not supplement that in another, much as the need for it may be. The program as a whole is to some extent a chance combination, growing out of contingency and of what the members of the staff, acting and thinking independently, decide they would like to take up. In other words, there is a suggestion of lack of coordination.

The station program ought not to be a heterogeneous admixture of independent, unrelated lines of work, without system or plan, but it ought to have regard to the efficiency of the station as a whole and to both the needs of agriculture in the State and the needs of agricultural science as a means of advancement.

It will have occurred to the reader that perhaps the largest element of chance lies in the human equipment. The ability of a station to enter upon a given piece of new work hangs on the chance of getting some one competent to take charge of it, and his qualification can not always be determined in advance. Even when such a worker is secured and is making encouraging progress, a successful issue is contingent on the ability to retain him. This is being continually brought home to the stations. To provide the necessary men of proper equipment, special efforts are being put forth, and to insure the continuity of investigations, attempts are being made to link the leaders more closely to their special problems.

In the past what the station was doing depended to no small extent on what the men could manage to fit into their other duties, and what they were able to accomplish depended on their ability to adjust their studies to the opportunity which the year brought forth. It has not been unusual for men to explain that they did not take up certain exacting lines of study because they knew their other duties would probably not permit them to follow these studies continuously or to devote the necessary time to them.

With the larger measure of relief of station investigators from other duties and from interruption, these elements of uncertainty are constantly growing smaller. The station's program at the present time is, to a far less extent than formerly, contingent on circumstances and other demands on its working staff. But the case of the supervising and coordinating head of the station, on whom general direction depends and to whom the men should look for stimulation and encouragement, is less favorable. He is often attempting to do too much and too great a variety of things, which leaves insufficient time for consideration of the station's work and management. The effect of this is to increase the element of chance, because it is inadequately guarded against.

A primary object of the experiment station is to remove the element of chance in farming—to make the art better understood and more certain in its results. The greater confidence of the public in experimenting and the extent to which the stations' teachings are now being incorporated into practice make it doubly necessary for the experimenter to be conscious of the elements of error, to make haste slowly, and to develop his studies along an orderly constructive program.

It behooves us to make experiment and investigation in agriculture as secure and adequate as possible, both in method and result—to eliminate or reduce to the lowest practicable terms the chance of failure or ineffective effort. The means for this are a part of the general problem. The spirit of investigation involves the discovery and overcoming of obstacles. It is in this way, instead of by going around them or passing them on, that advancement is made. Some of the present uncertainty is avoidable or capable of being brought more largely under control than it is in many cases, and supplemented by more exact studies. There is opportunity for searching inquiry as to the adequacy of plans and methods involved in new undertakings and in lines which have been under way for a period; and there is good opportunity for a larger measure of sympathetic, constructive criticism. When everything is done that science and experience suggest, there is a sufficient chance element standing in the way of progress, and without progress our experiment stations would soon cease to be leaders in this great educational effort.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The acids and colloids of humus, G. Fischer (*Kühn Arch., 4 (1914), pp. 1–136, figs. 4*).—In this work the colloids of humus were isolated by either the cold or hot water extraction methods, with filtration through hardened quantitative filters, asbestos or Pukall's filters, and concentration in vacuum at 30° C. or at ordinary pressure. The concentrates were purified by either parchment paper or fish bladder, by ultrafiltration, precipitation with alcohol, acetone, etc.

The method of preparing the humus did not seem to have any effect upon the reactions, but it has not been established whether the hot-water treatment can be used in other instances. On account of the higher concentrations of the Pukall filtrates of the hot-water extracts, the observations could be more easily made on these solutions.

The colloids of the cold-water treatment of composts in some cases showed other reactions. Humus colloids passed through 7.5 per cent ultrafilters. The colloids remaining in the ultrafilter with one exception were irreversible, but the ultrafiltrates still contained typical colloids, as was proved by flocculation, cataphoresis, and ultramicroscopy.

The hydrogen ion concentration of the various soils examined was determined by direct measurement of the electromotive power on the nonpurified and dialized solutions of humus. The crystalloid cations were removed from the colloid salt by dialysis. No illusion of an acid reaction with an indicator like litmus which depends on the absorption of the coloring matter cations could be noted.

Migrating capacity and velocity were determined with and without the addition of acid or alkali in unpurified and dialyzed colloids. The electric charge was negative, and the migrating velocity was least in acid media. Black soils were not examined. The migrating velocity of the dispersive phase of the same solution was ununiform, and the electric potential of the colloid particles was not constant.

By covering with water in the modified Coehn apparatus, partial coagulation occurred. This was irreversible in unpurified colloids, with one exception, but reversible after purification.

Protective properties were not possessed by humus colloids against colloidal gold and clay. There was protection against iron oxid, but it was not identical with that of reversible colloids. Reduction of colloidal iron oxid by humus colloids was not observed. The precipitation optimums of humus sols and sesquioxids were, in some cases, established. The humus colloids were not sensitive toward electrolytes. Reduction of gold chlorid hydrochlorid in the presence of humus was not noted. The dry state of humus sols in soils in most cases was irreversible.

A chemical analysis of the inner organic constituents of the soil in most cases gave no insight into the composition of colloids, but only emphasized the organic nature of humus colloids. Microscopically examined, the solutions of colloids were found homogeneous. Greenish-yellow and yellowish-red particles were visible with the ultramicroscope. Humus colloids were not found to be typical, reversible hydrosols, but appear to be related to certain organic coloring matters.

A new reaction for clay, F. RATHGEN (*Tonindus. Ztg., 38 (1914), No. 3, pp. 30, 31, fig. 1; abs. in Chem. Ztg., 38 (1914), No. 14, Repert., p. 57*).—This is a microchemical reaction which will detect aluminum and aluminum compounds in all substances, even though they be present in traces, e. g., in green or brown bottle glass. To 1 gm. of the powdered substance under examination in a platinum dish is added a little ammonium fluorid and 4 to 5 drops of concentrated sulphuric acid, and heated gently to dryness. As a result corundum is formed, which may be recognized under the microscope as six-sided colorless plates. When iron is present there are formed yellowish to brownish six-cornered crystals surrounded by a border of colorless corundum. Light-green (very small) and bluish six-cornered crystals point to the presence of cobaltic and chromium oxid, respectively.

A review and discussion of some of the methods for the determination of alkali in soils, R. F. HARE (*New Mexico Sta. Bul. 95 (1915), pp. 7–16*).—This is the report of the associate referee on alkali soils to the Association of Official Agricultural Chemists at Washington, D. C., November, 1914 (E. S. R., 32, p. 296). It reviews and discusses methods used by the Bureau of Soils of this Department and by several of the state experiment stations for the determination of alkali in soils.

Comparative investigations of Thomas slag powders according to the Lorenz, Naumann, and Popp methods, W. HOLLE (*Chem. Ztg. 38 (1914), Nos. 112–113, p. 1083*).—In these investigations it was found that the Lorenz method gave lower results than the Popp and Naumann methods, the two last-named methods being considered about on a par. The best results can be obtained by the Lorenz method, but the procedure is cumbersome. See also the work of Haussding (E. S. R., 31, p. 410).

Methods of bacterial analyses of air, G. L. A. RUEHLE (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 4, pp. 343–368, figs. 3*).—This study was undertaken at the New York State Experiment Station in connection with the relation of the bacterial content of stable air to the amount of bacterial contamination of milk. It is devoted especially to a determination of the filtering efficiency of two aeroscopes and a modification of one of them.

"It seems reasonable to conclude that the nature of the filters tested had little influence on the results secured in duplicate analyses, that is, those obtained where a sand and a liquid filter were used side by side agreed just as well as those where either two sand filters or two liquid filters were used side by side. It was found that the particular form of sand-filter aeroscope recommended by the committee on standard methods of bacterial air analysis appointed by the American Public Health Association varied in its filtering efficiency from 50 to 100 per cent, with the average efficiency for two series of tests of 90 and 91.6 per cent. It is believed that the chief cause of error with this form of aeroscope arises from the fact that it is so constructed that it must be sterilized with steam, which causes caking of the sand-filtering layer."

The modification of the standard aeroscope differs from the standard instrument in that the lower rubber stopper and the bolting cloth supports are eliminated and the small tube is fused into the larger one. The layer of sand is supported by a layer of cotton, resting on the shoulder at the junction of the large and small tubes. The upper stopper is replaced by a cork, which permits sterilization of the aeroscope by dry heat instead of steam.

"The modified standard aeroscope was found to retain nearly 100 per cent of the bacteria, with little chance of error. It was also found to be cheaper, less breakable, easier to operate, and more adaptable to field work than either the standard sand aeroscope or the aeroscope recommended by Rettger. The latter can be made to yield excellent results, provided sufficient care is exercised in handling it. Its use, however, is attended with a number of difficulties, among which may be mentioned its tendency to leakage about the rubber stoppers after being sterilized, the foaming of the liquid during operation, and the tenacity with which the bacteria cling to the inner surface of the moist inlet tube.

"The method of determining bacterial precipitation from air by means of exposed Petri plates has been found to be entirely unreliable, as it gives a measure of the number of bacteria-laden dust particles and not a measure of the number of bacteria present. The number of bacteria precipitating upon a given area has been determined by analyzing measured quantities of sterile water which had been exposed to the air for a given length of time in sterile pails. The numbers obtained in this way were from 2 to 32 times higher than those obtained with the plate-exposure method."

A bibliography of cited literature is appended.

The differentiation of various kinds of yeast with the aid of specific agglutinins, LICHTENSTEIN-ROSENBLAT (*Wchnschr. Brau., 31 (1914), pp. 293–295; abs. in Ztschr. Angew. Chem., 27 (1914), No. 85, Referatenteil, p. 592*).—Rabbits receiving intravenous injections of pure cultures of yeast yielded blood sera which could be used in the agglutination test for differentiating not only the various Saccharomycetes (top and bottom fermentation yeasts) but also for differentiating torulas from Saccharomycetes.

Picric acid as a titrametric standard, O. PFEIFFER (*Ztschr. Angew. Chem., 27 (1914), No. 50, Aufsatzteil, p. 383*).—Picric acid is advocated as a substance for iodometry and acidimetry. For standardizing acid solutions, however, the author prefers measuring the strength of the original solution with alkali and dimethylamidazobenzol.

The titrametric estimation of free sulphurous acid, E. KEDESDY (*Chem. Ztg., 38 (1914), No. 57, pp. 601, 602; abs. in Ztschr. Angew. Chem., 27 (1914), No. 91, Referatenteil, p. 625*).—The method in which sulphuric acid is titrated with methyl orange until the acid sulphite stage is reached and then with phenolphthalein until the neutral salt is obtained is deemed inexact, since the change in color with phenolphthalein occurs before the formation of the neutral salt is complete. The transition from one stage to the other may be made sharper if one oxidizes the acid salt to the neutral salt with hydrogen peroxid.

A new simple method for determining free sulphurous acid when thiosulphate or sulphuric acid is present, A. SANDER (*Ztschr. Angew. Chem., 27 (1914), No. 26, Aufsatzteil, pp. 194, 195*).—In this method, which is a modification of Feld's, standardized iodin solution is run in excess into the mixture of sulphurous acid and thiosulphate, and the excess of iodin is determined with standardized thiosulphate solution. The colorless solution is then treated with an iodid-iodate mixture and the liberated iodin is titrated with thiosulphate as before. The method can be used for estimating bisulphates, and also sulphuric and sulphurous acid in admixture.

The chief cause of the loss of sulphuric anhydrid and of chlorin by incinerating substances containing these constituents, J. O'SULLIVAN (*Analyst, 39 (1914), No. 463, pp. 425–428*).—The conclusions arrived at are as follows:

Although chlorids are decomposed and chlorin is lost on incinerating organic substances containing chlorids, the sulphates of calcium, potassium, and sodium are not appreciably reduced. Magnesium sulphate undergoes decomposition on ignition unless a carbonate is present. In the absence of a carbonate the ash of substances containing magnesium sulphate will, when ignited, consist of magnesium oxid. The quantity of magnesium sulphate in a substance containing chlorids may be sufficient to cause the total loss of the chlorin on incineration.

Volumetric determination of copper, G. ZUCCARI (*Ann. Chim. Appl.* [*Rome*], *2* (*1914*), *Nos. 9–10, pp. 287–290*).—The solution of the salt is titrated with a solution of a sodium nitroprussid which contains 46.866 gm. per liter until a filter paper moistened with ammonium sulphid becomes colored. One cc. of the sodium nitroprussid solution=0.01 gm. of copper. Free acids or salts of ferric iron, zinc (save in high concentration), tin, aluminum, lead, manganese, and certain other metals do not affect the results, and the method can be applied directly to solutions of copper which do not contain nickel or cadmium.

Detection of vegetable fats in animal fats, M. KLOSTERMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 26* (*1913*), *No. 9, pp. 433–437; abs. in Jour. Soc. Chem. Indus., 32* (*1913*), *No. 23, p. 1118*).—The Marcusson and Schilling method was not found always applicable, since digitonin precipitates only free cholesterol and phytosterol and not their esters.

"Saponification is essential, and the following method is recommended: One hundred gm. of the fat is saponified with alcoholic potassium hydroxid, the soap solution diluted with water, and the fatty acids liberated by hydrochloric acid and extracted with 250 cc. of ether. The ethereal solution is washed with water and shaken with 250 cc. of petroleum spirit and about 25 gm. of sodium chlorid, which is subsequently separated by filtration through cotton wool. The filtrate is heated and treated with a solution of 1 gm. of digitonin in 20 cc. of 90 per cent alcohol, and the crystalline precipitate separated after 15 minutes and washed with ether until free from fat. It is then dried with filter paper and acetylated with 20 to 30 cc. of acetic anhydrid. The excess of acetic anhydrid is evaporated, the residue dissolved in 50 cc. of absolute alcohol, and the solution treated drop by drop with water until crystals begin to separate. More water, up to 25 cc. in all, is then added and the crystals filtered on cotton wool, washed with 70 per cent alcohol, and dissolved in ether. The solution is evaporated to dryness and the acetates are recrystallized from absolute alcohol and examined in the usual way."

The separation of sterins from fats with digitonin, P. BERG and J. ANGERHAUSEN (*Chem. Ztg., 38* (*1914*), *No. 93, pp. 978, 979; abs. in Ztschr. Angew. Chem., 27* (*1914*), *No. 91, Referatenteil, p. 644*).—The value of the Windaus method for separating sterins with digitonin was studied. It was deemed especially desirable to know whether the method could be employed for food-control work, and, furthermore, whether the procedure could furnish new ways for investigating the unsaponifiable constituents of fats.

A modification of the Marcusson and Schilling, Klostermann, and Fritzsche methods (which utilize the Windaus principle) was finally decided upon. The solvent employed was chloroform saturated with digitonin at 60 to 70° C. Twice as much acetic acid anhydrid was employed for acetylation as is recommended by Marcusson and Schilling. For quantitative purposes the Klostermann procedure for separating the acetates is recommended. The sterin-free portion of animal fats does not seem to possess optical activity, but in plant fats and hardened animal fats optical activity of the sterin-free part is often observed. In hardened fats the optical activities are dextrorotary. It is thought that this optical property might eventually be employed for detecting hydrogenated fats.

Methods for the quantitative estimation of mannit, J. SMIT (*Ztschr. Analyt. Chem., 53* (*1914*), *No. 8, pp. 473–490; abs. in Ztschr. Angew. Chem., 27*

(1914), No. 91, Referatenteil, p. 625).—The methods worked out can be divided into three groups: (1) A modification of the Gayon and Dubourg method; (2) separation of mannit compounds of definite composition, when appropriate compounds can be obtained with ketones and aldehydes; and (3) indirect methods which do not involve the separation of mannit.

Determination of the amino acid and polypeptid nitrogen in barley, malt, and beer by the formaldehyde titration method, L. ADLER (*Ztschr. Gesam. Brauw., 37 (1914), Nos. 9, pp. 105–108, fig. 1; 10, pp. 117–121; 11, pp. 129–133*).—The method described is based on principles similar to those set down by Sörensen et al. (E. S. R., 19, p. 808; 23, p. 217). Phenolphthalein was used as an indicator. See also a note by Schjerning (E. S. R., 32, p. 23).

The presence of citric acid in natural wines, BLAREZ, DENIGÈS, and GAYON (*Ann. Falsif., 7 (1914), No. 63, pp. 9–11*).—Certain countries do not admit wines which contain citric acid, and this study was made for the purpose of determining whether French wines, especially Sauternes, contain this acid naturally. The method used in the investigation was Denigès.

In 25 wines made in the years 1893, 1903, 1906, 1907, 1908, and 1912 the percentage varied from 0.01 to 0.045. Wines taken from Montbazillac, Anjou, and on the Rhine (1904 to 1911, 13 samples) contained from 0.005 to 0.03 per cent. The juices of 16 samples of red and white grapes were found to contain, before fermentation, from 0.012 to 0.05 per cent and after fermentation, from 0.008 to 0.05 per cent.

Analysis of milk, G. MEILLÈRE (*Jour. Pharm. et Chim., 7. ser., 9 (1914), Nos. 10, pp. 489–493; 11, pp. 559–563, fig. 1*).—After discussing in a general way the physical methods for density, freezing point, and electrical conductivity, the methods for making quantitative determinations of the components of milk, especialy fat, are considered. A modification of Armand Adam's method, which allows the determination of fat, dry matter, lactose, and casein, but not the salts, in the same sample, is proposed. This requires two hours at the longest for making a chemical examination of milk without special apparatus. It separates the milk by means of a mixture consisting of 1,000 cc. of 75 per cent alcohol and 1,100 cc. of ether into a layer of fat and a layer of nonfatty substances. Ammonia is added in sufficient quantity to insure a good separation of liquids. The ethereal layer is drawn off and evaporated on the water bath.

The specific weight of milk serum in the detection of water adulteration, HERRAMHOF (*Molk. Ztg. [Hildesheim], 28 (1914), No. 7, pp. 115–118*).—It was found that the specific weight of milk serum from different cows shows less variation than does that of the entire milk, that it is correspondingly lowered as the water content increases, and that it remains unchanged after three days' coagulation. It is stated that clouded milk serum may be made clear by filtering through bone charcoal.

Lime-sulphur sprays, their composition and analysis, A. A. RAMSAY (*Jour. Agr. Sci. [England], 6 (1914), No. 4, pp. 476–483*).—In a previous paper (E. S. R., 31, p. 541) it was stated that the monosulphid sulphur present in lime-sulphur sprays appears to be essentially calcium hydroxyhydrosulphid (CaHSOH) with very minute quantities as calcium hydrosulphid (CaH_2S_2). "The solution of lime sulphur then appears to consist of calcium hydroxyhydrosulphid, calcium thiosulphate, calcium sulphate with sulphur held in solution." This is now amended by adding calcium disulphid.

The method of analysis is now as follows: Dilute 50 cc. of the concentrated lime sulphur to 500 cc. with water. (1) Titrate 25 cc. of the diluted mixture with decinormal iodin solution till the yellow color is discharged. The number of cubic centimeters used multiplied by 0.0016=sulphur by 0.0028=lime.

(2) Continue the addition of decinormal iodin solution till a tinge of yellow color obtains. The number of cubic centimeters decinormal iodin added multiplied by 0.0064=sulphur as thiosulphate and by 0.0056=lime (CaO) in combination as thiosulphate. Starch paste or paper may be used in (1) and (2) but the addition of starch renders filtration of (2) difficult to proceed to (3).

"(3) The fluid used in (2) is filtered through double filter paper and washed with cold water. To the filtrate barium chlorid and a few drops dilute hydrochloric acid are added, and the whole allowed to stand all night in the cold. Barium sulphate is filtered off, washed, dried, ignited, and weighed. The weight obtained multiplied by 0.1373=sulphur present as sulphate and sulphite. The sulphur multiplied by 1.75=lime equivalent to sulphur as sulphate and sulphite.

"(4) Ten cc. of the diluted mixture is diluted with about 25 cc. water and is shaken up in a separating funnel with 10 cc. carbon bisulphid, and allowed to separate. The carbon bisulphid is drawn off into a tared Erlenmeyer flask. The diluted mixture in the funnel is again extracted with 10 cc. carbon bisulphid and finally with two lots of 5 cc. each—the carbon bisulphid after extraction being added to that already in the tared flask. The carbon bisulphid is now removed by placing the flask in warm water, and the flask and contents dried to constant weight at a low temperature (not exceeding 70° C.). The sulphur obtained is free sulphur.

"(5) To 10 cc. of the diluted mixture, about 6 or 8 gm. sodium peroxid is added to oxidize the mixture, which is allowed to stand a few minutes. Fifty to 75 cc. water is added, and then hydrochloric acid, cautiously, till the solution clears up. Add a few drops of potassium iodid solution (15 gm. KI in 100 cc. water) to reduce the higher oxids (of chlorin)—boil off the excess of iodin—dilute with water to about 200 cc. and precipitate sulphur as $BaSO_4$. Filter, dry, ignite, weigh, and calculate to sulphur by multiplying weight of precipitate by 0.1373. This gives total sulphur.

"(6) To another 10 cc. aliquot of the diluted mixture, decinormal iodin solution is added as previously described till sulphids and thiosulphates are decomposed as at (1) and (2). Filter sulphur off through double-filter paper. Make filtrate ammoniacal, and determine the lime by precipitation with ammonium oxalate. This gives total lime. Calculations: (a) Sulphur obtained at (5)—[sulphur (4)+sulphur (3)+sulphur (2)]=sulphur as hydroxyhydrosulphid and disulphid=a. (b) Lime obtained at (6)—(lime calculated at (3)+lime calculated at 2)=lime as hydroxyhydrosulphid and disulphid=b. Let x=lime in combination as hydroxyhydrosulphid then $b-x$=lime in combination as disulphid. Further, $x\times 0.5714$ will be the sulphur in combination with x lime as hydroxyhydrosulphid and $b-x\times 1.1428$ the sulphur with $b-x$ lime as disulphid. Then

$$x\times 0.5714+(b-x)\times 1.1428=a,$$

$$x-\frac{(b\times 1.1428)-a}{0.5714}$$

from which $b-x$ is found."

The technical method for manufacturing dicyanamid from lime nitrogen from the standpoint of chemical kinetics, G. GRUBE and P. NITSCHE (*Ztschr. Angew. Chem., 27 (1914), No. 50, Aufsatzteil, pp. 368–378, figs. 4*).—A discussion of the methods and the results of some experimental work in this direction.

Formation of furfurol from wood during the steaming process, E. HEUSER (*Ztschr. Angew. Chem., 27 (1914), No. 100, Aufsatzteil, pp. 654, 655*).—All furfurol obtained from straw or wood which is undergoing a process of steaming at 4 atmospheres originates from the pentosans which the substance contains.

No furfurol results when wood or straw is steamed or boiled at atmospheric pressure. When xylose in water was heated in a closed tube at 135 to 140° C. for 8 hours 11.7 per cent of the weight of the pentose was converted into furfurol. Xylose heated in a closed tube with 10 per cent acetic acid solution and 10 per cent formic acid showed a fufurol conversion of 31.32 per cent, and an increase in the temperature for the concentration of the acids resulted in further increasing the amount.

Chemical utilization of southern pine waste, M. C. WHITAKER and J. S. BATES (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 289–298, figs. 4*).—This is an investigation of methods of utilizing southern pine waste (not convertible into lumber) with regard to obtaining turpentine, rosin, and pulp in marketable form.

The possibilities of hardwood distillation on the Pacific coast, R. C. PALMER (*Metallurg. and Chem. Engin., 12 (1914), No. 10, pp. 623–626*).—A description of the hardwoods available on the Pacific coast for preparing tanning materials and the manufacture of products of destructive distillation (alcohol, acetate of lime, and charcoal). The cost of building a plant and the marketing of the products are considered.

Chemistry of the sugar industry, O. WOHRYZEK (*Chemie der Zuckerindustrie. Berlin, Julius Springer, 1914, pp. XVI+676, figs. 18*).—This text and handbook is divided into three parts, viz, the chemistry of the beet, the chemistry of raw sugar manufacture, and the chemistry of sugar refining. It contains 159 tables and an appendix which deals with pure chemistry, especially with relation to the interpretation of the contents of the book.

Progress made in the manufacture of beet sugar in 1913, E. O. VON LIPPMANN (*Chem. Ztg., 38 (1914), No. 10, pp. 97–100*).—A retrospect of the advances made in the agriculture, chemistry, and commerce of the beet-sugar industry in 1913.

METEOROLOGY.

What the Weather Bureau is doing in agricultural meteorology, P. C. DAY (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 5, pp. 649–652*).—After briefly defining "the new science of agricultural meteorology" and indicating its importance, this article notes the ways in which the Weather Bureau of the U. S. Department of Agriculture is endeavoring to develop this field of investigation and what it is now doing to aid the agricultural interests of the country.

It is stated that although the bureau's chief effort and success lie in the prevention of crop loss by timely warnings of adverse weather conditions, it has actively entered, in cooperation with other bureaus of the Department and the state agricultural colleges and experiment stations, into investigations having as their object "the complete correlation of climate and plant growth." Among the lines of work of direct value to the farmer in which the bureau is now engaged are the distribution of frost warnings in fruit growing and trucking regions, measurements of snow in the western mountain States as a basis for predicting the probable water supply for irrigation, distribution of information regarding pasture conditions on the ranges with a view to bringing about a favorable distribution of cattle, warnings of adverse weather conditions in the great corn, wheat, cotton, tobacco, sugar, rice, and truck-growing regions, and studies on the occurrence and distribution of frost in mountain regions, with particular reference to the location of orchards.

Drought frequency during crop-growing season (*U. S. Dept. Agr., Nat. Weather and Crop Bul. 7 (1915), p. 6*).—A map is given showing the frequency of droughts (period of 30 consecutive days or more in which the precipitation did not amount to 0.25 in. in any 24 hours) during the last 20 years, for the period from April to September, inclusive. The greatest frequency is recorded for the Great Plains area and the least in the southern Appalachians.

Meteorological reports, C. C. Georgeson (*Alaska Stas. Rpt. 1914, pp. 89–96*).—Tabular monthly summaries are given of observations on temperature, precipitation, and condition of the weather at 25 stations in different parts of Alaska during 1914.

Australian rainfall, H. A. Hunt (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 439–442*).—This article deals with the controlling causes and distribution of rainfall in Australia. The relation of the southeast and westerly trade winds, the monsoonal and southern depressions, cyclones and anticyclones, and physical features of the country to the distribution of rainfall is considered in detail.

It is shown that the isohyets describe somewhat concentric curves around the central dry area of Australia, such modifications as occur being due mainly to variations in elevation. During the hot season, from November to April, inclusive, the northern parts of Australia are wet and the southern dry, the reverse being true during the colder months, May to October. In the eastern areas of the continent, however, the rainfall is distributed fairly generally throughout the year. Occasionally there are heavy monsoonal rains in the interior, resulting in luxuriant growth of grass and herbage. The heaviest rainfall recorded occurs at Innisfail on the northeast coast of Queensland, where the average annual rainfall is 145 in., the maximum being 211.24 in., and the minimum 69.87 in. The driest region for which records are available lies east and northeast from Lake Eyre, where the average annual rainfall is less than 5 in. This is also the region of lowest elevation, Lake Eyre being 39 ft. below sea level. The interior of Australia, which is usually considered the driest region, has, as far as available records show, an annual average rainfall of from 10 to 12 in. It is stated that wheat growing is safe with 10 in. of rainfall from April to October, inclusive.

In general it appears that the rainfall of Australia is usually ample for pastoral and agricultural industries over two-thirds of its area. The different regions have distinct seasonal dry and wet periods, and the country is subject in part, but never in whole, to prolonged periods when the rainfall is below the seasonal average.

"There exists apparently an oscillatory movement of the seasonal rains throughout Australia about a center in the vicinity of Forbes, in New South Wales." Apparently the seasonal rains in Australia are more regular than has generally been supposed, and the alternating dry and wet seasons are quite definitely defined.

The ten-inch line of rainfall, T. Cherry (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 645, 646*).—From a study of the rainfall and the practice of dry farming in the southern third of the continent of Australia the conclusion is reached that dry farming does not begin until the 15-in. line of rainfall is passed, the winter and the total rainfalls being nearly identical. It is stated that "the experience of the last 15 years has shown: (1) That with the assistance of small amounts of soluble phosphates profitable crops may be grown on less than 10 in. of winter rainfall. (2) Provided the land is fairly fertile rapid growth takes place in July and August, so that a considerable margin is available in autumn for early and late planting. (3) The dry weather toward harvest time materially reduces the risk from all fungus diseases in cereals. (4) Wherever wheat can be grown peas may also be grown if necessary as an alternate crop. (5) Evaporation in winter is comparatively small, and consequently by fallowing and other modern methods a payable crop is obtained on a lower rainfall than is the case in any other part of the world. (6) The slight ground frosts which often occur in the winter nights appear to simulate the growth of the cereals when followed by 10 hours of bright sunshine. (7) The chief problem which has now to be solved is to devise methods by which large numbers of sheep and cattle can be profitably kept on the wheat farms in the 10-in. rainfall regions. (8) Lands originally covered with scrub and producing very little grass have been proved to be very suitable for wheat. With the gradual advances in the numbers of stock kept on these farms permanent agricultural settlement is likely to extend well beyond the 10-in. line of rainfall."

The influence of weather conditions upon the amounts of nitric acid and of nitrous acid in the rainfall near Melbourne, Australia, V. G. Anderson (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 338, 339*).—A previous article based upon the observations here briefly reported has already been noted (E. S. R., 31, p. 812).

The influence of weather conditions upon the amounts of nitric acid and of nitrous acid in the rainfall at and near Melbourne, Australia, V. G. Anderson (*Quart. Jour. Roy. Met. Soc. [London], 41 (1915), No. 174, pp. 99–122, figs. 11*).—The amounts of nitrous and nitric acids were determined in the rainfall at the center of Melbourne and at the suburb of Canterbury six miles distant during 16 months beginning November 1, 1912, as previously noted (E. S. R., 31, p. 812). The nitrous acid was determined by a modification of the method of Griess and the nitric acid by the salicylic acid method of Caron and Raquet (E. S. R., 25, p. 613).

Correlation of the data with the meteorological elements of Melbourne and with the daily isobaric charts of Australia showed "the existence of a relation between weather conditions and the amounts of the nitrogen acids in the rainfall. . . . A relation between atmospheric temperature and the ratio of nitric nitrogen to nitrous nitrogen was observed, and according to the results it seems probable that, in rain water, nitric and nitrous acids are formed in equal molecular proportions, and that the effect of variations in temperature is to change the velocity of transformation of nitrous acid into nitric acid, resulting in a high ratio in summer and a ratio approaching unity in winter. . . . For a given type of weather, and in samples of rain water collected during 24 hours (a) the concentration of oxidized nitrogen varies inversely as the rainfall, and therefore (b) the product of the concentration of oxidized nitrogen and the rainfall is constant. . . . Amounts (pounds per 1,000 acres) of oxidized nitrogen per day varying from 1.5 in the case of certain antarctic storms to 35 in the case of intense tropical storms" are reported.

In the discussion following the paper especial emphasis was laid on the importance of determining the amounts of ammonia as well as of nitrous and nitric acids in the rainfall.

SOILS—FERTILIZERS.

Thirty-nine experiments in soils, C. L. Quear (*Muncie, Ind.: Author, 1915, pp. 90, figs. 15*).—In this publication 39 soil experiments and 13 supplementary experiments are outlined for the use of beginners in the study of agriculture.

Surface formations and agricultural conditions of northwestern Minnesota, F. Leverett and U. G. Purssell (*Univ. Minn., Geol. Survey Bul. 12 (1915), pp. VI+78, pls. 8, figs. 14*).—This report describes the topography, geology, and climate of northwest Minnesota, and deals at length with the soil and agricultural conditions and land classification by counties.

Fruit soils in the Sierra foothills, J. W. NELSON (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 3, pp. 134–139*).—This article deals briefly with the soils of an area of about 5,000,000 acres in the Sierra foothills of California, the topography of which consists of a series of low broken hills, small narrow valleys, rounded ridges, and moderate to steep slopes along the valley margin. The drainage is good except in small irrigated valleys.

The soils are prevailingly red in color and have been derived mainly from igneous and metamorphic rocks. It is stated that they are generally fertile and their greatest requirement appears to be organic matter. They are all well supplied with mineral plant food, but the heavier types rank first and are the most durable soils.

It is also stated that the marked variation in elevation, rainfall, temperature, and soils makes the growth of a wide range of profitable fruits possible in this belt.

The atmosphere of the soil: Its composition and the causes of variation, E. J. RUSSELL and A. APPLEYARD (*Jour. Agr. Sci. [England], 7 (1915), No. 1, pp. 1–45, figs. 17*).—This article, the first of a series, reports investigations of the composition and characteristics of the soil air.

It was found that the free air in the pores of the soil to a depth of 6 in. is very similar in composition to the atmospheric air, but differs in that it shows greater fluctuations in composition and contains more carbon dioxid and correspondingly less oxygen, the average in 100 volumes being 0.25 volume of carbon dioxid and 20.6 volumes of oxygen against 0.03 volume of carbon dioxid and 20.96 volumes of oxygen in atmospheric air. "Usually the sum of the CO_2 and oxygen is only slightly less than in atmospheric air, but at periods when nitrates rapidly increase there is a perceptible falling off of oxygen and a still greater one in waterlogged soils."

In addition, there is another atmosphere dissolved in the water and colloids of soils which consists mainly of carbon dioxid and nitrogen and has practically no oxygen. "The fluctuations in composition of the free soil air are mainly due to fluctuations in the rate of biochemical change in the soil. . . . The rate of biochemical activity attains a maximum value in late spring and again in autumn and minimum values in summer and winter. In autumn the bacteria increase first, then the CO_2 rises, and finally the nitrate increases. From November to May . . . the soil temperature . . . appears to be the dominating factor, from May to November . . . the rainfall and to a less extent the soil moisture. . . .

"It is shown that the dissolved oxygen brought in [in rainfall] is probably a factor of considerable importance in renewing the dissolved soil atmosphere and facilitating biochemical change. . . . No evidence could be obtained that the growing crop markedly increases the amount of CO_2 in the soil air, and if it gives rise to any great evolution of CO_2 in the soil, it apparently exercises a corresponding depressing effect in the activities of soil bacteria. . . . As the soil differences are eliminated so the differences in composition of the soil air become less and less. . . . Such weather conditions as barometric pressure, wind velocity, variations in temperature from the mean, small rainfall, etc., seem to have but little effect on the soil atmosphere."

A manometer method of determining the capillary pull of soils, W. A. CANNON (*Plant World, 18 (1915), No. 1, pp. 11–13*).—An apparatus for determining the capillary lift of soils is briefly described.

It consists essentially of a U-shaped mercury manometer with open ends, a soil container of 500 cc. capacity, and a water reservoir of about 500 cc. capacity. The water reservoir is connected by means of a T-shaped glass tube and rubber tubing to the manometer and the soil container. The flow of water from the reservoir to the soil container is regulated by stopcocks and the capillary lift of the soil is indicated by the rise of the mercury in the manometer.

Losses of moisture and plant food by percolation, G. S. FRAPS (*Texas Sta. Bul. 171 (1914), pp. 5–51*).—The results of three years' experiments made to ascertain the amount of percolation and evaporation from eight different soil types of Texas and the effect of cultivation, manure, and fertilizers upon the amount of water percolating and on the losses of plant food therein are reported. The soils used were Norfolk sand, Orangeburg fine sandy loam, Houston loam, Houston black clay, Yazoo clay, Miller fine sandy loam, Crawford clay, and Lufkin fine sandy loam.

Percolation was found to be greater through uncultivated clays and loams than through uncultivated sands and sandy loams. Cultivation increased percolation through the latter, but had little effect upon the former. Potassium sulphate and manure increased percolation through sandy soils but the former decreased percolation through clay soils. The fall application of manure was more effective in increasing percolation than the spring application.

The amount of nitrates in water percolating from uncultivated soils was related to a certain extent to the total nitrogen of soil and subsoil. More nitrate appeared in the percolates from manure applied in the fall than in the spring. An application of sodium nitrate increased the nitrates in the succeeding percolates of two of the soils, but with the other six no effect was observed until three or four weeks later. Only small quantities of potash appeared in the percolates from most of the soils, even after heavy applications of potash were made, the maximum loss being 12 per cent in three years from the Norfolk sand and the losses from the other soils varying from 0 to 4.5 per cent. From 9.7 to 66.6 lbs. of potash per acre per year were lost by percolation from uncropped, uncultivated, and unfertilized soils, and the losses were to a certain extent related to the active potash of the soil. The losses of phosphoric acid in the percolates were very small, but the losses of lime were large, varying from 70 to 582 lbs. per acre from the uncropped, uncultivated soils. The lime losses were in a general way related to the quantity of lime soluble in strong hydrochloric acid.

Effect of moisture content of a sandy soil on its nitrogen fixing power, C. B. LIPMAN and L. T. SHARP (*Bot. Gaz., 59 (1915), No. 5, pp. 402–406*).—Studies of the natural nitrogen fixing flora of a light sandy soil from a walnut grove with reference to moisture content are reported. The soil-culture method was used.

It was found that nitrogen fixation in this soil by means of its natural flora and under optimum temperature conditions takes place most actively with a water content varying from 20 to 24 per cent, based on the air-dry weight of soil. With 28 per cent of moisture there was a slight decline in nitrogen fixation. With 32 per cent a marked decrease in nitrogen fixing power of the soil was evident, and a still greater decrease was noted with 36 per cent. Almost no nitrogen fixation, or very little, took place with a moisture content of 4 per cent (air-dry basis), but a very marked increase occurred when 8 per cent was present, and amounts of moisture equivalent to 12 per cent (air-dry basis) gave about the same nitrogen fixation as 32 per cent moisture.

It is concluded from these results that for the soil used the aerobic forms of nitrogen-fixing bacteria do best with a 20 per cent moisture content. At higher percentages of moisture up to 24 per cent the anaerobic forms become much more active, while the aerobic forms are depressed in their nitrogen-fixing powers.

The effect of some organic soil constituents upon nitrogen fixation by Azotobacter, H. S. Reed and B. Williams (*Virginia Sta. Tech. Bul. 4 (1915), pp. 81–96; Centbl. Bakt.* [*etc.*], *2. Abt., 43 (1915), No. 1–7, pp. 166–176; abs. in Science, n. ser., 42 (1915), No. 1079, pp. 320, 321*).—The results of a study of the effect of various organic compounds likely to be constituents of the soil on the growth of Azotobacter are reported, which indicate that nitrogen fixation by these organisms was only slightly influenced by most of the compounds tested. A depression was noted in a number of cases, but it was usually the result of a relatively high concentration of the compound used. Hydroquinone and salicylic aldehyde were the most toxic of any compounds studied, while esculin, quinic acid, and borneol afforded marked stimulation to the growth of the organisms. In concentrations which are considered fatal to certain higher plants many of the compounds only slightly depressed fixation.

Such nitrogenous compounds as nicotin, picolin, guanidin, and skatol showed toxic properties commensurate with those usually ascribed to these substances, while caffein appeared to stimulate the growth of the organism. "Many of the nitrogenous compounds used which have been reported as beneficial to higher plants exercised a marked depression on fixation. It appears that the simpler compounds were more pronounced in this respect than were the more complex ones. It is suggested that this condition is not one of toxicity, but that the nitrogen of the compounds was utilized by Azotobacter in preference to that of the atmosphere. Urea, glycocoll, formamid, and allantoin were especially active in depressing fixation."

A list of the organic compounds studied, showing their occurrence and possible source in the soil, together with reports on their action toward higher plants and a list of references to literature bearing on the subject, are appended.

Nitrogen fixation and nitrification in various soil types, H. S. Reed and B. Williams (*Virginia Sta. Tech. Bul. 3 (1915), pp. 59–80*).—This bulletin reports in four papers experiments on the effect of mineral fertilizers on nitrogen fixation and nitrification in soil, nitrogen fixation and nitrification in various soil types, and the effect of sand and lime on nitrification.

It was found that the various inorganic fertilizers did not cause marked stimulation of nitrogen fixation in truck soils. The maximum fixation was attained under the influence of stable manure with lime.

Crimson clover increased the nitrifying power of the soil 83 per cent, crimson clover and lime 526 per cent, stable manure 120 per cent, and stable manure and lime 407 per cent.

An examination of 93 soils, 88 of which were collected in pairs of virgin and cultivated samples, showed the superiority of cultivated soils for nitrogen fixation. Fixation by virgin clay soils was greater than by light virgin soils. The results of these studies are taken to indicate that, with the possible exception of lime, the humus content of a soil and its cultivation are the only factors which materially affect nitrogen fixation.

In nitrification studies of the 93 soils, using ammonium sulphate solution, it was found that cultivated soils showed decidedly higher nitrifying qualities than the virgin soils. The nitrifying power of light open sandy soils was strikingly low, that of loams and clay loams was the highest, and that of heavy clays was also low, but not so low as that of the light soils. It is thought, however, that the low nitrifying power of the heavy clays can be improved by proper tillage.

Studies of the soils with reference to their accumulation of nitrates over a period of six months did not show the distinctive superiority of cultivated soils over virgin soils, as was evinced in the ammonium-sulphate tests. The clay loam failed to show nitrifying powers commensurate with those shown with ammonium sulphate, although the relationship as regarded other soil types was quite consistent in both series.

In tests of the effect of sand and lime on nitrification in heavy clay soils, a sandy loam, and a light porous soil it was found that lime caused a marked increase in nitrates, while sand failed to stimulate nitrate formation, particularly in the clay soils.

The organic nitrogen of Hawaiian soils, W. P. KELLEY and ALICE R. THOMPSON (*Jour. Amer. Chem. Soc., 36 (1914), No. 2, pp. 429–444*).—Brief technical accounts are given of investigations more fully reported elsewhere (E. S. R., 30, p. 419; 31, p. 11).

Notes on some methods for the examination of soil protozoa, C. H. MARTIN and K. R. LEWIN (*Jour. Agr. Sci. [England], 7 (1915), No. 1, pp. 106–119, pls. 2*).—The purpose of this paper is to outline the present knowledge of the life of the protozoa in the soil and to describe certain methods which have been found useful in work on the subject.

The authors think it probable that there are always some free living protozoa present in an active state in even relatively dry, poor soils. "In manuring on ordinary soil with farmyard manure a large number of protozoa are introduced into that soil, and if the conditions of culture are such as to necessitate a high water and a high manurial content the protozoa may well get the upper hand to such an extent as to produce a well-marked deleterious effect on the crop, resulting in the condition known as soil sickness. . . . The nature of the protozoan fauna seems to vary to a certain extent with the soil under examination. . . . It is probably that the richer the soil and the higher the water content at the time of examination, the greater the probability of the dominant culture form being the dominant trophic form in the fresh soil. . . . Up to the present the dominant active fauna of the soil, as shown by the fresh films, consists mostly of amœbæ, the camœbæ, and small flagellates. . . . In this connection one point which requires further investigation is the frequent prevalence of relatively large flagellates in soil culture (e. g., Prowazekia and Copromonas), whereas in fresh films the only flagellates found are very small monads. . . .

"Another factor which must be reckoned with . . . is the possibility that the present methods for the examination of fresh soil films do not give a fair account in regard to these large flagellates, which may be caught up by their flagella amongst the soil particles."

It is stated in conclusion that there appear to be three categories under which the protozoan population of any soil at a given moment should be studied, i. e., (1) the active fauna, (2) the cysts, and (3) the cultural fauna. "In the immediate future better methods must be devised for the detection of the active fauna, a complete study is needed of the possible seasonal variations which might result in a transfer of certain forms from the resting fauna to the active fauna, and a more careful study must be made of cultural conditions, so that it may be possible to cultivate at once any desired member of the active fauna of a soil."

Studies on soil protozoa, A. CUNNINGHAM (*Jour. Agr. Sci. [England], 7 (1915), No. 1, pp. 49–74*).—The work discussed in this paper is a continuation of that previously reported (E. S. R., 31, p. 26) and deals with (1) the dilution method and its application to the enumeration of protozoa in soils, (2) the effect of protozoa on the numbers of bacteria in ammonifying solutions and on ammonification in solution tests, and (3) the effect of inoculations of protozoa on the bacterial content of partially sterilized soils.

It was found that the dilution method gives only relative, not absolute, results, and that the whole of the protozoa in soils do not develop in soil extract. In connection with the dilution method, heating to 58° C. appeared to kill a number of the encysted protozoa in addition to active forms. Treatment with caustic potash killed all active protozoa, but left the encysted uninjured. "It is evident that it is impossible to fix upon a temperature which will destroy all active protozoa in soils and leave the cysts perfectly uninjured. . . . As it is better to select a temperature which will kill all active forms even if it does injure some of the cysts, rather than one which will leave the cysts unharmed, and also probably some of the active forms alive, the continued use of 58° C. seems to be justified."

Experiments on the effects of temperature and moisture on the soil protozoa brought out "that some, at least, of the protozoa in soils lead an active life and are capable of multiplying to quite a considerable extent when the conditions become favorable." It was also found that the soil protozoa, in solutions, exercise a very decided limiting effect on the numbers of bacteria.

The results obtained as regards the influence of protozoa on ammonification in solution tests were inconclusive.

The reduction in bacterial numbers in the soils inoculated with protozoa was found to be very marked and to lie well outside the limits of experimental error. "The conclusion may safely be drawn, therefore, that the limiting factor, or at least one limiting factor (of Russell and Hutchinson) has been inoculated into the sterilized soils and has produced its effects on the numbers of bacteria. . . . As it has been shown that the protozoa are capable of reducing the numbers of bacteria in solutions, it appears justifiable to consider them as the limiting factor in soils."

Studies on the lime requirements of certain soils, H. B. HUTCHINSON and K. MACLENNAN (*Jour. Agr. Sci.* [*England*], 7 (*1915*), *No. 1, pp. 75–105, pl. 1, figs. 4*).—In continuation of work along the same general lines as that previously noted (E. S. R., 32, p. 32), investigations are reported dealing with the determination of the amount of lime (CaO) necessary to induce partial sterilization changes in soils and the amount of lime (CaO) or chalk ($CaCO_3$) required for soil neutralization.

It was found that calcium oxid is capable of producing partial sterilization effects but that calcium carbonate is not. The amounts of lime necessary to produce specific effects in different soils varied greatly, and the critical amount required was found to depend on the amount necessary for the production of an alkaline reaction of the soil water. The results obtained on this basis, correlated with those of pot experiments, showed that the amount indicated coincides with that required for the maximum production of dry matter in the first crop following treatment and the maximum production of dry matter in the first four crops. Applications of lime double or treble the amount indicated by the method, although causing an increase in the ammonia and nitrates produced, did not give corresponding increases in crop. Certain physical changes also occurred about the partial sterilization point.

The determination of the lime requirements of the soil was found to depend on the absorptive capacity of the soil for calcium carbonate (present in solution as bicarbonate). Comparative tests of various soils to which quantities of lime had been added previously showed a proportionate diminution of the lime requirements, and no absorption was indicated in the case of neutral soils. Soils showing a positive lime requirement according to this method were found to respond distinctly to the application of carbonate by increased ammonia and nitrate production in laboratory experiments and by greater plant growth in pot culture and field work. The application of lime to field soils was reflected in decreased lime requirements and increased crop production even after a prolonged period (upwards of 17 years). The values of calcium oxid and carbonate were found to be identical, provided the lime requirements (for neutralization purposes) were not fully satisfied. After the neutral point was reached calcium oxid exercised its specific effect. An application of carbonate to a soil accelerated the process of ammonification and nitrification to a lesser degree. "The results of an acidity, or lime requirement, test and not those of determinations of free carbonate should be taken into consideration when the needs of any particular soil are concerned. In the case of soils on the same geological formation a definite relation between soil reaction and natural flora has been traced. The occurrence of certain plants on acid soils appears to be determined by their capacity of resistance to acidity."

A list of references to literature bearing on the subject is appended.

Probable combination of the chlorin ions in alkali salts, R. F. HARE (*New Mexico Sta. Bul. 95 (1915), pp. 3–6*).—Experiments showing the effect of heat on chlorids in the residue from some New Mexico irrigation waters and showing the loss of chlorids on heating 0.5 per cent solutions of magnesium chlorid, calcium chlorid, and sodium chlorid singly and in different mixtures are reported. The results are taken to indicate "that heating the residue of chlorids from a water or soil solution at a low red heat for ten minutes might furnish a method for determining the chlorin in mixed alkali salts that exist in combination with magnesium."

The effect of arsenite of soda on the soil, W. T. McGEORGE (*Hawaii Sta. Press Bul. 50 (1915), pp. 16, figs. 3*).—Investigations on the effect of sodium arsenite on the growth of millet, cowpeas, and buckwheat and on the physical, chemical, and biological activities in heavy red clay, brown clay, and highly organic silt soils are reported.

It was found that the effect of sodium arsenite on plant growth depends upon the resisting power of the plant and upon the chemical and physical nature of the soil. In small quantities plant growth was stimulated in most instances, but when added at the rate of 0.1 to 0.25 per cent plant growth was made practically impossible. Sodium arsenite materially altered the mechanical condition of the soil, its action being primarily that of a deflocculating agent, thus checking the movement of the water.

The influence of sodium arsenite on ammonification and nitrification varied considerably in the different soil types, and no general rule applicable within reasonable limits was established.

Sodium arsenite was strongly fixed by the soil, even resisting the washing of heavy rains, and accumulated in the top layer. An analysis of a sample of soil from a tract of land sprayed three times a year for five years at the rate of 5 lbs. of sodium arsenite per acre per application showed all the arsenic to be present in the top 4 in. of soil.

The influence of zinc vessels in culture experiments, K. GHEDROIZ (*Selsk. Khoz. i Lîesov., 345 (1914), July, pp. 625–627; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 1, pp. 57, 58*).—Pot experiments during three years showed that the sulphate and chlorid of zinc had almost the same effect on the growth of mustard. The effect on barley differed from that observed in the case of mustard, as with 0.02 per cent of zinc the growth of mustard ceased, while barley gave a relatively good yield. Zinc in very small quantities, however, stimulated the growth of mustard, but had a depressing effect on barley.

Long-continued experiments with zinc pots showed that red clover grown in acid soils lost its germinating power and made feeble growth in the third year. The injurious effect of the zinc pots was apparent in the case of clover in the second year. It was most pronounced in the case of acid soils.

The effect of fertilizers and stimulants upon the growth and production of Corchorus capsularis, S. F. ALBANO (*Philippine Agr. and Forester, 3 (1915), No. 9–10, pp. 218–226*).—Experiments on jute with cow manure, kainit, and tankage, with or without the addition of potassium sulphate, are reported. A beneficial effect from the use of fertilizer was observed in the growth of the plant and in the yield of fiber. The best results were obtained with mixtures containing nitrogen.

In comparative tests of the effect of dilute solutions of borax and salts of manganese, mercury, iron, calcium, nickel, zinc, fluorin, and iodin it was found that jute "is decidedly less subject to stimulation with various chemicals than are some of the other crops with which experiments have been carried on, most notably, for instance, potatoes and radishes. The only chemicals whose use can be recommended as very likely to be profitable as a result of these tests are iron and very dilute nickel."

Various forms of dung, D. A. GILCHRIST (*Armstrong Col. Newcastle-upon-Tyne, Agr. Dept. Bul. 10 (1914), pp. 10, 11; abs. in Nature [London], 94 (1915), No. 2363, p. 651*).—Fresh dung, dung kept just long enough to be in good condition for application, and old dung stored in the heap for some months were applied at the rate of 12 tons per acre in five 4-course rotations of swedes, barley, hay, and oats. The manure which had been kept just long enough to be in good condition gave the best results.

Green manuring table, F. ARNDT (*Deut. Landw. Presse, 42 (1915), No. 29, p. 255*).—A table is given showing for German conditions the quantities needed for different purposes and the cost of different green manures.

German nitrogen monopoly (*Chem. Ztschr., 14 (1915), No. 5–6, pp. 17, 18*).—The terms of the German Imperial monopoly on nitrogenous materials used for fertilizing purposes, which is to be effective until March 31, 1922, are explained.

Lime nitrogen, R. KINDLER (*Illus. Landw. Ztg., 35 (1915), No. 3, pp. 11, 12*).—This is a concise summary of present knowledge regarding the nature and value of lime nitrogen as a fertilizer.

Cyanamid in complete fertilizer mixtures, E. J. PRANKE (*Com. Fert., 10 (1915), No. 2, pp. 15, 16*).—It is pointed out in this article that the quantities of cyanamid used by King in experiments previously noted (E. S. R., 33, p. 25) were out of proportion to the amounts of fertilizer mixture and of acid phosphate used. It is considered advisable to limit the use of cyanamid to 60 lbs. per ton of fertilizer mixture containing approximately 1,000 lbs. of acid phosphate.

Phosphates in Massachusetts agriculture: Importance, selection, and use, W. P. BROOKS (*Massachusetts Sta. Bul. 162 (1915), pp. 130–167, pls. 2*).—This bulletin reviews the Hopkins theory of permanent soil fertility and reports an extended study of the applicability of this theory, with particular reference to the use of phosphorus, to Massachusetts soils and agriculture.

It is shown that phosphoric acid is not relatively deficient in Massachusetts soils and that under the systems of agriculture common in the State, which usually include the use of some phosphate, there is no reason to believe that it is generally becoming more so. It is shown in fact that, contrary to the Hopkins theory, for most of the leading crops of the State potash is far more frequently the dominant food requirement than phosphoric acid.

The general results of two series of experiments comparing different phosphates, one extending over twelve and the other over eighteen years, are presented to show that the application of at least a moderate amount of phosphate is usually profitable and that the more soluble and available materials give results much superior to those obtained with the fine ground rock phosphates. The more soluble phosphates were found to favor more rapid early growth, earlier and more perfect maturity, and larger yields than the rock phosphates and to be used with greater profit.

On this basis Massachusetts farmers, gardeners, and orchardists are advised against the general use of raw rock phosphates. "The phosphates employed should be the more soluble and available kinds, such as acid phosphate (dissolved rock), dissolved bone, basic slag meal, and bone meals."

Phosphoric acid and potash fertilization in the spring, SCHNEIDEWIND (*Landw. Wchnschr. Sachsen, 17 (1915), No. 8, pp. 61, 62*).—Seven years' fertilizer experiments with potatoes and sugar beets, and with wheat and barley as second crops, with and without stable manure fertilization, are summarized to show that these crops, when growing on soil fertilized with stable manure, either need no additional phosphoric acid or much less than is needed when no stable manure is used. Also the after effects of stable manure fertilization are considerable, as is indicated by the superior yields and smaller additional phosphoric acid requirements of wheat and barley as second crops on soil fertilized with stable manure.

A general statement is included as to the forms of phosphoric acid and potash best adapted to different soils.

Potash salts, 1914, W. C. PHALEN (*U. S. Geol. Survey, Mineral Resources of the United States, Calendar Year 1914, pt. 2, pp. 9–33, pl. 1; Press Bul. 215 (1915), p. 4*).—This report gives statistics of potash salts and of materials entering into the fertilizer industry imported for consumption in the United States during 1914 and several preceding years, discusses briefly the work done in 1914 with a view to finding a domestic supply of potash, and gives data regarding foreign potash deposits, particularly those of Spain (E. S. R., 33, p. 26).

It is stated that the potash salts imported for consumption in the United States in 1914 was 485,818,459 lbs., valued at $8,743,973, a decrease in quantity and value as compared with 1913 of 126,696,457 lbs. and $2,061,747, respectively. No especially notable developments in the discovery of new sources of potash with the object of establishing a domestic potash industry are reported.

In addition to potash salts, bone dust, calcium cyanamid, guano, basic slag, and other materials used as fertilizer, including kainit and manure salts, were imported in 1914 to the extent of 761,896 long tons, valued at $9,921,439, and sodium nitrate valued at $15,204,539.

A bibliography of papers on potash salts appearing during 1914 is given.

Radium fertilizer in field tests, C. G. HOPKINS and W. H. SACHS (*Science, n. ser., 41 (1915), No. 1063, pp. 732–735*).—This is a brief article based mainly upon experiments reported in more detail elsewhere (E. S. R., 32, p. 821), calling attention to the fact that the amount of radium which can be applied even at a cost of $100 per acre is so small that it does not and can hardly be expected to produce any effect upon crop yields.

A municipal fertilizer plant at Los Angeles, California, B. A. HEINLY (*Engin. News, 73 (1915), No. 22, pp. 1063, 1064*).—Three plants built and operated by the park department of Los Angeles for the production of manure compost are described.

In these plants stable manure is allowed to ferment in a concrete-lined pit at a temperature of about 100° F. for from 20 to 30 days. It is then forked over, spread out in layers 1 ft. thick, to which 5 per cent by volume of wood ashes and 2 per cent of slaked lime are added, and the mixture covered with a layer of loam soil ranging from 50 to 150 per cent of the total volume, depending upon whether the manure was pure or mixed with much straw. The heap is built up of alternate layers of this kind to a height of about 8 ft. and allowed to stand about 60 days to disintegrate.

It is stated that at the end of this time about 80 per cent of the material will pass through a ½-in. mesh. Material coarser than this is returned to the manure heap for further disintegration.

It is stated that from 8,000 to 10,000 cu. yds. of such fertilizer is now being manufactured per annum, at a factory cost of $1.38 per cubic yard, any surplus over the needs of the department finding a ready sale at $2 per cubic yard at the factory.

The international movement of fertilizers (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 323–370*).—This review issued in March, 1915, "contains, as far as possible, final figures for the fertilizer production and trade in 1912 and 1913, together with provisional figures for 1914, according to the scheme outlined in the first number of the review which was published in September, 1914" (E. S. R., 32, p. 425). Two new tables have been added to those appearing regularly, one referring to the world's production of natural guano and the other to the production of superphosphate in the different countries. An estimate of the natural reserves of phosphates in the United States is also included. The report contains no figures relating to the production of potash salts in Germany.

A bibliography of 178 references to recent literature on the subject of fertilizers is appended to the detailed tables of production, imports and exports, consumption, and prices.

Importation of fertilizer materials, B. Y. Ordoñez (*Rev. Asoc. Rural Uruguay, 44 (1915), No. 3, pp. 173–186*).—This article reviews the laws of Uruguay relating to trade in fertilizers and describes the official methods employed in inspection.

AGRICULTURAL BOTANY.

The measurement of electrical conductivity as a method of investigation in plant physiology, W. Stiles and I. Jörgensen (*New Phytol., 13 (1914), No. 6–7, pp. 226–242, figs. 5*).—Giving a partial review of the work already done by others toward making use of electrical conductivity measurements in questions of plant physiology, the authors report on the methods and results of their own studies in this direction. They hold it probable that (while use of these methods is still in its preliminary experimental stage) with further development of methods, electrical conductivity may afford a convenient and comparatively simple means of investigating certain classes of problems in plant physiology.

A bibliography is appended.

A new theory regarding the feeding power of plants, E. Truog (*Science, n. ser., 41 (1915), No. 1060, pp. 616–618*).—As a result of investigations on the feeding power of plants the author proposes the following hypothesis:

"Plants containing a relative high calcium oxid content have a relatively high feeding power for the phosphorus in raw rock phosphate. For plants containing a relatively low calcium oxid content the converse of the above is true." A calcium oxid content of less than 1 per cent is considered relatively low, and corn, oats, rye, wheat, and millet belong to this class. A content of more than 1 per cent is considered high, and to this class belong peas, clover, alfalfa, buckwheat, and most of the species of Cruciferæ. The author considers that the feeding power of a plant for an insoluble substance depends primarily upon two conditions, (1) the solubility of that substance in carbonated water, and (2) whether or not the plant removes from solution all the products of the solubility reaction in the proper proportion, so as to allow the solubility reaction to continue indefinitely.

The presence of inorganic iron compounds in the chloroplasts of the green cells of plants, considered in relationship to natural photosynthesis and the origin of life, B. Moore (*Proc. Roy. Soc. [London], Ser. B, 87 (1914), No. B 598, pp. 556–570*).—The author discusses experimentation designed to throw light upon the processes taking place and the substances occurring in the wide hiatus between the simple colloidal molecules of inorganic iron salts or oxids in the solution or suspension, which, as shown by Moore and Webster (E. S. R., 30, p. 129), possess the power of synthesizing formaldehyde in the presence of carbon dioxid with sunlight as energy supply, on the one hand, and such a highly complex organic substance as chlorophyll, on the other. It is stated that inorganic iron salts and iron or aluminum hydrates in colloidal solution possess the power of transforming the energy of the sunlight into the chemical energy of organic compounds. Inorganic iron in crystalloidal or colloidal form is thought to be present in the colorless part of the chloroplast of the green plant cell in many plants. In the absence of iron the green coloring matter can not develop in the leaf, although the green coloring matter itself contains no iron. In the presence of sunshine the iron-containing substance of the chloroplast develops the coloring matter, so that this itself is a product of photosynthesis induced by the iron-containing compound.

It is held that these facts afford an explanation of chlorosis and of its cure by inorganic iron salts, and demonstrate that iron is a primary essential in photosynthesis and the production of chlorophyll. The iron-containing substances of the colorless portion of the chloroplast and the chlorophyll produced by them thus become associated in the functions of photosynthesis as a complete mechanism for energy transformation.

Nitrites in plants, K. Aso and T. Sekine (*Bot. Centbl., Beihefte, 32 (1914), 1. Abt., No. 1, pp. 146, 147*).—The authors, noting the statement of Klein (E. S. R., 30, p. 30) regarding the absence of nitrites in underground portions of *Sagittaria sagittifolia*, report a study of cases in which nitrites were doubtless present, though in slight concentrations, in the shoot-like buds of this plant. The nitrites were supposedly produced either by physiological oxidation of amido acids or by reduction from nitrates.

Free nitrogen and higher plants, M. Molliard (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 9, pp. 310–313*).—Reporting and discussing his own experimentation testing for an alleged capability of higher plants to utilize atmospheric nitrogen, as upheld by Mameli and Pollacci (E. S. R., 25, p. 633; 31, p. 223), the author concludes that *Raphanus sativus* does not utilize the free nitrogen of the air.

Studies on anthocyanin bodies, O. Gertz (*Svensk. Bot. Tidskr., 8 (1914), No. 4, pp. 405–435, figs. 20*).—The author gives an account of his observations on the various forms, structures, locations, arrangements, etc., of anthocyanin bodies as studied in more than 40 plant species belonging to almost as many genera, with a discussion thereof and of some related literature, which is listed in this connection.

A new method of so-called water culture, II, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 12 (1914), No. 5, pp. 49–55, figs. 2*).—These experiments, continuing those previously reported with serradella (E. S. R., 28, p. 817), show the value of rock phosphate in nutritive solutions for use in growing oats as preventive of dry spot and tipburn and also as supplementary to or as replacing other nutritive components.

Antagonism and balanced solutions, R. H. TRUE (*Science, n. ser., 41 (1915), No. 1061, pp. 653–656*).—The author discusses the terms antagonism and balanced solutions as used by a number of investigators and claims that there appears to be no reason to limit the use of the term balanced solutions as is commonly done.

On the osmotic pressure of the juices of desert plants, J. A. HARRIS, J. V. LAWRENCE, and R. A. GORTNER (*Science, n. ser., 41 (1915), No. 1061, pp. 656–658, fig. 1*).—A series of cryoscopic determinations on the spring flora of the vicinity of Tucson, Ariz., with comparisons on species of spring and early summer plants in the vicinity of the Station for Experimental Evolution on Long Island have been made to test the results given by E. and Hilda Drabble (E. S. R., 18, p. 824) and Fitting (E. S. R., 25, p. 430).

The authors were unable to find pressures as high as those described by Fitting, but they do not claim that they do not occur. Pressures of 10.5 atmospheres or lower were obtained for about 50 per cent of the Cold Spring Harbor series, whereas in the desert plants 50 per cent of the pressures were 15.7 atmospheres or higher.

Relations between osmotic pressure and regulation of stomata, W. S. ILJIN (*Bot. Centbl., Beihefte, 32 (1914), 1. Abt., No. 1, pp. 15–35, figs. 8*).—Reporting details of experimentation on the behavior of leaf stomata under varying conditions the author claims that stomatal regulation, which is related to transpiration conditions, shows also a close relation to change in starch content, and this in itself shows a close relation with variations in osmotic pressure.

Regulation of the stomata is dependent directly upon physiological processes. Variation in total water content in a plant acts as a stimulating factor, conditioning the activation of certain enzyms which determine the state of the starch material. Alternations of osmotic properties and of turgor also result, the latter influencing the degree of stomatal opening.

The changes observed are not purely mechanical, but dependent upon the activity of living protoplasts under the influence of external stimuli, for example, alterations or differences in intensity of illumination, which seem to affect the osmotically influential contents of the guard cells.

The problems in a comparative study of transpiration in plants, W. S. ILJIN (*Bot. Centbl., Beihefte, 32 (1914), 1. Abt., No. 1, pp. 36–65, figs. 27*).—Results of studies on various types of plants are given, but they are considered to show that it is not yet possible by a study of the transpiration curves alone to ascertain the degree of protection enjoyed by types biologically different. The present work aims not so much to give exact results for individual species or plants as to mark out lines along which study may proceed in order to ascertain which plants may be expected to survive under given conditions or to win out in competition.

Increased carbon dioxid concentration in relation to transpiration and development in plants, N. KISSELEW (*Bot. Centbl., Beihefte, 32 (1914), 1. Abt., No. 1, pp. 86–96, pls. 2, figs. 3*).—The author describes experimentation relative to the effects of increased carbon dioxid supply on plants somewhat similar to that reported by Brown and Escombe (E. S. R., 14, p. 546) and by Fischer (E. S. R., 28, p. 837). The results agreed with Fischer's conclusions, inasmuch as a heightened content of carbon dioxid considerably accelerated and increased development in the plants employed.

The effects of high temperatures on leguminous seeds, F. NEUBERGER (*Kisérlet. Közlem., 17 (1914), No. 1, pp. 121–170*).—The author exposed seeds of several leguminous plants in dry air at temperatures of 50 to 130° C. for ½ to 6 hours and in water at 45 to 100° C. for ½ to 2 hours, and then tested them for germinability under favorable conditions.

It was found that in general the injurious effects of high temperature were increased by its elevation and its duration. Decrease of water content in seeds by artificial drying increased progressively the power of resistance to heat in dry air. This, however, ceased at 130° C., even for short exposures.

Water at a temperature above the maximum point for germination remained harmless to seeds therein only until the germination changes were started. Resistance varied even within species and is considered as largely an individual character. High temperature is thought to break down the enzyms connected with activity of germination.

A bibliography is given.

Death of young plants from heat, L. SCHUSTER (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 8, pp. 377–379, figs. 2*).—Noting accounts of heat injury by von Tubeuf (E. S. R., 31, p. 343) and by Münch (E. S. R., 31, p. 348), the author describes the effects of heat combined with dryness of the soil on plantlets of *Cedrela odorata*, *Baphia kirkii*, and *Afzeia cuanzensis* in the neighborhood of Morogoro, German East Africa.

External and internal phases of the action of attenuated acid gases and smoke on plants, H. WISLICENUS (*Mitt. K. Sächs. Forstl. Versuchsanst. Tharandt, 1 (1914), No. 3, pp. 85–175, pls. 4, figs. 19*).—This is a somewhat extended account of the repetition of former work under improved conditions and of later work (E. S. R., 10, pp. 531, 644; 32, p. 524), bearing upon the effects of atmospheric pollution with smoke and gases from industrial plants, particularly in high attenuation, upon development and functioning in plants.

It is stated that highly attenuated sulphuric acid is markedly injurious to plants only when the leaves or needles are assimilating and in proportion to the intensity of that activity, this acid being then poisonous and a delicate indicator of photosynthetic activity. Light intensity and assimilative activity are the principal conditions, but others are discussed as modifying factors.

Forest injury from coal smoke, C. BALTZ (*Ztschr. Forst u. Jagdw., 46 (1914), No. 3, pp. 158–174*).—Summing up a discussion of work reported by Wieler (E. S. R., 31, pp. 322, 521) and others, the author states that smoke injury to forest growth near furnaces is due largely to the direct action of the acids resulting from the oxidation of sulphur dioxid.

The degree of injury depends largely upon the situation and configuration of the area affected. It is favored by the melting of snow, also by fog or slow falling rains, which absorb the acid and give it up to the foliage. The effect is greater in case of the younger parts. Conifers are more sensitive than deciduous trees.

Good cultural conditions are considered the best means of protection against a tendency to injury through the soil.

Physiological characters of plants, their variability and their relation to the theory of evolution, S. IVANOW (*Bot. Centbl., Beihefte, 32 (1914), 1. Abt., No. 1, pp. 66–80*).—From a study of the characters, particularly oil production, of several series of species, the author concludes that plant characters fall into two categories, namely, morphological (which depend more upon external conditions and by modification form new species) and physiological (consisting in the capacity to form certain substances and showing less dependence upon external conditions).

At the limits of genera physiological characters are modified in a quantitative way, but slowly, probably not at all qualitatively. Species, as complex morphological and physiological characters, are established through a slow process of evolution. Variation and evolution of physiological characters are easier to understand from the Darwinian standpoint than from that of De Vries, according to the author.

It is held that a natural rather than a fortuitous systematic arrangement of vegetable oils should be recognized.

On the nature of mutations, R. R. GATES (*Jour. Heredity, 6 (1915), No. 3, pp. 99–108, figs. 7*).—Noting views which have been advocated regarding the origin and fundamental nature of mutations, the author discusses some characters of *Œnothera lata*, *Œ. gigas*, and *Œ. rubricalyx* in connection with their behavior in regard to inheritance of chromosome numbers and other characters.

It is claimed that any theory which will explain the origin of the *Œ. rubricalyx* character, which is claimed to be inherited in simple Mendelian fashion (unlike those of *Œ. lata* or *Œ. gigas*), will explain also the origin of all Mendelian differences It is held that, as a rule, simple Mendelian characters arise through alteration on the part of a chromosome analogous to the mutations known to occur in certain bacteria. This type of change is considered as sufficient to account for the origin of all mutations inherited in Mendelian fashion. The change is considered to be fundamentally chemical rather than morphological in its nature.

The author concludes in general that mutations, which are of many kinds and tend in many directions, furnish the material for real evolution. The manner of inheritance of a character is determined, or at any rate limited, by the manner of its origin, that is, by the nature of the germinal change by which it occurred. Just as there are different types of discontinuity in variation, so there are various methods of inheritance of the differences which thus arise, these methods depending on the basic nature of the original change.

Induced variations in chromogenesis, M. R. SMIRNOW (*Abs. in Science, n. ser., 41 (1915), No. 1060, pp. 621, 622*).—The author states that chromogenesis may be increased not only by growing the bacteria on more favorable media and environment, but also by the process of selection, transplanting each time from the portion of the culture or from a colony that shows the most pronounced pigmentation.

Chromogenesis is considered to be more or less closely associated with the metabolic activities of bacteria. It varies with the strain and is more or less dependent upon oxygen, temperature, and the medium used. An organism may produce more than one color at one and the same time, or it may produce different colors, depending upon the environment and the medium used, particularly the latter.

Influence of the concentration of the nutrient substrate upon microorganisms, ZAE NORTHRUP (*Abs. in Science, n. ser., 41 (1915), No. 1060, pp. 620, 621*).—The effect of liquefying and nonliquefying organisms on gelatin media containing different concentrations of gelatin was investigated. The size of the colonies was found to be inversely proportional to the concentration of the gelatin. This was especially marked in the case of the organisms which are most active in liquefying gelatin.

Halophytic and lime-precipitating bacteria, K. F. KELLERMAN and N. R. SMITH (*Abs. in Science, n. ser., 41 (1915), No. 1060, p. 624*).—The authors report that of approximately 70 cultures isolated from water from the Great Salt Lake and sea water from Florida and the Bahamas three types of organisms were secured. *Pseudomonas calcis*, a new spirillum, and a new bacterium were isolated from the sea water, and closely similar varieties of species of Spirillum and Pseudomonas were found in water from the Great Salt Lake. Both in sea water and in the water of the Great Salt Lake these bacteria were found associated with the precipitation of calcium carbonate.

Bacteria of the colon type occurring on grains, L. A. Rogers, W. M. Clark, and Alice C. Evans (*Jour. Infect. Diseases, 17* (*1915*), *No. 1, pp. 137–159, figs. 3; abs. in Science, n. ser., 41* (*1915*), *No. 1060, p. 624*).—A study was made of gas production by 166 colon-like cultures from grains which showed that under controlled conditions these organisms could be divided into three physiological groups, cultures giving a low volume composed of carbon dioxid only, those giving a low volume and a carbon dioxid-hydrogen ratio of 1.06, and those having a high volume and a ratio varying from 1.9 to 2.9.

Two other groups differing in their gas ratio and fermentation reaction were made, but they included a relatively small number of cultures.

Chondriosomes and their significance, F. Cavers (*New Phytol., 13* (*1914*), *Nos. 3, pp. 96–106; 4–5, pp. 170–180*).—The author gives a bibliographical review, from which it is evident that there is still difficulty in reaching safe conclusions regarding the nature of the so-called chondriosomes. The evidence as to the existence of true chromidia in plants is considered still somewhat scanty and unconvincing. It is admitted that thus far the study of chrondriosomes has definitely solved few if any of the numerous questions it has raised, and that it still remains to be shown whether chondriosomes are really cell organs which, like the nucleus, persist from generation to generation with certain definite functions, or are merely artifacts.

FIELD CROPS.

[Report of the] department of agronomy, C. S. Knight (*Nevada Sta. Rpt. 1914, pp. 30–33*).—The results of experiments in testing different dates for planting sugar beets showed the period from April 20 to May 20 to be the most propitious. When planted on dates later than June 1 the yields decreased from 12.54 to 4.74 tons per acre. In variety tests with potatoes the yields ranged from 2.67 to 9.81 tons of marketable tubers per acre. The results favored home-grown seed.

In variety tests with mangels the yields ranged from 18.5 to 27.8 tons per acre, swedes from 20.6 to 26.5 tons, corn for silage 16,170 to 25,795 lbs., wheat 1,980 to 2,520 lbs., oats from 1,780 to 2,430 lbs., barley 2,200 to 2,250 lbs., irrigated Siberian oats from 46.4 to 61.45 bu. per acre, and irrigated White Australian wheat 30.38 to 43.22 bu.

The results of the irrigation experiment with oats "indicate that the greatest production was received with two irrigations before and three after heading, while the heaviest yield per acre-foot of water was obtained with one irrigation before and one after heading. The yields per acre of oats of over 56 bu. with one irrigation before and two or three after heading also indicate that the oat crop can better withstand a slight shortage of water before than after heading."

The results of the irrigation experiment with wheat show that "the greatest production was received with two irrigations before and two after heading. The heaviest yield per acre-foot of water was obtained with one irrigation before and one after heading."

Report of [field crops] work at Fairbanks Station, J. W. Neal (*Alaska Stas. Rpt. 1914, pp. 44–48, 48–51, 52–54, pls. 3*).—The performance of several varieties of barley, oats, spring rye, spring wheat, and of buckwheat, winter rye, winter wheat, alfalfa, and red clover that seem to be suitable as grain and forage crops for that region is given. The cultivation of potatoes and general methods of cultivation employed at this station are described and the successful production of potatoes and turnips noted.

Report of [field crops] work at Rampart Station, G. W. Gasser (*Alaska Stas. Rpt. 1914, pp. 56–64, pls. 2*).—The successful season's growth of Grimm alfalfa, sand lucern, and Mongolian and Cherno alfalfas; *Medicago falcata* and *Vicia cracca;* Semipalatinsk and Disco alfalfas; *Trifolium lupinaster;* and Gobi Desert and Obb alfalfas is noted. Descriptions of varieties of spring wheat, spring rye, winter wheat, winter rye, barley, oats, and potatoes are given.

[Report of field crops work at Kodiak Station], M. D. Snodgrass (*Alaska Stas. Rpt. 1914, pp. 68–74, pl. 1*).—It is noted that on the ash-covered soils wheat and barley when seeded with oats made better growth than when seeded alone.

Nitrate of lime and nitrate of soda showed marked gains with oats, fair gains with wheat, and little effect on barley. Fish guano, muriate of potash, fish and bone, bone meal, double-manure salts, and sulphate of potash had little effect on any of these grains.

In testing cow kale as a crop for cattle feed it was shown that plants must be started in hotbeds and transplanted to heavily manured soil to be successful. Turnips and rutabagas are noted as making a fair growth. The slow, unsatisfactory growth and yield of several varieties of potatoes is noted. The season is stated as being favorable for general garden vegetables. The making of hay and silage from native bluetop grass and from oats is mentioned.

The restoration of vegetation on the volcanic ash-covered lands (E. S. R., 32, p. 31) was slowly secured by seeding grasses. The wild rye grass (*Elymus mollis*) and bluetop came up through the ash and provided excellent growth.

Crop-growing suggestions to dry land farmers, A. Atkinson (*Montana Sta. Circ. 45 (1915), pp. 121–140, figs. 10*).—The author discusses breaking the sod, tillage following breaking, tillage after the first year, and crops for the dry land farm, and suggests methods of production for spring and fall cereals, flax, corn, alfalfa, sweet clover, brome grass, timothy, and clover.

An article on potatoes by O. B. Whipple and notes regarding crop rotation for dry-land farming are included.

Crop production in the Great Plains area: Relation of cultural methods to yields, E. C. Chilcott, J. S. Cole, and W. W. Burr (*U. S. Dept. Agr. Bul. 268 (1915), pp. 28, figs. 2*).—This bulletin presents a summary of the data given in detail in six buleltins already noted (E. S. R., 33, pp. 137, 230, 231, 232, and 332), and discusses the value of the methods of tillage employed with the different crops, upon which the following conclusions were based:

"Under the normal conditions prevailing in any part of the Great Plains for a term of 10 years on any type of soil represented at any of the stations, some crops can be produced at a profit when proper cultural methods are practiced, provided that the prices of labor and of farm produce bear the same relation to each other as those which have prevailed there during the last 10 years. No single crop tested in these investigations can be raised profitably in all parts of the Great Plains area on any type of soil by any cultural method so far tested. As forage crops of some kind can profitably be grown at all stations, they must occupy an important place in any system of farming adapted to the Great Plains. Sufficient live stock must be kept to convert these crops into finished products on the farm, and sufficient forage must be produced and stored during favorable seasons to carry the live stock through specially unfavorable seasons."

Cereal experiments at the Williston substation, F. R. Babcock (*U. S. Dept. Agr. Bul. 270* (*1915*), *pp. 36*, *figs. 11*).—Descriptions of the soil, weather conditions with meteorological data, and the experimental methods employed are given, followed by detailed results of experiments conducted in cooperation with the North Dakota Experiment Station with spring and winter wheat and with oats, barley, flax, and minor cereals, and including tabulated data on yields of the varieties used, in some cases additional data being given on growth and weight per bushel.

"Spring wheats have given better results than winter wheats. Except in the dry years, 1910 and 1911, the durum wheats have produced higher yields than the common spring wheats. Kubanka durum wheat (C. I. No. 1440) gave the highest average yield of all of the spring wheats tested from 1908 to 1914, inclusive, 29.9 bu. per acre. Power fife wheat (C. I. No. 3697) stood second for the same period, producing 28.6 bu. per acre. The bluestem group has not yielded as well as the durums and fifes, and the average weight per bushel has also been lower. Rate-of-seeding tests with bluestem spring wheat have indicated that the highest yields are obtained from sowing 4 pk. to the acre. The average yields from winter wheat are lower than those from the spring wheats, for winter wheat frequently winterkills. Sowing winter wheat in grain stubble or standing corn gives protection to the plants and reduces the loss from winterkilling.

"The best three varieties of oats for the seven years 1908 to 1914 are Abundance, with an average yield of 66.4 bu. per acre; Lincoln, 65.9 bu.; and Siberian, 64.5 bu. These are all midseason varieties. The late-maturing varieties, such as White Russian, and the very early varieties, Sixty-Day and Kherson, have yielded much less than the midseason varieties. Rate-of-seeding tests with Swedish Select oats indicate that the best yields are obtained by sowing from 4 to 6 pk. per acre.

"The 6-rowed group of barley has yielded better than the 2-rowed group. The highest average yield for the seven years (1908 to 1914), 39.9 bu., has been produced by the Williston No. 170 (C. I. No. 882), a strain of Manchuria barley.

"Flax is grown with some difficulty on ground that is infested with weeds. In the seven years that tests were made only four crops were harvested. The average yield of the highest producing variety for these four years was 16.2 bu. per acre from the North Dakota No. 1221 (C. I. No. 16). Emmer and spring rye have not given as high average yields as oats, barley, or wheat. Proso, grown in field plats from 1912 to 1914, inclusive, gave an average yield of seed per acre of 25 bu. Kursk millet, grown in a plat test in 1914, yielded 38 bu. of seed per acre."

The effect of different methods of inoculation on the yield and protein content of alfalfa and sweet clover, A. C. Arny and R. W. Thatcher (*Jour. Amer. Soc. Agron.*, 7 (*1915*), *No. 4*, *pp. 172–185*).—This article gives results of the effect of different methods of inoculation on the crop as shown in the harvest two years after seeding. The methods include no inoculation, commercial culture applied to the seed, commercial culture applied to the soil, soil from an old alfalfa field, soil from an old alfalfa field plus two tons of limestone per acre, and no inoculation but two tons of limestone. The yields of dry matter per acre in three cuttings by the different methods were, respectively, 7,343, 7,750, 7,533, 7,969, 7,969, and 7,934 lbs., and the average protein content as 16.34, 16.4, 16.97, 17, 18.02, and 16.67 per cent.

The effect of inoculation of alfalfa with soil from a sweet-clover field is shown in yields per acre as follows: No inoculation (3 plats), 1,277, 1,683, and 1,293 lbs.; with sweet-clover soil, 3,028 lbs.; and with alfalfa soil, 3,022 lbs.

The protein contents were 12.6, 12.6, 12.73, 15.79, and 15.55 per cent, respectively.

The effect of inoculation of sweet clover with soil from alfalfa and sweet-clover fields was to produce enormous increases in the yield of dry matter and to reduce slightly the percentage of protein. There was a large increase in the yield of both tops and roots of alfalfa and sweet clover as a result of inoculation, and the gain in weight was an actual increase in dry matter per plant and not an increase in the number of plants growing upon a given area of soil. In each individual case, with both alfalfa and sweet clover, the ratio of tops to roots was greater in the inoculated plat than in the untreated check plat.

Determinations were made of the percentage of total ash and of nitrogen, phosphorus, and potassium in the dry matter. The figures for total ash show a very remarkable effect of the inoculation in increasing the ash content of the roots and decreasing it in the tops of the plants. Other results are given below.

Effect of inoculation upon quantity of plant-food constituents in crops of sweet clover and alfalfa.

Crop.	Treatment.	Part of plants.	Plant-food constituents present in crop.					
			Nitrogen per square yard.	P_2O_5 per square yard.	K_2O per square yard.	Nitrogen per acre.	P_2O_5 per acre.	K_2O per acre.
			Gm.	*Gm.*	*Gm.*	*Lbs.*	*Lbs.*	*Lbs.*
Sweet clover	Inoculated	Tops	10.05	5.15	2.98			
		Roots	1.46	1.17	.45			
		Whole plant	11.51	6.32	3.43	128	70	38
Do	Not inoculated	Tops	.86	.40	.39			
		Roots	.13	.14	.11			
		Whole plant	.99	.54	.50	11	6	5
Alfalfa	Inoculated	Tops	8.25	3.34	3.27			
		Roots	2.73	2.03	1.10			
		Whole plant	10.98	5.37	4.37	122	60	49
Do	Not inoculated	Tops	.99	.67	.56			
		Roots	.31	.36	.20			
		Whole plant	1.30	1.03	.78	14	11	9

Results of lucern tests, season 1914–15, A. E. V. RICHARDSON (*Jour. Dept. Agr. Victoria, 13 (1915), No. 7, pp. 417–436, pl. 1, figs. 10*).—The results of tests in both pot and field experiments as carried on at Werribee are given as follows:

"A lucern crop transpired approximately 681 tons of water to produce 1 ton of dry matter at Werribee for the season 1914–15. By giving a lucern crop as much water as it would use up during the season 1914–15 an equivalent of 8 tons of 16½ cwt. of dry lucern was produced per acre. To produce this quantity, however, no less than 72 acre-inches of water were required, of which 61 acre-inches had to pass through the crop, and 11 acre-inches were dissipated from the soil by evaporation. In field tests the water requirements of lucern were even greater, on account of the impossibility of obtaining a perfect mulch and thus keeping down the loss by evaporation from the soil. On a block of 15 acres, sown in October, 1912, 12.3 tons of commercial hay, containing 10.45 tons of dry matter, were produced in 2½ years. During this period 9.1 acre-feet of water were supplied as rain and irrigation water. Consequently, under field conditions, for every ton of dry hay produced 10½ in. of water were required, 3½ in. of which was lost from the soil by evaporation and 7 in. by transpiration. An acre of lucern in full growth will use up considerably more water than would be lost by evaporation from a free water surface of equal area. The presence of a sufficiency of soluble phosphates helps to reduce the transpiration ratio, and this makes the crop more economical of water.

"A 15-acre block of lucern yielded 6.5 tons of commercial hay during the second season of growth, and 4.3 tons during the third season, though receiving only three irrigations during the past season. Tamworth lucern has given the best average yield during the past two years, averaging 22¾ cwt. per acre for ten cuts. The heaviest seedings of lucern gave the best returns, but there appears to be no material benefit in sowing more than 18 lbs. of seed per acre. Sixteen lbs. is the seeding adopted at Werribee.

"The application of artificial fertilizers gave decided and profitable increases over the unmanured plats. Nitrogenous manures, though not generally used to fertilize leguminous crops, gave the most marked crop increases. Superphosphate proved to be the most efficient of the artificial phosphates. An application of 2 cwt. at seeding, costing 9s., gave an increase of a ton of lucern hay to the acre in the second season of growth, and this in spite of the dryness of the season. Lime has given an increase in crop yields, but the increase was barely sufficient to cover the cost of the application. Heavier dressings than 20 cwt. appear to depress the yield. The effect of these manures will probably be felt next season. Lime has given greater crop increases than an equivalent value of ground limestone, though the effect of the latter manure may be expected to persist longer. In view of the heavy demands made on the mineral constituents of the soil by good lucern crops, top-dressings, applied every winter, of phosphates at the rate of 1½ to 2 cwt. per acre are recommended. On soils similar to Werribee dressings of lime or ground limestone applied every two years at the rate of 10 to 12 cwt. lime and 20 to 25 cwt. ground limestone are likely to prove profitable."

Alfalfa, G. W. Carver (*Alabama Tuskegee Sta. Bul. 29 (1915), pp. 1–7*).—This bulletin notes the great value of alfalfa as a hay and forage crop as indicated by tests from 1912 to 1915, and gives directions for its production.

Suggestions to alfalfa growers, A. Atkinson and M. L. Wilson (*Montana Sta. Circ. 49 (1915), pp. 9–42, figs. 31*).—In this circular are discussed the types of alfalfa, methods of production of hay and seed under irrigated and dry-land conditions, and the value of alfalfa as a pasture crop.

Studies on bean breeding.—I, Standard types of yellow eye beans, R. Pearl and F. M. Surface (*Maine Sta. Bul. 239 (1915), pp. 161–176, pls. 6*).—It is here stated that observations have shown that the bean, usually a self-fertilized plant, may be cross-pollinated by the action of the large bumblebee, so that for breeding purposes it has been found necessary to erect bean cages inclosed with screen wire. The commercial importance of the Maine bean crop and of the two types of yellow eye beans are discussed. Standards of types, including the characters of sizes and shape, ground color, and eye pattern and color, are suggested for the Improved Yellow Eye and the Old Fashioned Yellow Eye, followed by comments of leading Boston dealers.

Seed values of maize kernels, butts, middles, and tips, Mary G. Lacy (*Jour. Amer. Soc. Agron., 7 (1915), No. 4, pp. 159–171*).—This article reviews the work of experimenters along this line with a view to determining how far the apparently contradictory results of different experiments could be reconciled by taking into account the fact that the silks of the kernels from the tip end of the ear are the last to appear, and hence are more likely to escape self-fertilization than other kernels.

The experiments from which these data are compiled cover a period of 45 years, and show that "the average yield of seed from the butt is 103 per cent of that from the middle seed and the yield of seed from the tips is 105 per cent of that from seed from the middle of the ear. In the case of the tips this is 5 times the probable error for the series, and in the case of the butts, 3⅓ times. These percentages, though small, must be considered significant in a table of 81 instances. . . . In 4 out of the 81 cases reported we may be sure that the yield has been increased by the use of tip seed, and in the other cases there is no evidence that the use of top seed has decreased the yield. In four cases the increased yield from butt seed is more than four times the probable error.

"The conclusion of the matter seems to be that the tips and butts are certainly not inferior for seed purposes, and there seems little justification for the practice, prevalent in some sections, of discarding them for seed."

A bibliography of 25 titles is appended.

Flax for seed and oil.—Harvesting and storing the crop for seed and oil purposes, H. L. Bolley (*North Dakota Sta. Circ. 7 (1915), pp. 4*).—Practical suggestions for the harvesting and storing of flax for seed and oil purposes are given.

Flax crop conditions for 1915 (*Montana Sta. Circ. 48 (1915), pp. 5–8*).—This circular discusses the methods of production and prices obtained for flax with reference to Montana conditions.

The potato crop in Montana, O. B. Whipple (*Montana Sta. Circ. 46 (1915), pp. 141–165, figs. 11*).—In this circular the author discusses methods of production with special reference to the improvement of the potato crop and the growing of potatoes for seed purposes, and includes irrigation and marketing. Descriptions are given of the most important types of potatoes.

Potato spraying and dusting in New Jersey, U. S. A., A. E. Cameron (*Bul. Ent. Research, 6 (1915), No. 1, pp. 1–21, pls. 3, figs. 2*).—A report of work already noted from another source (E. S. R., 33, p. 336).

Experiments in covering cane by plow and by spade, A. H. Rosenfeld (*Internat. Sugar Jour., 17 (1915), No. 200, p. 364*).—In tests conducted at the Tucumán Experiment Station cane covered in planting with a small share plow produced at the rate of 39,105 kg. per hectare (17.4 tons per acre) as compared with 35,254 kg. for that covered with a spade.

Possibilities of the sweet potato in Macon County, Alabama, G. W. Carver (*Alabama Tuskegee Sta. Bul. 30 (1915), pp. 22, figs. 8*).—A revised and slightly enlarged reprint of Bulletin 17 already noted (E. S. R., 22, p. 729).

Notes on the germination of tobacco seed, II, T. H. Goodspeed (*Univ. Cal. Pub., Bot., 5 (1915), No. 7, pp. 233–248*).—This reports the continuation of work previously noted (E. S. R., 29, p. 739), and presents further evidence regarding the relation between the age of the seed of certain pure-line cultures and of the seed of hybrids made between them, and the viability of this seed.

The data "concerning the germination of hybrid *v.* parental seed leave no doubt that different plants of F_1, F_2, and F_3 produce seed the germination of which is significantly differentiated as to the total amount of the seed that will germinate, or as to the length of time during which germination takes place, or as to the period, during the extent of the test, within which the maximum amount of germination occurs. Further, there is evidence that among the seeds of a single F_2 or F_3 plant a portion have a characteristic period during which they germinate, which is distinct from the period characteristic of another group of the same seed. . . . Finally, the F_1 seed from reciprocal crosses has been shown to differ with reference to its germination. In this connection, either the amount of total germination, or the extent of the germinating period, or the days of maximum germination peculiar to one parent have been shown also to be characteristic of the cross-pollinated seed which it bore."

The chemical composition of the tobacco plant, E. PANNAIN (*Staz. Sper. Agr. Ital., 48 (1915), No. 1, pp. 18–43, figs. 4*).—Previously noted from another source (E. S. R., 33, p. 436).

A study of Colorado wheat, W. P. HEADDEN (*Colorado Sta. Bul. 208 (1915), pp. 3–48*).—This bulletin gives results of a study made during 1913 of some factors that may determine the quality of Colorado wheat, which is generally assumed to be inferior to the best bread-making wheat grown in other States.

Wheat was grown on plats that received varying quantities of nitrogen, phosphoric acid, and potash. From the chemical analyses of the soils at various depths before and after fertilization, the analyses of different parts of the wheat plants at several stages of growth, and a study of the bacterial content of the soil, the author is led to believe that there exists a definite relation between the available supply of nitrogen, phosphorus, potash, and moisture in the soil and the quality, or nitrogen content, of the wheat produced thereon. The application of sodium nitrate increased the total amount of ash. It depressed the amount of silica and increased the amounts of potash and calcium, while it did not seem to affect that of phosphorus. The application of phosphorus and potash to the soil seemed uniformly to lower the amount of phosphorus in the plant. The amount of potash in the plant did not seem to have been influenced by the application of either phosphorus or potash. The application of nitrogen to the soil increased the nitrogen in the plant quite materially over that present in the plants grown on the check plats. This was true for each of the different applications made.

Tabulated data show the chemical analyses of soil and subsoil used in these experiments; the variation of total nitrogen, nitric nitrogen, phosphoric acid, and potash in consecutive areas; the percentage of moisture, total nitrogen, and bacterial count of soils differently treated; the effect of varying amounts of nitrogen, phosphoric acid, and potash on (1) the ratio of stems, leaves, and heads for Red Fife varieties of wheat, (2) the amount of dry matter in several varieties of wheat, (3) the total nitrogen, proteid nitrogen, ammonic nitrogen, and amid nitrogen in wheat plants at different stages of development, (4) the moisture and soluble and insoluble ash in air-dried wheat plants and in various parts of the plants, and (5) the amount of silicon in the different parts of the wheat straw; and the mineral constituents of air-dried wheat straw.

HORTICULTURE.

[Horticultural investigations in Alaska], C. C. GEORGESON (*Alaska Stas. Rpt. 1914, pp. 11–26, pls. 2*).—The investigations of the year were confined principally to the Sitka Station and consisted principally of breeding and cultural experiments with orchard fruits and variety tests with vegetables.

The work of hybridizing strawberries (E. S. R., 32, p. 45) has been continued with success. Many crosses have been made between these hybrids, the best of which are being selected for further study. Notes are given on breeding work now under way with currants, gooseberries, raspberries, blueberries, and cranberries.

Of 40 varieties of apples planted in the station's test orchard some years ago, those which are now left that give any promises of usefulness are the Yellow Transparent, Raspberry, Hyslop, Sylvan Sweet, Whitney, and an English variety, Keswick Codlin. The Yellow Transparent and Raspberry produced fruit last season. The apples were undersized for these varieties but were of very good flavor. The cherry trees at the station continue to make moderate growth and bloom profusely every spring. For some reason, however, possibly lack of insects to aid in fertilization, 90 per cent of the blossoms drop off without setting fruit. Many supposedly hardy varieties of plums have been grown during the past few years but none of them has produced a bloom.

The usual variety tests with vegetables are reported. A list is given of the shrubs and vines that have proved to be adapted to southeastern Alaska conditions. A list supplementary to that in the 1911 report (E. S. R., 28, p. 436) is also given of hardy perennials, together with annuals or perennials that blossom the first year from seed which were found to do reasonably well last year.

Biennial report State Horticultural Commission of the State of Utah from December 1, 1912, to November 30, 1914 (*Bien Rpt. State Hort. Com. Utah, 1912–1914, pp. 68*).—This report contains a statistical account of the nursery and fruit industry in Utah for 1913 and 1914, together with an account of nursery inspection and quarantine work, including a brief statement of quarantine measures in adjacent States. In addition to statistics on fruit trees planted in 1913 and 1914, data are given of an orchard survey including some 727 blocks of fruit on 357 farms. The various fruits are classified, both with reference to age and acreage and conditions with reference to spraying, cultivation, and pruning. A report is also included relative to the possibilities for fruit product factories in Utah, together with a paper on diversified fruit growing by W. W. Knudson, in which the author gives an account of the management of a farm on which are grown small fruits, cherries, peaches, plums, and vegetables. The data given include the varieties of fruit grown, time of harvest, receipts, and expenses for the three years, 1912–1914. The report concludes with a list of nursery licenses and a financial statement for the biennial period.

The determination of humidity in the greenhouse, M. A. Blake (*New Jersey Stas. Circ. 47, pp. 3–7, fig. 1*).—This circular contains directions and tables for the determination of humidity by means of a sling psychrometer.

The origin and history of some of our more common garden vegetables, O. E. White (*Brooklyn Bot. Gard. Leaflets, 3. ser., No. 6 (1915), pp. 7, pls. 3*).—This comprises brief notes, together with a list showing the supposed origin of most of our common vegetables and the certain or probable date of earliest cultivation.

Morphological and biological researches on the cultivated radishes, Yvonne Trouard Riolle (*Ann. Sci. Agron., 4. ser., 3 (1914), No. 7–12, pp. 346–550, figs. 135*).—The first part of the work here reported includes a study of differences in color, as measured by the action of acids and bases on the anthocyanin solutions of radishes and by the spectroscopic absorptions of the anthocyanin solutions treated with acids and bases; a study of difference in form of cultivated radishes; a quantitative and qualitative study of carbohydrates in selected types among all the known European, Chinese, and Japanese radishes; a morphological and botanical study of cultivated radishes, including the roots, foliage, flowers, and fruit; and a comparative study of the wild species of Raphanus, with special reference to determining the origin of cultivated radishes. In part two of this work are grouped a number of biological investigations, including experiments in the amelioration of forms of the wild radish *Raphanus raphanistrum* into forms of the cultivated radish *R. sativus;* a study of the natural hybrids between the two species; hybridization experiments between different genera of crucifers, different species of Raphanus, and crossing experiments between different varieties of *R. sativus;* and a study of the degeneration among cultivated radishes.

Attempts to transform the wild radish *R. raphanistrum* into the cultivated form through cultivation and selection were unsuccessful, although hybrid forms were secured between the species and were also found to occur naturally. Attempts to cross the wild radish with Isatis, Brassica, and Sinapis were also unsuccessful. From the results of her experiments as a whole the author concludes that the cultivated radish has a dual origin. The Japanese radish (Daïkon) is descended from *R. sativus raphanistroides*, a native of China and Japan. The European and Chinese radish appears to be derived from another wild type, native to central Asia, and rare or extinct at the present time. The greater number of cultivated radishes are descended from the latter type.

The origin of the radish (*Gard. Chron., 3. ser., 57 (1915), No. 1483, p. 296*).—An abstract of the above-noted work.

Tomato culture in Montana, L. G. SCHERMERHORN (*Montana Sta. Circ. 44 (1915), pp. 111–119, figs. 5*).—A popular treatise on tomato culture discussing location and soils, varieties, planting and transplanting, setting in the field, irrigation and cultivation, pruning and staking, and ripening tomatoes after frost.

Fungicides, insecticides, and spraying calendar (*Fla. Quart. Bul. Agr. Dept., 25 (1915), No. 2, pp. 179–194*).—This comprises directions for the preparation of fungicides and insecticides, including a spray calendar for both fruits and vegetables.

Bordeaux mixture, M. T. COOK (*New Jersey Stas. Circ. 48, pp. 3–7*).—This circular discusses the preparation of Bordeaux mixture, its use for controlling diseases of various fruits and vegetables, and spraying machinery.

An American fruit farm, its selection and management for profit and for pleasure, F. N. THORPE (*New York: G. P. Putnam's Sons, 1915, pp. XII+348, pls. 21*).—A popular account of fruit farming based primarily on the record of a fruit farm on the southern shore of Lake Erie. The subject matter is treated under the following general headings: Time and the tree, selecting the fruit farm, the planting of the fruit farm, getting along with help, the cultivation of the fruit farm, feeding the land, the fruit farm and the young folks, ten thousand a year, birds and the fruit farm, and the fruit farm and old age.

Systematic cooperation in Nova Scotia, A. E. ADAMS (*Proc. Conf. Fruit Growers Canada, 4 (1914), pp. 43–54*).—In this article the author gives a brief history of the development of fruit cooperative companies in the Annapolis valley, with special attention to errors and necessary improvements.

The blooming season of hardy fruits, U. P. HEDRICK (*New York State Sta. Bul. 407 (1915), pp. 367–391*).—Continuing previous work (E. S. R., 20, p. 41) the present bulletin, which has been prepared from data secured at the station by various members of the horticultural department, assigns a blooming season for all of the varieties of fruits commonly cultivated in New York. The observations for most of the orchard fruits covered a period of five years, and for grapes and small fruits a period of three years, the blooming seasons given being based upon the opening of the flowers. The varieties are classed as very early, early, midseason, late, and very late.

Ripening dates and length of season for hardy fruits, U. P. HEDRICK (*New York State Sta. Bul. 408 (1915), pp. 393–418*).—This bulletin contains the ripening dates and length of season for the same varieties of fruits for which the blooming time is given in the above-noted bulletin.

Dwarf apples, U. P. HEDRICK (*New York State Sta. Bul. 406 (1915), pp. 341–368, pls. 7*).—This bulletin comprises a final report of a comparative test of dwarf and standard apples which has been conducted at the station for a period of ten years. French Crab stocks were used for the standard trees and Doucin and French Paradise stock for the dwarf trees. The sites for the tests were selected, with reference to climate and soil, in three widely separated parts of the States. The general plan of the test was to grow a permanent orchard of standard trees with fillers on Doucin stock and between these trees on Paradise stock. The orchards were set with 27 varieties represented by 1,193 trees.

The results of the investigations show that the union between stock and scion is poorer with Doucin and French Paradise stocks than with the French Crab. Unions were better on Doucin stock than on French Paradise. French Crab was the hardiest stock and French Paradise the least hardy stock. The greatest weakness of the dwarfing stock for New York is the surface rooting habit, in which character the two stocks can not be distinguished. The evil results following surface rooting are winterkilling, uprooting the trees by wind, suckering, and injury in cultivation. Dwarf trees suckered much more than the standard trees. The trees on the three stocks attained the size commonly ascribed to them, those on French Crab being full-sized, those on Doucin medium-sized, and those on French Paradise true dwarfs. Trees on French Paradise came into bearing soonest, Doucin next, and French Crab last. There were no marked differences in size, color, and quality of the apples on the three stocks.

The test has not been such that safe conclusions can be drawn as to which stock makes the most productive orchard. The varieties have not done equally well in the three orchards, and none of the trees are yet near their maximum usefulness. All things considered, however, the most satisfactory varieties on dwarfs have been McIntosh, Wealthy, and Lady. Jonathan, Esopus, Grimes, Alexander, Wagener, Boiken, and Bismarck have been very satisfactory, while Baldwin, Rhode Island Greening, Rome, Ben Davis, Northern Spy, and Sutton have not been very satisfactory on dwarfing stocks. Twenty Ounce has been the most satisfactory.

In this 10-year test no satisfactory time nor method could be found to prune dwarf trees which did not promote a weak, sickly growth. This invariably died back the next winter.

The author concludes that the dwarf trees appeal to amateur rather than to professional apple growers, as they take less space, and therefore permit a greater variety in orchard or garden and are handsomer ornamentals.

The apple in Brittany, E. Duplessix (*Trav. Sci. Univ. Rennes, 10 (1911), No. 2, pp. 1–41, 191–232; 11 (1912), No. 2, pp. 13–23, 41–61, 126–167; 12 (1913), No. 2, pp. 1–29*).—A treatise on apple growing in Brittany, including a discussion of varieties, methods of propagation, orchard management, diseases, and insect pests.

Chemical and biological notes on cherry orchard soils, A. Harvey and C. H. Hooper (*Gard. Chron., 3. ser., 57 (1915), No. 1484, pp. 308, 309*).—Data secured by the authors relative to the chemical and physical composition of a number of cherry orchard soils indicate that neither the chemical nor mechanical anaylsis is a good index of the value of the soil for growing cherries. A favorable soil influences the actual growth of the tree but not necessarily its fruiting capacity. The failure of cherry trees to fruit year after year is apparently due to the lack of suitable cross pollination rather than to some fault in the soil. This may be true even when there are several varieties in the orchard, since they may not be good pollenizers for each other.

Blight resistance in pears and pear stocks, F. C. Reimer (*Better Fruit, 9 (1915), No. 12, pp. 5, 6*).—In this paper the author advances the opinion that the ultimate solution of the pear blight will be the growing of resistant varieties. Attention is called to a number of varieties of *Pyrus communis* which, although of poor quality, are blight resistant and superior to the Kieffer as stocks for top-working with our commercial varieties. It is recommended that such blight resistant varieties be grown in the orchard on resistant *sinensis* stocks for a period of two years and then top-worked with commercial varieties.

Peach growing in Virginia, G. C. Starcher (*Va. Polytech. Inst. Ext. Bul. 1 (1915), pp. 32, figs. 13*).—A popular discussion of some of the more important problems in peach growing with special reference to Virginia conditions. Consideration is given to selecting the location for the commercial peach orchard, soil and site, varieties, planting operations, selection of trees and time to plant, arranging varieties, tillage, pruning, thinning, picking, packing equipment, and insect and disease control.

Inheritance of certain characters of grapes, U. P. Hedrick and R. D. Anthony (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 4, pp. 315–330*).—This work discusses certain results of breeding experiments with grapes which were begun at the New York State Experiment Station by E. S. Goff in 1885 and have been continued and increased from year to year by subsequent investigators. The work is now proceeding mainly along two lines: The determination of the breeding potentialities of a considerable number of varieties of grapes, especially with the view of finding unit characters; and a review of all the station's breeding data on this fruit, the necessary crosses being made to throw further light upon doubtful points. Nearly 200 varieties of grapes have been used in the breeding work but much of the value of the early work was lost by growing too few seedlings of each cross. Recently *Vitis vinifera* has been used to a considerable extent in hybridization.

The results as a whole have compelled the belief that improved varieties of grapes will not be produced to any extent until the fundamental laws of heredity are understood. One of the surprises in the study of grape varieties was the failure of many commercial sorts to transmit desirable qualities. Nearly 3,000 selfed, or pure, seedlings have been grown. They are uniformly lacking in vigor.

The work shows that reflexed stamens are correlated with complete or nearly complete self-sterility and upright stamens with self-fertility. Partial or complete self-sterility is probably caused by impotent pollen and depends to some extent upon the condition of the vine and environmental factors. Breeding from varieties with upright stamens decreases but does not eliminate the seedlings with reflexed stamens. Sex inheritance seems to be transmitted as follows: Hermaphrodite female × hermaphrodite male = all hermaphrodites. Hermaphrodite female × pure male = $\frac{1}{2}$ hermaphrodites + $\frac{1}{2}$ males.

With reference to skin color, white is a pure color and is recessive to both black and red. No black or red varieties have proved pure for blackness or redness. The colors of pure seedlings of certain varieties show wide variation, even when derived from varieties of similar color.

The most noticeable observation as to quality was the low percentage of seedlings whose quality is good or above good. This is attributed to the leveling influence of the wild ancestors, from which the seedlings are but a step removed. Most grapes of high quality possess some *V. vinifera* blood. This predominance of high quality is probably due to the intense selection to which the species has been subjected for centuries. Pure seedlings in this work have been lower in quality than crossed seedlings.

Relative to the inheritance of size of berry, there was no indication of dominance of any size, though there is a tendency for a variety to produce seedlings approaching its own size. It is suggested that the oval form of many *V. vinifera* hybrids is an intermediate between round and a more pronounced oval. Oblate may be a pure form recessive to round. The season of ripening of the parent influences to a considerable extent the season of the offspring.

A vineyard of 1,500 seedlings bred from 1898 to 1903 has by a process of vigorous selection decreased to less than 75 vines; but among this number are several that seem very promising. Five of these have been tested, named, and placed in the hands of nurserymen.

A short bibliography of cited literature is appended.

Combination spraying experiment for the control of mildew and leaf-hoppers on grapevines, S. W. Foster (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 250–253*).—Experiments conducted in 1914 by the author in cooperation with R. M. Roberts and F. P. Roullard indicate that in vineyards where mildew does not cause any injury until after the grapes are through blooming both vine hoppers and mildew can be effectively controlled by one application of the following formula: Atomic sulphur, 24 lbs., blackleaf 40 or sulphate of nicotin 1 pint, and water to make 200 gal. On varieties where the undersurfaces of the leaves are covered with excessive hairy pubescence or when many of the hoppers are more than half grown it is of advantage to add from 0.5 to 1 gal. of liquid whale-oil soap to each 200 gal. of spray. In those vineyards where mildew begins development early in the season the vines should be sprayed once before blooming for mildew control, although no good can be accomplished in vine-hopper control by spraying at this time.

Factors governing the successful shipment of red raspberries from the Puyallup Valley, H. J. Ramsey et al. (*U. S. Dept. Agr. Bul. 274 (1915), pp. 37, figs. 26*).—This bulletin is based upon handling, storage, shipping, and precooling experiments with red raspberries conducted by the Office of Horticultural and Pomological Investigations during the seasons of 1911, 1912, and 1913. The subject matter is presented under the general headings of the berry industry of the Puyallup Valley, methods of growing red raspberries, handling and shipping red raspberries, causes of decay of fruit in transit, frequency of picking, relation of rainfall to handling, relation of methods of growing to keeping quality, the labor problem, handling—an economic problem; careful handling experiments, effect of delay in cooling or keeping quality, precooling experiments, decay in top and bottom crates, temperature conditions in an iced refrigerator car, and the application of precooling.

The results of these investigations demonstrate that care exercised in handling and the promptness with which the fruit is cooled are among the most important factors in determining the distance red raspberries can be successfully shipped. A number of recommendations are made with special reference to facilitating and improving methods of handling, shipping, and precooling.

Ettersburg strawberries, R. E. Clausen (*Jour. Heredity, 6 (1915), No. 7, pp. 324–331, figs. 3*).—A popular account is given of the strawberry breeding work of A. F. Etter, of Briceland, Cal.

The author concludes that the most important result of this work is the demonstration of the fact that further hybridization of the common garden varieties of the strawberry, supposedly largely *Fragaria chiloensis* derivatives, with wild forms of that species results in a notable increase in vigor and in the production of new varieties superior in every respect to the ones commonly cultivated.

The citrus grove, its location and cultivation, P. H. Rolfs (*Fla. Quart. Bul. Agr. Dept., 25 (1915), No. 2, pp. 135–154*).—An account of citrus culture in Florida with special reference to the selection of location and site, preparation of land, cultural treatment, and building up a neglected grove.

The fertilizer requirements of citrus trees, H. J. Webber (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 225–230; Proc. Fruit Growers' Conv. Cal., 45 (1914), pp. 101–107*).—The results of the first five fruiting years are given of fertilizer experiments with oranges and lemons which were started by the California Citrus Station in 1907.

The results thus far indicate very strongly the importance of nitrogen fertilization and the desirability of using nitrogen from organic sources. Potash appears to be unnecessary for the fertilization of young groves, and it is doubtful whether phosphoric acid is required in such large quantities as ordinarily are used. In lieu of further experimental results the author concludes that in general one of the factors of fundamental importance in citrus groves is to increase the amount of organic matter in the soil. This can probably best be done by the regular use of a winter cover crop such as Melilotus or purple vetch and the application of manure, alfalfa hay, bean straw, and similar materials as fertilizers.

Suggestions on coffee planting for Porto Rico, T. B. McClelland (*Porto Rico Sta. Circ. 15 (1915), Spanish ed., pp. 23 pls. 4, fig. 1*).—A Spanish edition of the circular previously noted (E. S. R., 28, p. 237).

Coffee: Its cultivation and manuring in South India, R. D. Anstead (*Dept. Agr. Mysore, Gen. Ser. Bul. 6 (1915), pp. 48, fig. 1*).—A practical treatise on coffee culture, the introductory chapter of which discusses the botany of the coffee plant. The succeeding chapters deal with planting the estate, selection of seed, nurseries, planting out, supplies, cultivation and preparation of the soil, renovation of old coffee, draining, shade, regulation of shade, pruning, weeding, mulching, humus, manurial value of mulch, manuring of coffee, valuation of manures, mixing of fertilizers, the use of lime, green manuring, and handling the crop.

Notes on the spraying of tea, E. A. Andrews and A. C. Tunstall (*Indian Tea Assoc. [Pamphlet] 1 (1915), pp. IV+75, pls. 9*).—This work discusses the more important insect pests and fungus diseases of the tea plant and gives directions for the preparation and use of sprays for their control.

Bearing dates for grafted shagbark.—A new method for grafting nut trees, R. T. Morris (*Amer. Nut Jour., 2 (1915), No. 6, p. 87*).—After briefly noting that Taylor grafts upon a top-worked shagbark stock came into flower the fourth year, the author describes a new method of grafting herbaceous grafts of shagbark hickory and English walnuts which has been used the present spring.

The method consists in mixing one part of commercial grape juice with three parts of water and dipping the grafting knife into this solution just in advance of cutting the scions or stock. The solution bathes the cut surface and not only prevents instantaneous drying of the surface, but also inhibits the enzymic action which otherwise takes place very rapidly with the effect of discoloring the cut surfaces. The grafts were all made according to the side-cleft method. Although no conclusive results have been secured as yet, scions not more than 2 in. in length gave so much promise of living two weeks after the grafting period that the method is described with a view to encouraging further experiments along this line.

The industrial cultivation of aromatic plants for essences and medicines, C. Craveri (*Coltivazione Industriale delle Piante Aromatiche da Essenze e Medicinali. Milan: Ulrico Hoepli, 1914, pp. XIX+307, pls. 24, figs. 71*).—A practical manual on the culture of essential and medicinal plants.

Part 1 contains general instructions relative to the selection and preparation of soils, nursery and seed-bed practices, methods of propagation, cultural operations, harvesting, marketing, drying, etc. Part 2 takes up specifically the botanical characteristics, cultivation, method of harvesting, and preparation and uses of various plants. Part 3 treats of diseases and insect pests and their control, and gives selections of plants suitable for growing in various situations and types of soil. Part 4 comprises a botanical glossary. The text is accompanied by a series of colored plates illustrating the more important plants discussed.

Crossing experiments with canna varieties, J. A. HONING (*Rec. Trav. Bot. Néerland., 12 (1915), No. 1–2, pp. 1–26, figs. 2*).—Data secured from a study of character inheritance in the joint progeny of two varieties of cannas are here presented in tabular form and discussed. The results secured from a study of the first two generations indicate that for *Canna indica* character transmission occurs not only according to Mendel's law, but there are three completely independent lines of inheritance.

Heredity of color in Phlox drummondii, A. W. GILBERT (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 4, pp. 293–301, pls. 3*).—A Mendelian study of color transmission in *P. drummondii*, conducted at the New York Cornell Station, including a review of our knowledge relative to the nature of color in plants. Commercial seed was purchased and the different varieties grown and self-fertilized for three years so as to be sure of pure types. The varieties used in these experiments were found to breed true for three years and are assumed to be pure. The parents were self-fertilized each year and grown alongside of the F_1 and F_2 hybrids. The flowers of a number of the seed parents and hybrids are illustrated in color.

The unit characters found in the four varieties of *P. drummondii* that were used in these experiments include (1) a dark eye factor producing a dense coloration at the center of the flower. This was dominant over its absence, the white eye, which was exhibited in more or less of a definite pattern. (2) A blue factor. (3) A red factor. (4) An intensifying factor which determines the degree of pigmentation of the reds. (5) A yellow factor which acts only in the presence of the eye factor. The reds and blues are cell-sap colors, and the yellow is due to the presence of yellow chromoplasts.

The National Rose Society's rose annual for 1915, edited by H. R. DARLINGTON (*London: National Rose Society, 1915, pp. 164, pls. 22*).—This consists of several articles on various phases of rose culture, including also descriptions of new varieties of 1914.

Italian gardens of the Renaissance, JULIA CARTWRIGHT (*London: Smith, Elder & Co., 1914, XII+298, pls. 16*).—This work comprises sketches of a number of Italian gardens and their makers.

FORESTRY.

[Forestry report for 1914] (*Rap. Dept. Suisse Int., 1914, pp. 1–9*).—A report on forest legislation, management, felling, and planting operations for the year 1914.

Annual progress report on forest administration in the Presidency of Bengal for the year 1913–14, C. E. MURIEL (*Ann. Rpt. Forest Admin. Bengal, 1913–14, pp. II+49+5*).—A progress report on the constitution, management, and exploitation of the state forests of Bengal, including a financial statement for the year 1913–14. All important data relative to alterations in forest areas, forest surveys, working plans, forest protection, revenues, expenditures, etc., are appended in tabular form.

Annual progress report of the forest administration in Coorg for the year 1913–14, H. TIREMAN (*Rpt. Forest Admin. Coorg, 1913–14, pp. 4+11+13*).—A progress report on the administration and management of the state forests in Coorg, including a financial statement for the year 1913–14, with a review of the work by the chief commissioner. All important data relative to alterations in forest areas, forest surveys, working plans, forest protection, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

The State and forestry in Ireland, A. C. Forbes (*Quart. Jour. Forestry, 9 (1915), No. 3, pp. 214–225*).—A short review of the history of forestry in Ireland with special reference to the development of state forestry in recent years.

The Tintern crown forests, W. Schlich (*Quart. Jour. Forestry, 9 (1915), No. 3, pp. 194–204, pl. 1*).—A descriptive account of these forests and the system of management applied to them during the last fourteen years.

Some developments in reforestation on the National Forests, C. R. Tillotson (*Forest Club Ann. [Univ. Nebr.], 6 (1915), pp. 103–109*).—An account of the more important developments in reforestation work, with special reference to nursery practice, sowing, and planting.

The quadrat method as applied to investigations in forestry, A. W. Sampson (*Forest Club Ann. [Univ. Nebr.], 6 (1915), pp. 11–31, pl. 1, figs. 6*).—In this article the author explains the use of the quadrat method of study in forestry and gives some results obtained through the application of this method in growth and management studies undertaken at the Utah Forest Experiment Station on the Manti National Forest.

On the harmful effects of the growth of certain grasses and weeds around the roots of young forest trees, S. F. Armstrong and E. R. Pratt (*Quart. Jour. Forestry, 9 (1915), No. 3, pp. 225–230, pl. 1*).—In the authors' experiments, which are being conducted at Ryston, a large number of grasses were grown at the base of young forest trees. The results for the 3-year period, 1912–1914, are in accord with those reported by the Duke of Bedford and S. U. Pickering for fruit trees (E. S. R., 26, p. 639). They also indicate that the harmful effects of grass are the result of some soluble toxic substance produced by growing plants. The plats have been retained for further observation.

Some methods in the germination tests of coniferous tree seeds, J. S. Boyce (*Forest Club Ann. [Univ. Nebr.], 6 (1915), pp. 71–88*).—A résumé of the literature on the subject, including also a description of methods of making germination tests and results secured by the author.

Variation in the size of ray pits of conifers, F. B. H. Brown (*Ohio Nat., 15 (1915), No. 8, pp. 542–550, figs. 6*).—A comparative study of variations in ray characters in Larix and Picea, including charts and tabular data showing variations in size and number of ray pits through one annual ring in *Larix laricina*, *L. occidentalis*, *Picea sitchensis*, and *C. canadensis*.

A new industry in Middle Park: The collection of lodgepole pine cones, A. T. Upson (*Forest Club Ann. [Univ. Nebr.], 6 (1915), pp. 32–40*).—A descriptive account of the methods of collecting lodgepole pine cones in Colorado and the extraction of seed by the Forest Service of the U. S. Department of Agriculture. See also a previous note by Farquhar (E. S. R., 29, p. 444).

The older forest plantations in Massachusetts.—Conifers, J. R. Simmons (*Boston: State, 1915, pp. 38, pls. 11*).—The author here presents data secured in 1914 on a number of forest plantings of coniferous trees which have reached an age when value can be measured in terms of lumber. The plantations are considered with reference to their history, objects, and treatment, and data are also given showing growth measurements, the number of trees, and estimated amount of lumber in sample plats.

Structure of the wood of Himalayan junipers, W. Rushton and W. Paddington (*Jour. Linn. Soc. [London], Bot., 43 (1915), No. 288, pp. 1–13, pl. 1*).—A macroscopic and microscopic study of the wood structure of four species of

Himalayan junipers is reported. The chief points of interest brought out are the shortness of the tracheids of all species, the resinous nature of the medullary rays, the distribution of the resin cells in the annual ring, and the nature of the rims above and below the pit areas, these being shown to agree with those of the East Indian pines in being of the nature of pectin and not cellulose.

Relationships of the white oaks of eastern North America, with an introductory sketch of their phylogenetic history, MARGARET V. COBB (*Proc. Amer. Phil. Soc., 54 (1915), No. 217, pp. 165–175, pls. 3, fig. 1*).—This article contains a reconstruction of the history of the Fagaceæ and of Quercus, together with a key showing the relationships of the white oaks of eastern North America. A bibliography of related literature is included.

Discussion on the eucalypts and their products, H. G. SMITH (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 116–125*).—A discussion of the essential oil products of the eucalypts with reference to their tanning capabilities and other avenues of possible utilization.

Culture of Manihot glaziovii at the State Agricultural Station at Bokala, Middle Kongo, JANSSENS (*Bul. Agr. Congo Belge, 5 (1914), No. 3, pp. 416–456, figs. 17*).—An account of cultural, tapping, and coagulation work with *M. glaziovii* rubber at the station, including estimates relative to the cost of establishing a rubber plantation and the probable returns, and a discussion of the diseases and other enemies of Manihot.

The treatment to which the Para rubber trees of the Botanic Gardens, Singapore, have been subjected (*Gard. Bul. Straits Settlements, 1 (1915), No. 8, pp. 247–295, pls. 4*).—An account of the early distribution of Para rubber plants in the Tropics and their introduction and culture in Singapore, with special reference to tapping experiments. Data are given on various tapping experiments conducted in the Botanic Gardens, together with tabular data on seed-bearing trees in the garden and the seed crop over a long series of years.

Rattan supply of the Philippines, J. R. ARNOLD (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 95 (1915), pp. 40*).—A statistical report on the supply of Philippine rattan and its suitability as to quality, cost of exploitation, etc., for placing in quantities on the export market. The data were collected principally by the Philippine Bureau of Forestry.

Wood-using industries of the Prairie Provinces, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 50 (1915), pp. 75, figs. 17*).—This report contains an account of the quantity, value, and source of supply of the different kinds of wood used by the industries of the Provinces of Manitoba, Saskatchewan, and Alberta. It includes detailed descriptions of the different classes of industries and of the properties of the different woods used in these industries. A discussion of the possible uses of the native woods of these Provinces and a classified list of the commodities manufactured from different woods are appended.

DISEASES OF PLANTS.

The vegetable parasites of cultivated or useful plants, T. FERRARIS (*I Parassiti Vegetali delle Piante Coltivate od Utili. Milan: Ulrico Hoepli, 1915, pp. XII+1033, app. pp. XIX, pl. 1, figs. 185*).—This edition differs from the first (E. S. R., 29, p. 644) chiefly in having an appendix dealing briefly with some recent articles on parasitic bacteria and fungi.

Fungus diseases, J. P. ANDERSON (*Alaska Stas. Rpt. 1914, pp. 26, 27*).—Notes are given on a number of diseases of economic crops observed during the year. The author states that the most injury is caused by *Botrytis cinerea* which is observed to attack at least 25 species of plants, including ornamental plants and small fruits.

In addition, the presence of *Nectria cinnabarina* is reported on currant canes as well as on a number of other woody plants. The gooseberry mildew (*Sphærotheca mors-uvæ*) was observed on English gooseberries, and the gooseberry rust (*Æcidium grossulariæ*) was found on gooseberries and currants. The apple scab (*Ventura pomi*) was common on a number of the more susceptible varieties of apples grown in the nursery, and was also found to attack the wild crab apple.

Club root of cabbage and other cruciferous plants is reported as common. In addition, a leaf spot of salmonberry due to *Septoria rubi*, a rust of thimbleberry due to *Phragmidium rubi*, and a pea disease probably caused by *Ascochyta pisi* are also reported as being observed.

Overwintering of parasitic fungi by means of mycelium, O. TREBOUX (*Mycol. Centbl., 5 (1914), No. 3, pp. 120–126*).—The author reports in detail his observations on *Puccinia dispersa*, *P. glumarum*, *P. obscura*, *P. arenariæ*, *P. poarum*, *P. agropyrina*, *P. coronata*, *P. carduorum*, *Uredo airæ*, *U. festucæ*, *Thecopsora pirolæ*, *Erysiphe graminis*, and *Melampsora lini* on various hosts named in regard to their ability to survive the winter in the dry climate of the steppes, which is thought to be favorable to such overwintering.

A new North American Endophyllum, J. C. ARTHUR and F. D. FROMME (*Bul. Torrey Bot. Club, 42 (1915), No. 2, pp. 55–61, pl. 1, figs. 2*).—This is a detailed account of investigations noted elsewhere (E. S. R., 32, p. 749.)

Rhizostilbella rubra, a by-fruit form of Ascobolus parasiticus, and its connection with the Sclerotium disease of certain tropical cultivated plants, P. C. VAN DER WOLK (*Mycol. Centbl., 4 (1914), No. 5, pp. 236–241, pl. 1*).—The author has studied a fungus found growing on rotting fruits and stalks of *Voandzeia subterranea* and has found that it exists in three forms or stages, which are designated as *A. parasiticus* n. sp., *S. omnivorum* n. sp., and *R. rubra* n. g. and sp.

Abnormal distribution of fruiting bodies in Ustilago tritici, E. RIEHM (*Ber. Deut. Bot. Gesell., 32 (1914), No. 8, pp. 570–573, pl. 1*).—The author has been able to confirm the statement made by Hennings (E. S. R., 6, p. 147) to the effect that *U. tritici* may be found developing its spore masses on the axis of the ear, also inside and outside the blades and sheaths of the upper leaves of wheat as well as in the flowers of this plant.

Cross sections showed the presence of the mycelium in the mesophyll, but not in the vascular bundles. Spore formation occurred between the latter, which accounts for the longitudinal streaking observed. The mycelium was intercellular in a majority of cases.

Mildew of the peach and rose, N. WORONICHIN (*Trudy Bi̮uro Prikl. Bot. (Bul. Angew. Bot.), 7 (1914), No. 7, pp. 441–450*).—It is stated that inoculation of the peach with conida of *Sphærotheca pannosa* from the rose gave negative results and that a careful study of the perithecia, asci, and spores showed differences in their dimensions as found on these different hosts. It is thought that the biological and morphological differences noted are sufficient to separate the species into the varieties *S. pannosa rosæ* and *S. pannosa persicæ*.

Deformation of oat leaves, ZADE (*Fühling's Landw. Ztg., 63 (1914), No. 18, pp. 593–595, fig. 1*).—A deformation of the youngest leaf of oats with some dwarfing is discussed as related to growth while enrolled in the bud.

Stagonospora cassavæ n. sp., P. C. VAN DER WOLK (*Mycol. Centbl., 5 (1914), No. 5, pp. 225–230, figs. 10*).—A severe disease of cassava (*Manihot utilissima*) appeared very suddenly at Buitenzorg early in 1913 and threatened to become a source of much loss. The causal fungus, *S. cassavæ*, is a typical wound parasite, attacking only, so far as yet observed, the cut surface of the slip which is above ground. It is said to be controlled by an early application of tar to such portions.

The description of the fungus shows an instance of spore formation within certain cells or sections of the mycelial threads. Such swollen and spore-bearing portions are regarded as asci, and several forms are noted. Pycnidia and pycnospores are also described.

Two physiological affections of Sea Island cotton in the West Indies, W. Nowell (*West Indian Bul., 14 (1914), No. 4, pp. 304–317, pls. 3*).—Descriptions are given of curly leaf and loggerhead of cotton in the West Indies. These are supposedly distinct physiological diseases, having been known in this region since about 1910.

Curly leaf appears to be related in some way with rapid growth, resulting from abundant water supply in still, cloudy weather, shade, and crowding, in connection with certain soil conditions, including depth and easy permeability. Loggerhead disease is very erratic in its occurrence, and its relation to weather conditions is not quite clear.

The incidence of either disease in any year is strictly local, cases of severe damage being rare and of limited extent. Neither disease appears to be increasing or to be connected with any particular kind of seed, and no remedial measures are known or suggested.

A bibliography is given.

Cruciferous club root and gall weevil injury, O. Schlumberger (*Deut. Landw. Presse, 41 (1914), No. 83, pp. 910, 911, pl. 1, figs. 3*).—This is a discussion of the appearance and effects of slime mold (*Plasmodiophora brassicæ*) on crucifers as contrasted with injury due to gall weevils, which somewhat resembles it externally.

Rheosporangium aphanidermatus, a new genus and species of fungus parasitic on sugar beets and radishes, H. A. Edson (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 4, pp. 279–291, pls. 5*).—In a previous publication (E. S. R., 29, p. 646) the author called attention to this disease and later has given a description of its pathogenic properties (E. S. R., 33, p. 246).

The present paper deals with studies on the morphology, cytology, and taxonomy of the organism which has been described as *R. aphanidermatus* n. g., and n. sp.

Apple spraying experiments in 1914, W. J. Morse and M. Shapovalov (*Maine Sta. Bul. 240 (1915), pp. 177–196*).—In continuation of experiments in apple spraying (E. S. R., 31, p. 151), the authors give an account of the results of their investigations in 1914.

A series of plats embracing 282 Ben Davis apple trees was sprayed with different fungicides to determine their relative efficiency for the control of apple scab, and also for their effect upon the foliage and fruit of the trees. Different plats of trees were sprayed with Bordeaux mixture, lime sulphur, "soluble sulphur," "atomic sulphur," copper lime sulphur, extra fine sulphur, and arsenate of lead, arsenate of lead being added as an insecticide to the different fungicides. Notes were taken of the effect of the various sprays on the foliage and fruit during the summer, and when the fruit was gathered the different lots were examined for the percentage of scabbed and russeted fruit.

Bordeaux mixture showed the greatest efficiency in scab control, but it also resulted in the largest amount of russeted fruit. Different dilutions of lime sulphur proved satisfactory, and as a result of three seasons' work it is concluded that the strength of this solution can be increased about 20 per cent with comparative safety. "Soluble sulphur," even when reduced to ¾ lb. in 50 gal. of water, caused serious defoliation of the trees, and as a result of this and previous experiments it is not considered safe to use. Where "atomic sulphur" was used, scab control was very efficient and the amount of russeting was less than that observed on the unsprayed check plat. The copper lime sulphur did not give any better scab control than ordinary lime sulphur, and the amount of leaf injury and fruit russeting was largely increased by the use of this fungicide. The extra fine sulphur did not give as good results as some of the other mixtures employed, although it had considerable efficiency in scab control. With arsenate of lead as a summer spray for apple trees the scab control on the fruit was very efficient. The experiments show that arsenate of lead has an important effect as a fungicide, although the results were not so favorable as those previously obtained.

In connection with this experiment the effect of omitting the earlier spraying was tested. It was found that if circumstances arise which cause the delay of the earlier application, or cause it to be entirely omitted, this does not necessarily imply failure in scab control if the later applications are made in due time.

Plectodiscella piri, representing a new Ascomycete group, N. N. Woronichin (*Trudy Bũro Prikl. Bot. (Bul. Angew Bot.), 7 (1914), No. 7, pp. 431–440, pl. 1; Mycol. Centbl., 4 (1914), No. 5, pp. 225–233, pl. 1, figs. 8*).—An account is given of the study of a disease of pear and apple leaves in the Caucasus, said to be due to a fungus hitherto unknown. This is described as *P. piri* n. g. and sp., the representative of a new family which is named Plectodiscellæ.

Silver leaf, T. A. C. Schoevers (*Tijdschr. Plantenziekten, 20 (1914), No. 1, pp. 36–41, pl. 1.*)—Noting studies on the attack of *Stereum purpureum* on stone fruits and other plants, as carried out in 1913 at Wageningen, the author states that the exact nature of the connection between the silvered appearance of the leaves and the presence of the fungus in the wood vessels is still undetermined.

Complete destruction of diseased parts is advised, also treatment of wounds with tar or carbolineum. Earth from near trees suffering from the disease should not be placed near sound ones. Material for grafting should be carefully inspected. Sufficient water supply should be provided, especially for dry weather. Growths liable to harbor the fungus should be removed from the neighborhood of susceptible plants.

Red raspberry injury caused by Sphærella rubina, W. G. Sackett (*Colorado Sta. Bul. 206 (1915), pp. 26, pl. 1, figs. 15*).—The author describes the injury done to raspberries by the fungus *S. rubina*, and gives an account of spraying experiments for its control. These experiments were carried on for two seasons, a 3 : 2 : 50 Bordeaux mixture being used, to which 2 lbs. of rosin fish oil soap was added. Three applications were given the canes, only the young canes being sprayed and the old ones being removed and burned as soon as the berries had been gathered.

As a result of spraying, a net gain of $167.26 per acre was estimated, at a cost of $10.24 per acre for materials and application.

Notes are also given on the effect of late frost, methods of covering, time of taking up canes, poor cultivation, age of plantations, etc., on raspberry production.

Bordeaux mixture as a citrus spray, G. L. Fawcett (*Porto Rico Prog.. 8 (1915), No. 13, pp. 6, 7*).—The comparative fungicidal values of fresh Bordeaux mixture, a commercial preparation of the same, and a dry powder of copper sulphate and lime were tested for leaf rot fungus on coffee trees. The freshly made Bordeaux mixture was fully effective, but the other two were impaired by rain which fell a few hours after their application, adherence thus appearing to be a deciding factor.

The scale-destroying fungi on the interior branches of citrus trees ordinarily remain uninjured in sufficient numbers to control scale insects after spraying, except occasionally in dry weather. An insecticide should follow or precede the Bordeaux mixture on trees which show many scale insects, indicating a deficiency of scale-destroying fungi. It is considered that no ready-made fungicide on the market is superior to freshly made Bordeaux mixture.

Fungi parasitic on the tea plant in northeast India, III, IV, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1914, Nos. 2, pp. 52–54; 3, pp. 96–98*).—Continuing previous reports (E. S. R., 32, p. 346) the author states that *Nectria cancri*, associated with canker of tea bushes, probably attacks its host originally through cavities resulting from improper pruning or injuries by hail, cattle, etc. Spores grown in the laboratory have not given successful inoculations up to the present time. As the fungus travels readily downward it is necessary to cut away all dead twigs and some depth of living wood for a distance below the dead portion, applying Bordeaux mixture freely.

Copper blight (*Læstadia theæ*) is contrasted symptomatically with gray blight (*Pestalozzia palmarum*) and with brown blight (*Colletotrichum camelliæ*). Copper blight is more noticeable during drought succeeding heavy rains, and so is often attributed to hot sunshine, which may hasten development of the fungus and browning of the leaves. Removal of all affected leaves and application of Bordeaux mixture should immediately follow the appearance of this disease, and a second spraying should follow two weeks later. For cases of general infection a treatment to be used during cold weather is outlined which is claimed to remove copper blight, also minor blights, and to stimulate production by the tea bushes.

Ascochyta clematidina, the cause of stem rot and leaf spot of clematis, W. O. Gloyer (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 4, pp. 331–342, pls. 5*).—A stem rot of clematis due to *A. clematidina* is described from the New York State Experiment Station, the disease attacking various species and hybrids and occurring in the field as a stem rot, while in the greenhouse where cuttings are propagated it is present both as a leaf spot and as a stem rot. On *Clematis paniculata* the disease takes both forms. The plants are killed by the growth of the fungus down the petioles into the stems, thus girdling the plant at the node. Overwintering out of doors does not kill the fungus in cultures or on dead vines.

The disease has been successfully produced by inoculating plants with mycelium from pure cultures. Matting of the vines produces a condition which is favorable for the spread of the disease, and ventilation should be secured by supporting the vines or planting them far apart. On hybrid plants the disease can be controlled in the forcing frames or in the greenhouse by the use of sprays, but in the field spraying proved of little benefit. On *C. paniculata* spraying checked the disease, and the removal of diseased leaves and vines before spraying was also found of practical value in controlling the trouble. A mixture of 1 lb. of laundry soap and 6 lbs. of sulphur to 15 gal. of water sprayed on cuttings in the greenhouse or in beds controlled the disease.

A list of cited literature is appended.

Dying out of oaks in Westphalia, Baumgarten (*Ztschr. Forst u. Jagdw., 46 (1914), No. 3, pp. 174–177*).—This is a brief discussion of recent losses from death of forest oaks as related to leaf rollers, mildew, and honey fungus, and of some views regarding the fundamental causes related thereto.

Species of Loranthus on rubber trees, F. T. BROOKS (*Agr. Bul. Fed. Malay States, 3 (1914), No. 1, pp. 7–9*).—The presence is reported of Loranthus on rubber trees or estates in Negri Sembilan.

Infection of wood by Coniophora, Trametes, and Polyporus, C. WEHMER (*Ber. Deut. Bot. Gesell., 32 (1914), No. 8, pp. 566–570*).—Discussing briefly the results of investigations previously reported (E. S. R., 32, p. 845) and of others more recently carried out, the author states that infection is assured only when the fungus extends itself from mycelium already growing attached.

Experiments of a preliminary character with *T. radiciperda* (*P. annosus*), *C. cerebella*, *P. vaporarius*, and *P. sulfureus* on moistened fir wood kept in flasks for eight weeks showed comparatively little development in case of wood sterilized before infection and almost none in case of unsterilized wood, while early and vigorous growth was observed on beer wort. The possible bearings of these facts are discussed.

The chemical action of the dry rot fungus on the substance of wood, C. WEHMER (*Ber. Deut. Bot. Gesell., 32 (1914), No. 9, pp. 601–608*).—The author has extended his studies on the acidity apparent in connection with dry rot fungi (E. S. R., 32, p. 150). Coniophora and Merulius were both tested as to their effects on fir wood.

It is stated that wood attacked by these fungi is no more acid than is sound wood. It is held that the reddening of the litmus in this connection is probably not due to the presence of acid substances, but that it is a result of colloidal action resulting from the acidity of the fungi.

The toxicity to fungi of various oils and salts, particularly those used in wood preservation, C. J. HUMPHREY and RUTH M. FLEMING (*U. S. Dept. Agr. Bul. 227 (1915), pp. 38, pls. 4*).—The results are given of tests of 18 wood preservatives against two wood-destroying fungi, *Fomes annosus* and *F. pinicola*.

The method employed was to determine the toxicity of the preservative on the fungus grown in Petri dishes. While some inaccuracies were found in this method, in general it was considered a satisfactory means of determining the toxicity of the different compounds.

In addition to a report on other investigations, the authors give a summary of the results of the various investigators of this subject. It is claimed that the chemical and physical composition of the media supporting the growth of the fungus determines to a large extent its development. Temperature is also an important factor in the growth of fungi, and the growth activities of fungi are believed to bear a close relation to the resistance offered toward toxic agents.

The results of the experiments show wide variation in the amount of the preservatives required per cubic foot of culture medium and also marked differences in their effects on the two species of fungi experimented upon.

A bibliography is appended.

Toxicity of various wood preservatives, C. J. HUMPHREY and RUTH M. FLEMING (*Jour. Indus. and Engin. Chem., 6 (1914), No. 2, pp. 128–131; 7 (1915), No. 8, pp. 652–658, figs. 4*).—A detailed report of the investigation described in these papers is given above.

Wallrothiella arceuthobii, J. R. WEIR (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 4, pp. 369–378, pls. 2*).—This fungus, which is parasitic on the false mistletoes, was first reported in New York and later in Michigan (E. S. R., 13, p. 259). The author of the present article reports its frequent occurrence on the false mistletoe in Idaho and Montana. In addition to the species *Razoumofskya pusilla*, the host plant on which it was first discovered, the author reports having observed the fungus on *R. americana* on *Pinus contorta*, and *R. douglasii* and its varieties on *Pseudotsuga taxifolia*, *Abies grandis*, *A. lasiocarpa*, and *Picea engelmanni*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Elementary text-book of economic zoology and entomology, V. L. Kellogg and R. W. Doane (*New York: Henry Holt & Co., 1915, pp. X+532, figs. 246*) — This book is intended as a guide to students who wish to learn about animals from the special point of view of their interrelations with man. It is an introduction to general and economic zoology.

Studies in the longevity of insects, J. P. Baumberger (*Ann. Ent. Soc. Amer., 7 (1914), No. 4, pp. 323–353, fig. 1*).—This article discusses the subjects of (1) longevity as affected by different constant temperatures (pp. 323–330); (2) longevity as affected by exposure to two different temperatures (pp. 330–338); and (3) hibernation as affected by exposure to two different temperatures (pp. 338–351).

A bibliography of 56 titles is included.

Key to the families of North American insects, C. T. Brues and A. L. Melander (*Boston: Authors, 1915, pp. VII+140, figs. 427*).—In this manual the authors have attempted to bring together a brief yet complete key to all the families of American insects for the use of the general student.

A glossary of terms, drawings of anatomical details, and an index are included.

Injurious and beneficial insects of California, E. O. Essig (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 4, Sup., pp. LXXXI+541, figs. 503*).—A revised and enlarged edition of the work previously noted (E. S. R., 28, p. 853). The general scope of the work is practically the same, but many insects of minor importance have also been included, although household insects and those attacking domestic animals are largely omitted.

Materials for study of the injurious insects of the Government of Moscow, D. M. Korolkov (*Mat. po Izuch. Vredn. Nasiek. Moskov. Gub., 5 (1914), pp. 1–93; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 366–370*).—This is a report on insects investigated by the author in an experimental orchard leased for that purpose. Among the pests considered are *Aporia cratægi*, *Anthonomus pomorum*, *Psylla mali*, *Byturus tomentosus*, the codling moth, *Incurvaria rubiella*, *Zophodia convolutella*, etc .

Fungus diseases and insect pests noticed in 1913 on the south coast of the Crimea and in the region of Balaklava, V. I. Tupizin (*Viestnik Vinodiel., No. 4 (1914), pp. 226–231; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 354 355*) —The insects mentioned as having caused the most severe injury in 1913 are *Otiorhynchus tauricus*, cutworms (Agrotis), *Pseudococcus vitis*, and *P. adonidum* (*longispinus*).

Deformed apples and the causes, L. Caesar (*Canad. Ent., 47 (1915), No. 2, pp. 49–54, figs. 4*).—A brief account is given of the plum curculio, apple curculio, leaf bugs or capsids, aphidids, apple maggot or railroad worm, and leaf rollers and green fruit worms, and the way they cause the malformations of apples.

The control of insect enemies of the vine, L. Bernard (*Technique des Traitements contre les Insectes de la Vigne. Paris: J. B. Baillière & Sons, 1914, pp. VIII+364, figs. 95; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, pp. 607–609*).—The first part (pp. 1–46) of this work deals with the cochylis and eudemis moths, their history, geographical distribution, characteristics as distinguished from the pyralid moth, and biology. Part 2 (pp. 47–286) deals with the control of these two pests, including both natural enemies and mechanical and chemical means. The third part (pp. 287–360) treats of other vine insects, of which 20 are dealt with, including 4 lepidopterans, 10 coleopterans, 1 orthopteran, 4 hemipterans, and 1 dipteran.

Hyponomeuta malinellus and Carpocapsa pomonella, N. Brunner (*Prog. Sadovod. i Ogorodnich., 1914, Nos. 27, pp. 870–872; 28, pp. 887, 888; 31, pp. 951–955, fig. 1; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, p. 647*).—A general account of these pests, their occurrence, and control measures employed in orchards of various districts of the Government of Ekaterinoslav.

The tree crickets of New York: Life history and bionomics, B. B. Fulton (*New York State Sta. Tech. Bul. 42 (1915), pp. 3–47, pls. 6, figs. 21*).—During the course of studies dealing with the economic aspects of tree crickets, accounts relating to which have been previously noted (E. S. R., 31, p. 649), observations were extended to several other species which do not attack cultivated crops, the results of which have been brought together in this bulletin.

An account is first given of the general characteristics of tree crickets, including general descriptions of life stages of Œcanthus, hatching, molting, feeding habits, digestive organs, musical organs and song production, mating habits, metanotal gland, description of the spermatophore, male reproductive organs, formation of the spermatophore, female reproductive organs, and oviposition. A key is next given to eggs and oviposition habits of eight species of tree crickets, namely, *O. niveus*, *O. angustipennis*, *O. exclamationis*, *O. quadripunctatus*, *O. nigricornis*, *O. pini*, *O. latipennis*, and *Neoxabea bipunctata*. The account of each of these species includes descriptions of life stages and habits so far as known.

A list of 50 titles of literature relating to the subject is included.

The destruction of Stauronotus maroccanus in Algeria by means of Coccobacillus acridiorum, M. Béguet (*Bul. Soc. Path. Exot., 7 (1914), No. 8–9, pp. 651–653; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 3, p. 118*).—A report of further work with *C. acridiorum* in Algeria (E. S. R., 31, p. 753).

Morphological studies on the head and mouth parts of the Thysanoptera, A. Peterson (*Ann. Ent. Soc. Amer., 8 (1915), No. 1, pp. 20–66, figs. 61*).—A detailed report of anatomical studies.

Experiments in the control of Lecanium cerasi, N. Ossipov (*Sadovod, No. 7 (1914), pp. 514–521; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, pp. 650, 651*).—This is a report of control work with *Eulecanium cerasi* conducted during 1912 and 1913 in the districts of Chotin and Kishenef of the Government of Bessarabia.

New species of Coccidæ collected in Italy, G. Leonardi (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 7 (1913), pp. 59–65, figs. 5*).—*Pseudococcus grassii* collected on bananas purchased in Rome, *Aspidiotus viticola* on the grape, and *Aonidiella inopinata* on the almond in the Province of Syracuse, Sicily, are described as new.

On possible poisoning of insectivorous birds in the war against the gipsy moth, L. O. Howard (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, p. 2*).—It is stated that as a result of a search for dead birds by agents of the Bureau of Entomology of the U. S. Department of Agriculture in New England but one had been found up to September and that its stomach showed no trace of arsenic.

Dispersion of gipsy moth larvæ by the wind, C. W. Collins (*U. S. Dept. Agr. Bul. 273 (1915), pp. 23, pls. 7*).—This is a detailed report of investigations of the dispersion of the gipsy moth by wind, in continuation of those by Burgess previously noted (E. S. R., 28, p. 655), in which large scale screen experiments were conducted at Salisbury Beach, Merrimac, Plum Island, Mass., on the Isles of Shoals, N. H., and on the hills of New Hampshire. Brief notes are first presented in regard to the structure and function of acuminate and vesicular hairs.

"In 1913 as a result of the several experiments conducted by using tanglefooted screens and cloth for traps, there were caught on 977 sq. ft. 289 first-stage larvæ which had been borne by the wind one-eighth to 1 mile or more. In 1914 there were removed from 1,614 sq. ft. of sticky surface 346 larvæ which had been blown from one-eighth to 13.5 miles or more, as verified by the wind records taken at or near those points. Three larvæ were also taken from two large screens on the hills in New Hampshire during 1914.

"Considering the great numbers of larvæ taken in these experiments, there can be no doubt that the wind is almost wholly responsible for the general spread of this insect in New England, notwithstanding the fact that many of the former publications teem with explanations of possible accidental or artificial spread by man and animals. . . . To prevent continual spread by the wind into new territory the badly infested areas near the border must be brought under control either by natural enemies, or hand methods, or both. Natural enemies, however, are now playing an important rôle in the control of this insect in the greater area of the inside infested territory.

"The larvæ are sufficiently active and allow themselves to be transported by the wind at temperatures of 55° F. and above, and have been caught at wind velocities varying from 2 to 23 miles per hour, although more active spread takes place when the temperature ranges from 65 to 85° and when the velocity reaches 8 miles or more per hour. Larvæ are removed from their support and carried by sudden gusts of wind, whether they spin or not, when the temperature reaches 50 to 55°, at which temperatures they often start crawling.

"The records also show that larvæ have been caught at times when winds were blowing from all directions except the North—only a very few coming from the East, but the location of the screens along and near the coast materially affected this condition. By far the larger number were borne by combinations of the west winds, as indicated on the screen at Merrimac, Mass., which was surrounded by a general infestation.

"The general progress of the species since its establishment at Medford, Mass., at the rate of 5 miles per year to the northeast and at the rate of 3 miles per year westward from Providence, R. I., since its first appearance there in 1901 tends to verify the data that have been collected in connection with the screen experiments."

A list of 8 references to the subject and a large size map showing the dispersion of the gipsy moth in New England and area quarantined in 1914 are included.

The millet caterpillar, A. HEMPEL (*Fazendeiro, Sao Paulo, 7 (1914), No. 3, p. 110; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, p. 627*).—The larva of *Remigia repanda*, known in Brazil for at least 12 years, has recently appeared in many parts of the country and a general invasion of this important pest is feared.

Control of the army cutworm, R. A. COOLEY (*Montana Sta. Circ. 47 (1915), pp. 1–3*).—Since Circular 4 on the army cutworm was issued (E. S. R., 23, p. 363) particular success has been met with in controlling outbreaks of this pest through the use of poisoned bran mash.

Notes by A. Atkinson on crops to plant where winter wheat has been destroyed by cutworms are appended.

Problems relating to the new pest of Egyptian cotton, the pink bollworm (Gelechia gossypiella), L. H. GOUGH (*Bul. Union Agr. Égypte, 12 (1914), No. 107, pp. 196, 197; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, p. 596*).—The author reports that the number of generations per annum of the pink bollworm in Egypt varies from one to six. After the growth of the larvæ has been completed a hibernation or estivation of from one week to an indefinite time may take place before they transform to pupæ.

Four natural enemies. namely, *Pimpla roborator*, *Chelonella sulcata*, *Limnerium interruptum*, and *Pediculoides ventricosus*, together with *Microsporidium polyhedricum*, are capable of reducing the number of hibernating larvæ to 40 per cent or less.

An enemy of cultivated carnations, MOLINAS (*Bul. Soc. Nat. Agr. France, 74 (1914), No. 4, pp. 476–481; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, p. 620*).—The tortricid moth *Tortrix pronubana*, of which there are four generations annually, is said to attack frequently carnations cultivated on the coasts of Provence and of Italy. The species, though quite polyphagous and found in the greater part of France on indigenous plants belonging to widely separate families, has not been reported a source of injury to cultivated plants. As high as 400 eggs may be deposited in batches of from 30 to 80 eggs. The larvæ live in the leaves and flowers. Several parasites which are important aids in its control have been reared by the author. Fumigation has not been found to be effective and hand destruction has to be resorted to. See also a previous note (E. S. R., 30, p. 356).

Life history of Eucosma haracana, A. BUSCK (*Proc. Ent. Soc. Wash., 16 (1914), No. 4, p. 150, pl. 1*).—The notes here presented relate to a lepidopterous leaf roller on chestnut in the vicinity of Washington, D. C.

Leaf miner of citrus (Phyllocnistis citrella), A. RUTHERFORD (*Trop. Agr. [Ceylon], 43 (1914), No. 1, pp. 49, 50; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, pp. 651, 652*).—This tineid mines in the young twigs and young leaves of citrus trees in Ceylon.

Life histories of North American Tineina, ANNETTE F. BRAUN (*Canad. Ent., 47 (1915), No. 4, pp. 104–108*).—The biological notes here presented relate to *Choreutis inflatella*, the larva of which feeds on the leaves of *Scutellaria lateriflora*; *Aristotelia salicifungiella*, which feeds on the leaves of *Salix longifolia*; *Recurvaria dorsivittella*, which feeds on the sweet gum (*Liquidambar styraciflua*); *Elachista prælineata* n. sp., which mines in the leaves of *Hystrix patula*; *Theisoa constrictella*, which feeds under a web on the lower surface of the leaves of the white elm (*Ulmus americana*) and cork elm (*U. racemosa*); and *Psacaphora engelella*, which mines the leaves of *Circæa lutetiana*.

Descriptions of new Microlepidoptera of forest trees, A. BUSCK (*Proc. Ent. Soc. Wash., 16 (1914), No. 4, pp. 143–150, pls. 2*).—The species of economic importance here described as new are *Sesia brunneri* on *Pinus ponderosa* at Camas, Mont.; *Recurvaria milleri* on *P. murrayana* in the Yosemite National Park, California; *Evetria bushnelli* on *P. ponderosa* and other pines at Fort Bayard, N. Mex.; *E. virginiana* on *P. virginiana* at Falls Church, Va.; *E. taxifoliella* on *Pseudotsuga taxifolia* at Missoula, Mont.; *E. metallica* on *P. ponderosa* at Missoula, Mont.; *E. montana* on *P. contorta* at Elliston, Mont.; *E. albicapitana* on *P. divaricata* at MacDowell, Saskatchewan, and at Boulder Junction, Wis.; *Swammerdamia castaneæ* on *Castanea dentata* at East River, Conn., and Charter Oak, Pa.; and *Ectœdemia heinrichi* on *Quercus palustris* at Falls Church, Va.

On Mnemonica auricyanea, A. BUSCK and A. BÖVING (*Proc. Ent. Soc. Wash., 16 (1914), No. 4, pp. 151–163, pls. 8*).—Notes are given on the biology and results of an anatomical study of *M. auricyanea*, the larva of which is a leaf miner on the chestnut, oak, and chinquapin. The eggs are deposited in May. The larva completes its feeding within a week or ten days and then drops to the ground, into which it burrows to as great a depth as 1 ft. It remains spun up in a cocoon during the summer and fall, and transforms to a pupa during the winter. Thus more than eleven months of each year of its life are spent underground.

On Acrocercops strigifinitella, C. Heinrich and J. J. Degryse (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, pp. 6–23, figs. 31*).—The larva of this lepidopteran has been found to mine the midribs of chestnut, chinquapin, and oak leaves at Falls Church, Va. Descriptions are given of its structure, stages, and habits. Chestnut appears to be the favorite food plant and during midsummer the work of the species is very common; few of the young leaves escape infestation and some bear as many as four separate mines. There are a number of generations with considerable overlapping so that larvæ are to be found at any time from May until well into October.

The small winter moth (Cheimatobia brumata) (*Inst. Phytopath. Wageningen, Vlugschr. 14 (1914), pp. 3; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, p. 642*).—This lepidopteran is a widespread pest in Holland in orchards, nurseries, and forests.

Malaria: Lessons on its cause and prevention, H. R. Carter (*Pub. Health Rpts. [U. S.], Sup. 18 (1914), pp. 20, pls. 4*).—This paper, prepared for use in schools, deals in large part with mosquitoes and their rôle in the transmission of malaria and the means of prevention of the disease through the control of anopheline mosquitoes.

Control of malaria: Oiling as an antimosquito measure, J. A. A. Le Prince (*Pub. Health Rpts. [U. S.], 30 (1915), No. 9, pp. 599–608, figs. 5*).—The author states that oiling of water surfaces as an antimalaria measure should be supplementary to proper drainage, but that where funds are not available for drainage mosquito propagation can be largely controlled by oiling. He states that there are many grades of oil suitable for mosquito destruction ranging from the very light oils such as kerosene to the heavier or crude oils. The advantage of the lighter oils is that they form a thin film which spreads rapidly. Apparatus and methods for oiling water surfaces of pools, ditches, streams, etc., are described and illustrated.

Some new observations on the life history of warble flies, G. H. Carpenter and T. R. Hewitt (*Irish Nat., 23 (1914), No. 10, pp. 214–221; abs. in Rev. Appl. Ent., 3 (1915), Ser. B, No. 2, p. 19*).—These data relating to the entrance of the larva into the host's body have been previously noted from another source (E. R. S., 32, p. 680).

Notes on the pupation of the house fly (Musca domestica) and its mode of overwintering, C. G. Hewitt (*Canad. Ent., 47 (1915), No. 3, pp. 73–78, fig. 1*).—The results of careful investigations of soil subjacent to heaps of manure, made with a view to determining the distances and depth to which house fly larvæ migrate prior to pupation, are reported upon and diagrammatically illustrated. "A few puparia were found directly beneath the manure pile to a depth of 12 in. The greatest numbers occurred in the region about 18 in. from the pile and at a depth of 12 in. to 2 ft. from the surface . . . the puparia were also numerous immediately below the surface of the soil. The numbers then gradually decreased proportional to the distance from the pile and dwindled away at a distance of about 4 ft. from its base."

As regards the overwintering of the house fly, the author states that in no case has he been able to find living pupæ of *M. domestica* under outdoor conditions during the winter in either England or Canada. Neither has it been possible in breeding experiments in Canada or England to carry it through the winter in the pupal stage. He recognizes the possibility, however, that it may do so in a more southern latitude.

The larva and puparium of the frit fly, T. R. HEWITT (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1914), No. 23, pp. 313–316, pl. 1*).—A detailed description of the early stages of *Oscinis frit*, one of the worst cereal pests in Europe and common in the British Isles, particularly in several counties of Ireland.

Fleas, F. C. BISHOPP (*U. S. Dept. Agr. Bul. 248 (1915), pp. 31, figs. 9*).—A popular summarized account of fleas, including their biology, host and disease relations, and control and remedial measures.

The May beetle in Bukowina and the conditions favoring its dissemination in central Europe, F. ZWEIGELT (*Naturw. Ztschr. Forst u. Landw., 12 (1914), Nos. 6, pp. 265–291; 7, pp. 329–344, figs. 4; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, p. 640*).—This is a discussion of the occurrence of May beetles (*Melolontha vulgaris* and *M. hippocastani*) in eastern Austria-Hungary, and particularly the outbreak of 1912, their injury, climatic and other conditions influencing their increase and spread, control measures, etc. A bibliography of 9 titles is appended.

Occurrence and distribution of the May beetle in lower Austria in 1913, F. ZWEIGELT (*Mitt. Bot. Versuchslab. u. Lab. Pflanzenkrank. K. K. Önol.-Pomol. Inst. Klosterneuburg, n. ser., No. 5 (1914), pp. 16, figs. 3*).—This is supplementary to the account above noted.

Laboulbeniales parasitic on Chrysomelidæ, R. THAXTER (*Proc. Amer. Acad. Arts and Sci., 50 (1914), No. 2, pp. 17–50*).—Thirty-one new species, parasitic on leaf-feeding beetles and collected from various regions in the Tropics, are described as new. While a great majority of the chrysomelid parasites belong to the genus Laboulbenia, two other genera are represented by well-marked forms, namely, Dimoeromyces, contributing four species from Mexico, the West Indies, and the Straits Settlements; and Ceraiomyces, including seven species, six of which are parasitic on flea-beetles from the West Indies and Brazil and the seventh a very peculiar form from Kamerun and Madagascar.

Borer pests of Ficus elastica, K. W. DAMMERMAN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Afdeel. Plantenziekten, No. 7 (1913), pp. 48, pls. 4, figs. 2; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 9, pp. 533–536*).—A report of studies of the coleopterous borers of the rubber plant (*F. elastica*) in Java, including 11 species of Cerambycidæ and 2 of Curculionidæ.

Some experiments on the control of wireworms (Elateridæ and Opatridæ) (*Trudy Bessarabsk. Obshch. Estest. i Lûbit. Estest., 3 (1911–12), pp. 135–146*).—A brief report of experiments in the protection of corn seed from, and the destruction of, wireworms of the genera Corymbites and Opatrum.

The soaking of seed corn in petroleum for as long as 20 minutes did not protect it from wireworm attack. In a series of tests, in which corn coated with powdered arsenicals, etc., was used as a bait, it was found that white arsenic killed 87 per cent of the wireworms in 21 days, Paris green 76 per cent in 16 days, barium chlorid 72 per cent in 19 days, and corrosive sublimate 65 per cent in 18 days.

The principal insects injurious to lucern.—II, Otiorhynchus (Cryphiphorus) ligustici, its description, life habits, and methods of combating it, I. V. VASSILIEV (*Abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, pp. 668, 669*).—This is the second part of a work on insect enemies of alfalfa, the first having dealt with *Adelphocoris lineolatus*.

O. ligustici is found everywhere in Europe, except in the more southern parts, and as far east as Tobolsk, Russia. The larvæ at first make unimportant wounds in the collars of the plant, but soon burrow deeper in the soil and attack the roots. The depth to which they burrow varies from the surface to 20 in., according to the amount of moisture in the soil, etc.

On some Curculionidæ living in bamboo stems, A. DA COSTA LIMA (*Mem. Inst. Oswaldo Cruz, 6 (1914), No. 3, pp. 224–230, pls. 2*).—In this second paper (E. S. R., 32, p. 352) the author deals at some length with *Astyage lineigera*, a curculionid beetle attacking bamboo in Brazil. The larvæ and nymphs of this species are said to be attacked by flacherie, which is responsible for a large mortality. Other species reared from bamboo stems at Joinville are *Periderœus granellus*, *Dionychus parallelogramus*, and *Erethistes lateralis catharinensis*.

Inquiline bumblebees in British Columbia, F. W. L. SLADEN (*Canad. Ent., 47 (1915), No. 3, p. 84*).—The author records the collection of *Psithyrus insularis* and *P. consultus* in a nest of *Bombus flavifrons* at Agassiz, British Columbia, upon which they are apparently parasitic.

Description of a new seed chalcid from spruce, S. A. ROHWER (*Canad. Ent., 47 (1915), No. 3, pp. 97, 98, fig. 1*).—A chalcidid reared from the seeds of Engelmann spruce (*Picea engelmanni*), the Sitka spruce (*P. sitchensis*), and the Colorado blue spruce (*P. parryana*) in Colorado, and also received from California, is described as *Megastigmus piceæ*.

Asparagus beetle egg parasite, F. A. JOHNSTON (*U. S. Dept. Agr., Jour Agr. Research, 4 (1915), No. 4, pp. 303–313, pl. 1*).—This report of studies of *Tetrastichus asparagi* includes a summary of those of Russell and Johnston, previously noted (E. S. R., 28, p. 858).

Following a brief introduction, descriptions are given of the several stages of the parasite, its distribution, and feeding habits. Under the heading of laboratory experiments, a brief account is given of methods used in rearing the parasite and a tabulation of records of the length of life of the adult in confinement. There appear to be three generations a year on Long Island, where it apparently hibernates as a full-grown larva in the cell of its host in the ground. In rearing experiments from 1 to 10 larvæ of the parasite were found in a single beetle cell. Attempted parasitism of the eggs and young larvæ of the potato beetle and eggs of the elm-leaf beetle failed. From 7 to 11 days were found to be passed in the pupal stage.

A list of 7 titles is given of literature cited.

Notes on the life history of a species of wasplike parasites of the genus Leptomastix, parasitic on the mealy bug, H. L. VIERECK (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 4, pp. 208–211, figs. 3*).—A chalcidid belonging to the genus Leptomastix which appears to be new to science was collected by the author on *Pseudococcus citri* at Palermo, Sicily, in June, 1914. It has since been introduced into California, where it has been successfully reared and bids fair to become an important aid in the control of the citrus mealy bug.

Studies of its life history show that from 21 to 49 days are required to pass from the laying of the egg to the emergence of the adult. From 3 to 6 days are passed in the egg stage, from 8 to 25 days in the larval stage, and from 10 to 18 days in the pupal stage.

Journey in Eritrea in search of olive fly parasites, F. SILVESTRI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 9 (1914), pp. 186–226, figs. 24; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, p. 173*).—As a result of a trip to Eritrea during August and September, 1914, 14 parasites of the olive fly (*Dacus oleæ*) were secured. Descriptions and biological notes are given.

Parasitic Hymenoptera new to the fauna of Turkestan, N. KOKUEV (*Russ. Ent. Obozr., 13 (1913), No. 3–4, pp. 513, 514*).—The author describes *Habrobracon* *simonovi*, reared from the bollworm (*Chloridea obsoleta* [*Heliothis armigera*]); and *Chelonus caradrinæ* and *Microplites rufiventris*, reared from larvæ of *Caradrina exigua*, all from Tashkend, as new to science.

Injury caused by Janus luteipes in osiers, W. BAER (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 6, pp. 292–294; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 11, pp. 642, 643*).—This sawfly is a source of considerable injury to osiers in the Tharandt district through boring in the stems.

The yellow gooseberry sawfly, L. FULMEK (*Reprint from Obstzüchter, No. 6 (1914), pp. 4, figs. 2; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 10, p. 590*).—An account of *Pteronus ribesii* and means for its control.

An imported red spider attacking fruit trees, L. CAESAR (*Canad. Ent., 47 (1915), No. 2, pp. 57, 58, figs. 2*).—*Tetranychus pilosus*, a European species that attacks fruit trees and is closely related to and perhaps identical with *T. mytilaspidis* which feeds chiefly on oranges, has been found to occur commonly on fruit trees in Ontario. The foliage of badly infested trees becomes covered with numerous fine whitish blotches very noticeable on the upper surface and after a time turns brown.

Four new tetranychids, E. A. MCGREGOR (*Ann. Ent. Soc. Amer., 7 (1914), No. 4, pp. 354–364, figs. 27*).—Four phytophagous mites from the southeastern United States, said to be of considerable economic importance, are described as *Tenuipalpus bioculatus* from privet, strawberry, and other plants at Batesburg, S. C., and Baton Rouge, La.; *Tetranychus yothersi* from camphor and eucalypts at Orlando, Fla., and elm, oak, and pecans at Batesburg, S. C., etc.; *T. banksi* from castor beans and velvet beans at Orlando, Fla.; and *T. quinquenychus* from castor beans at Orlando, Fla.

The beaver fluke (Amphistomum subtriquetrum), DOROTHY DUFF (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 8 (1914), Sect. IV, pp. 87–98, pls. 4*).—A report of an anatomical and histological study of this fluke. A list of references to the literature cited is appended.

Leeches: Exotic leeches, A. E. SHIPLEY (*Brit. Med. Jour., No. 2814 (1914), pp. 962–964, figs. 6*).—A brief account of leeches of importance.

FOODS—HUMAN NUTRITION.

Milling and baking qualities of Victorian wheats, A. E. V. RICHARDSON, P. R. SCOTT, and F. G. B. WINSLOW (*Jour. Dept. Agr. Victoria, 12 (1914), No. 11, pp. 668–675*).—In continuation of previous work (E. S. R., 32, p. 659), the authors report a study of the milling and baking qualities of wheat grown under different soil and climatic conditions.

Regardless of the conditions under which they were cultivated, the same varieties showed the same relative differences in the quality of the grain. In chemical composition it is thought that seasonal conditions and soil are important in determining quality. The varieties of highest milling quality were the least prolific growers, and vice versa.

The gluten content of flours, M. H. HITIER (*Bul. Soc. Encour. Indus. Nat. [Paris], 121 (1914), No. 1, pp. 76–87*).—A summary and digest of data which considers the variation, during different years and in different countries, of the gluten content of flours. The variety of seed, kind of soil, and cultivation, and, most important of all, the influence of climatic conditions, are the factors attributed by the author to the steadily decreasing gluten content in French wheats especially noticeable during recent years.

Bread, K. SCHERINGA (*Chem. Weekbl., 11 (1914), No. 51, p. 1074*).—Chemical examinations of bread are reported which indicate that the fiber content depends upon the origin of the grain and also upon the method of milling. The pentosan content of bread appeared to vary considerably.

Studies of poultry from the farm to the consumer, MARY E. PENNINGTON (*U. S. Dept. Agr., Bur. Chem. Circ. 64, reprint (1915), pp. 42, figs. 9*).—In this reprint (E. S. R., 24, p. 361) a few changes as to storage temperatures have been made.

Cured fish, P. BUTTENBERG and L. VON NOËL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 30 (1915), No. 1, pp. 1–15*).—Methods are described for curing fish, and the results are reported of analyses of several products cured in different ways.

Some new constituents of milk.—I, The phosphatids of milk, T. B. OSBORNE and A. J. WAKEMAN (*Jour. Biol. Chem., 21 (1915), No. 3, pp. 539–550*).—This paper describes in detail the chemical and physical properties of two phosphatids separated from milk by the authors. The experimental procedure followed is described in detail.

Human milk, A. W. BOSWORTH (*New York State Sta. Tech. Bul. 43 (1915), pp. 5; Jour. Biol. Chem., 20 (1915), No. 4, pp. 707–709*).—In extension of earlier work and employing methods previously described (E. S. R., 32, p. 607), an investigation was made of the chemical composition of human milk.

The author states that "the high acid figures previously obtained for cow's milk were due to the interference of the neutral calcium phosphate, $CaHPO_4$, which is present in cow's milk but not in human milk." The results of this study indicate that, contrary to the prevailing idea, the acidity of human milk and cow's milk is practically the same, and "the practice of adding lime water to modified cow's milk used for infant feeding as a means of correcting the acidity is thus shown to have no foundation. . . .

"It was found impossible to separate the calcium from the protein by any mechanical means; so we conclude that it is in chemical combination with the protein. It is important to note that evidence seems to indicate that the albumin as well as the casein is combined with calcium. This will be investigated more carefully before any definite report is made."

Unlike cow's milk, human milk contains no insoluble inorganic phosphates. The following figures are given as representing the probable average composition of human milk: Fat, 3.3 per cent; calcium chlorid, 0.059 per cent; milk sugar, 6.5 per cent; proteins combined with calcium, 1.5 per cent; monopotassium phosphate (KH_2PO_4), 0.069 per cent; sodium citrate ($Na_3C_6H_5O_7$), 0.055 per cent; potassium citrate ($K_3C_6H_5O_7$), 0.103 per cent; and mono-magnesium phosphate ($MgH_4P_2O_8$), 0.027 per cent.

Soy bean milk (*Epicure, 21 (1914), No. 250, pp. 157, 158*).—This article describes briefly the manufacture of an artificial milk from soy beans, which it is claimed can be successfully used as a substitute for cow's milk. It is stated that, owing to its low degree of acidity, it will keep longer than cow's milk. The chemical composition of this product is given as follows: Fat, 3.5 per cent; casein and albumin, 3.5 per cent; carbohydrates, 4.25 per cent; salts (mineral matter), 0.75 per cent; and water, 88 per cent.

Vegetable butters (*Pure Products, 10 (1914), No. 11, pp. 550, 551*).—In this article are described several vegetable butters which it is claimed could possibly be substituted for butter and lard in cooking. The varieties described are Karite butter, a substance prepared from the seeds of a tree belonging to the family of Sapotaceæ, found principally in Africa and the East Indies; Illipe butter, prepared from two different species of the Sapotaceæ family, found principally in Hindustan; Dika butter, prepared from the seeds of the *Irvingia gabonhnsis* of the family of the Simaparoubia, found principally in the

Kongo region; and Muscade butter, extracted from the seeds of the *Myristica moschata*, grown on the Sonda Islands.

Changes in potatoes during drying, H. I. WATERMAN (*Chem. Weekbl., 12 (1915), No. 3, pp. 48, 49*).—Analytical data are given from which the author concludes that, when dried at a moderate temperature, a part of the starch of potatoes is converted into sucrose. The amount of sucrose present when the drying was carried on at 35° C. was 3.3 per cent; at 45° it was 2.1 per cent; and at 55°, 1.6 per cent. The increased temperature did not alter the content of total or soluble nitrogen.

Tomato conserve, P. GUARNIERI (*Staz. Sper. Agr. Ital., 47 (1914), No. 7, pp. 474–480*).—The results are given of analyses of extracts of preserved tomatoes with and without added preservative.

A tea from Asia Minor, T. F. HANAUSEK (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 5, pp. 259–263, figs. 4*).—This product, which is described in detail, is said to resemble genuine Chinese souchong. It is prepared from the leaves of *Origanum vulgare albiflorum* and is in general use in Asia Minor.

Tin in canned foods, ROSSÉE and VON MORGENSTERN (*Ztschr. Öffentl. Chem., 20 (1914), No. 9, pp. 171, 172*).—The analytical data here reported may be summarized briefly as follows:

Canned vegetables contain traces of tin dissolved from the container. Larger amounts were found when the receptacle had been open for some time. According to the authors, since the dissolved tin forms insoluble substances with the vegetables and is not redissolved by the digestive juices, the ingestion of small amounts of tin from this source is not injurious to the body.

Methods of destroying vinegar eels, J. F. SACHER (*Chem. Ztg., 38 (1914), No. 99, pp. 1021, 1022; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 4, pp. 193*).—Out of 25 samples of vinegar collected in retail stores, 23 were found to be infested with vinegar eels.

It was found that they could be killed by heating the vinegar to 45° C. for a few minutes and removed by filtration. Exposure to bright sunlight for several hours or complete exclusion of air for several weeks was also fatal, but this method is only applicable to finished vinegar as *Mycodesma aceti* is also injured by light. If 2½ to 3 gm. of calcium carbonate was added to sealed bottles containing 400 cc. of vinegar the animalculæ died—it was thought from want of air. One per cent of common salt killed the organisms within 24 hours and 2½ per cent of sodium sulphate in 20 hours, but similar quantities of potassium salts had little effect. A summary of these and other tests seems to indicate that the toxic action of the sodium salts is due to the presence of the sodium ion. The poisonous effect of acids is also probably due to the concentration of the hydrogen ion. A concentration of 14 per cent of alcohol was also fatal to the eels.

Report of the department of food and drugs control, and weights and measures for the period ending December 31, 1914 (*Nevada Sta. Rpt. Dept. Food and Drugs Control, and Weights and Measures, 1914, pp. 34*).—A review of the work of the department in the sanitary inspection of dairies and restaurants and the chemical examination of miscellaneous samples of foods and drugs, together with the reports of local food inspectors and the department of weights and measures.

Twenty-ninth annual report of the dairy and food division (*Ann. Rpt. Dairy and Food Div. Ohio, 29 (1914), pp. 175, figs. 7*).—This report reviews the work of the dairy and food division for the year ended November 15, 1914. This included the sanitary inspection of dairies and other establishments where food is prepared, and the examination of foods and drugs. The texts of the sanitary codes for the regulation of ice-cream factories, cheese factories, confectionery establishments, and bottling establishments are also given. The reports of the sealers of weights and measures and general data regarding the work constitute the bulk of the report.

[Food, drug, and paint laws], E. F. Ladd (*North Dakota Sta. Spec. Bul. 6, reprint* (*1915*), *pp. 48*).—This publication contains the texts of the state food, drug, and paint laws, with rulings and discussions, as amended since the first issue. (E. S. R., 19, p. 113.)

State laws and regulations pertaining to public health adopted during the [years 1913 and 1914] (*Pub. Health Rpts.* [*U. S.*], *1915, Reprints 264, pp. 539; 279, pp. 190*).—In these publications is given the text of legislative enactments regulating the sanitary condition of places where food is manufactured, stored, sold, or handled.

The nutrition of a household, E. T. and Lilian Brewster (*Boston: Houghton Mifflin Co., 1915, pp. X+208*).—In this book the authors bring together a great deal of useful information in a form which should make it available to nontechnical readers. Fundamental principles of human nutrition are considered in the light of the work of various investigators, and different dietetic standards are discussed. An appendix contains tables showing the energy furnished by standard amounts of the more common food materials.

How to cook and why, Elizabeth Condit and Jessie A. Long (*New York and London: Harper & Bros., 1914, pp. II+249, figs. 16*).—This book is intended for the use of housekeepers and students in domestic science and treats of both food values and food costs. The different groups of food materials (cereals, breads, pastries, fruit, dairy products, meat, etc.) are considered from the standpoint of chemical composition, food value, and relative cost as sources of nutriment.

Information regarding the selection, preparation, cooking, and serving of different foods; a few recipes; and hints regarding the combining of foods and the keeping of foods in the home are also given.

Household accounting, Laura Comstock (*Agr. of Mass., 62* (*1914*), *pp. 78–90*).—In this address consideration is given to the proportion of the income which should be spent for food as well as for other household expenses. Methods of keeping accounts are also considered to some extent.

Nutrition of workingmen in cities with reference to protein requirement, F. Hirschfeld (*Deut. Med Wchnschr., 41* (*1915*), *No. 9, pp. 244–248*).—Two dietary studies are reported in which special attention was given to the protein requirements of two subjects engaged in moderately hard muscular work. A critical discussion of the article by M. Rubner is appended.

The diet of the herdsmen in two counties near Innsbruck in the higher Alps, L. E. von Ceipek (*Wiener Klin. Wchnschr., 27* (*1914*), *No. 21, pp. 703–709*).—A dietary study of two herdsmen showed that on an average they ate, respectively, 176 and 213 gm. of protein, 307 and 318 gm. of fat, and 537 and 541 gm. of carbohydrates daily, which supplied 5,636 and 6,107 calories. Over half of the protein eaten was of animal origin.

Studies of the etiology of pellagra, Carbone and Cazzamalli (*Gior. R. Soc. Ital. Ig., 36* (*1914*), *Nos. 1, pp. 4–14; 2, pp. 51–63; 3, pp. 99–109; 4, pp. 151–156; abs. in Zentbl. Biochem. u. Biophys., 17* (*1915*), *No. 16, pp. 635, 636*).—Experiments are reported in which were studied the effects of feeding mice sterilized maize, maize infected with pathogenic bacteria, and maize containing toxic products of nonpathogens. The results would seem to support the theory that toxic substances in the maize produce pellagra.

The exclusive maize feeding of animals, J. J. Nitzesco (*Compt. Rend. Soc. Biol.* [*Paris*], *78* (*1915*), *No. 8, pp. 222–224*).—Experimental feeding of dogs during a 3-month period is the basis for the author's conclusion that the insufficiency of the maize diet and intoxication with zein (zeinolytic ferments were found in the blood) are to be considered among the principal causes of pellagra.

Influence of fat on the gastric digestion of milk, D. S. Riva Rocci (*Pediatria* [*Naples*], *22* (*1914*), *No. 7, pp. 487–494*).—From the results of a number of digestion experiments here reported the conclusion is drawn that the presence of fat aids rather than hinders the digestion of the protein of milk.

The effect of fats and carbohydrates upon nitrogen excretion during protein starvation, H. Zeller (*Arch. Anat. u. Physiol., Physiol. Abt., No. 3–4* (*1914*), *pp. 213–236; abs. in Zentbl. Biochem. u. Biophys., 17* (*1914*), *No. 13, pp. 482, 483*).—Experimental data are reported which may be summarized in part as follows:

A replacing of from 70 to 90 per cent of the carbohydrates in the diet with an equivalent (isodynamic) amount of fat did not result in exceeding the minimum of nitrogen excretion of a pure carbohydrate diet. In the opinion of the author, to secure complete combustion of the fat the ratio of fat to carbohydrate must be at least 4:1. The excretion of creatin and creatinin was the same in the case of pure carbohydrate and pure fat diets. The increase in the excretion of nitrogen noted during maintenance upon a pure fat diet apparently depended upon an increased destruction of protein.

The influence of starch on infant digestion, T. S. Southworth (*Jour. Amer. Med. Assoc., 63* (*1914*), *No. 16, pp. 1375–1377*).—The results of clinical experiences are given, from which the inference is drawn that with those infants suffering from digestive and nutritional disturbances the principal benefit to be derived from the addition of starch to their food is not only to nourish the infant but to make possible a more orderly digestion of its main nutriment, milk.

The influence of lactose on the metabolism of an infant, F. B. Talbot and and L. W. Hill (*Amer. Jour. Diseases Children, 8* (*1914*), *No. 3, pp. 218–227, fig. 1*).—A metabolism experiment with an infant five months of age is reported from which the conclusions drawn are in part as follows:

"Increasing amounts of sugar up to a certain limit increase the retention of nitrogen, and beyond that point may diminish the absorption and possibly the retention of nitrogen. Increasing amounts of sugar do not affect the absorption of fat up to a certain point, beyond which point there may be a diminished absorption of fat."

Excessive amounts of lactose produced digestive disturbances.

Creatinin and creatin in starvation, G. Graham and E. P. Poulton (*Jour. Physiol., 48* (*1914*), *No. 5, pp. LIII, LIV*).—The results are reported of two fasting experiments which indicate that traces of "true" creatin are excreted during absolute starvation lasting for three days.

Studies in endogenous uric acid metabolism, G. W. Raiziss, H. Dubin, and A. I. Ringer (*Jour. Biol. Chem., 19* (*1914*), *No. 4, pp. 473–485*).—A study of the uric acid excretion of 10 individuals on a meat-free diet gave results considerably lower than values reported by other investigators. It was found that under the same conditions of diet and rest different individuals eliminated practically the same amount of uric acid daily. An increase in uric acid excretion was produced by work and a high protein intake. After changing from a mixed diet to a vegetable and meat-free diet the amount of uric acid eliminated was smaller, though for the first few days it increased somewhat—due probably to the excretion of accumulated purin in the body.

Lipins in nutrition, C. G. McArthur and C. L. Luckett (*Jour. Biol. Chem., 20* (*1915*), *No. 2, pp. 161–174, figs. 3*).—The results of feeding experiments with laboratory animals (mice) are summarized by the authors as follows.

"Lecithin, cephalin, cerebrosids, cholesterol, and fats are dispensable parts of a food for mice, but a substance is present in egg yolk [which is], insoluble in ether, soluble in cold alcohol, and probably easily destroyed by heat, that needs to be added to a synthetic food containing casein, starch, lactose, lard, and the salts of milk, to make it a complete food."

The therapeutic value of organic phosphorus compounds, E. K. MARSHALL, JR. (*Jour. Amer. Med. Assoc., 64 (1915), No. 7, pp. 573, 574*).—A digest of experimental data which support the view that the animal organism can synthesize its complex organic phosphorus constituents from inorganic phosphates in the food.

Studies of unbalanced diet.—II, Water distribution and edema following the addition of salts to the diet, P. TACHAU (*Biochem. Ztschr., 67 (1914), No. 4–5, pp. 338–348*).—The addition, in gradually increasing quantities, of inorganic salts (sodium chlorid, sodium phosphate, and sodium lactate) to the diet of laboratory animals (mice) appeared to have no influence upon the total water content of the body, although it led to the occurrence of edema. The cause of the edema was believed to be osmosis. Earlier work has been noted (E. S. R., 33, p. 68).

The effect upon appetite of the chemical constituents of the air of occupied rooms, C. E. A. WINSLOW and G. T. PALMER (*Proc. Soc. Expt. Biol. and Med., 12 (1915), No. 7, pp. 141–144*).—The authors having noted in previous experiments carried out by the New York State Commission on Ventilation that vitiated air apparently caused a diminished appetite for food, this series of experiments was conducted. The subjects of the experiments (men and women) were placed in an observation room and on certain days were supplied with fresh air; on the other days no fresh air was supplied and the products of respiration were allowed to accumulate. Temperature and humidity were so regulated as to be the same on ventilation and nonventilation days. On each experimental day after the subjects had been in the chamber from 2 to 3 hours they were served a weighed luncheon of known calorific value and the amount of this eaten was determined.

From these experiments the conclusions were drawn that "there are substances present in the air of an unventilated, occupied room (even when its temperature and humidity are controlled) which in some way, and without producing conscious discomfort or detectable physiological symptoms, diminish the appetite for food. The effect of such an influence might in time be very important, and it seems possible that the observed beneficial effects of fresh air may to some extent be connected with this phenomenon."

On the respiratory exchange in fresh-water fish.—II, On brown trout, J. A. GARDNER and CONSTANCE LEETHAM (*Biochem. Jour., 8 (1914), No. 6, pp. 591–597, fig. 1*).—In continuation of previous work (E. S. R., 32, p. 565), the apparatus employed is described, and data are reported regarding the amounts of oxygen necessary to maintain the life of the fish at different temperatures and under different pressures.

ANIMAL PRODUCTION.

The stockfeeder's companion, J. PORTER (*London: Gurney and Jackson, 1915, pp. XX+316, pls. 33, figs. 5*).—A general treatise on stock feeding and management, especially applicable to English conditions. Summaries of a large number of English experiments and feeding trials are included.

The international movement of feeding stuffs (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 4, pp. 481–516*).—This gives data on the production, consumption, and import and export trade in feeding stuffs of the various nations. An extensive bibliography is included.

Result of official chemists' analyses of feed stuffs (*Off. Bul. Ohio Agr. Coc., 6 (1915), No. 1, pp. 74–99*).—Analyses are given of alfalfa meal, middlings, tankage, cotton-seed meal, hominy feed, meat scrap, bran, gluten feed, linseed-oil meal, dried beet pulp, rye middlings, and various mixed and proprietary feeds.

Feeding stuffs, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 75 (1914), pp. 274–276*).—Analyses are given of decorticated cotton cake, palm-nut cake and meal, and coconut cake.

The amino acid content of certain commercial feeding stuffs and other sources of protein, E. H. NOLLAU (*Jour. Biol. Chem., 21 (1915), No. 3, pp. 611–614*).—The distribution of the nitrogen of the amino acids of the following feeding stuffs is given: Soy beans, distillers' dried grains, cotton-seed meal, cowpeas, wheat bran, maize kernel, hemp seed, rice, sunflower seed, rolled oats, oat grain, sprouted oats, barley grain, rye grain, tankage, dried blood, peanuts, gluten flour, and gluten (wheat).

Among the individual peculiarities of the different mixed proteins may be mentioned "the absence of histidin in distillers' dried grains and in the cowpea; the absence of nonamino nitrogen, representing prolin and oxyprolin, in wheat bran and the maize kernel. The relatively large amount of lysin present in the soy bean, distillers' dried grains, wheat bran, dried blood, maize kernel, hemp seed, and sunflower seed is especially noteworthy. In contrast to this we have an absence of lysin in rice, oat grain, rolled oats, and barley grain. The monoamino acids constitute in most cases about one-half of the amino acids present. The high ammonia content and the low lysin content of gluten (wheat) and gluten flour is marked."

Concerning the distribution of cyanogen in grasses, especially in the genera Panicularia or Glyceria and Tridens or Sieglingia, C. L. ALSBERG and O. F. BLACK (*Jour. Biol. Chem., 21 (1915), No. 3, pp. 601–609*).—"Twenty-two species of American grasses were tested for cyanogen. Of these, cyanogen was found in *Tridens flavus*, *Panicularia nervata*, *P. grandis*, and *P. canadensis*. Three other American species of Panicularia examined, *P. pauciflora*, *P. fluitans*, and *P. septentrionalis*, did not contain it under the conditions of the examination. *Stipa vaseyi*, sleepy grass of the Southwest, generally regarded to be poisonous, contained no cyanogen."

Bitter and sweet cassava, hydrocyanic acid contents, A. E. COLLENS (*Bul. Dept. Agr. Trinidad, 14 (1915), No. 2, pp. 54–56; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 11, p. 630*).—"The following percentage quantities of hydrocyanic acid were found in (A) sweet and (B) bitter cassava plants, the determinations being made immediately after the plants had been dug up: Leaves, (A) 0.0162, (B) 0.041; peel of stem, (A) 0.043, (B) 0.113; pith of stem, (A) 0.019, (B) 0.076; edible portion of root, (A) 0.0048, (B) 0.053. The hydrocyanic acid content of different parts of the freshly dug roots was the same, but after keeping for three days the upper part of the sweet roots contained about twice as much at the bottom portion; loss of water during air drying also caused the hydrocyanic acid content to increase. When sweet cassava was boiled with water for one hour, or roasted, no hydrocyanic acid was developed."

The composition and value of lupine seeds, G. MUENK (*Landw. Vers. Stat., 85 (1914), No. 6, pp. 393–416*).—The seeds of the blue, yellow, and white lupines are rich in ferments. In addition to a diastatic enzym and to others which split up glucosids and peptones and produce changes in urea, there is a ferment, heretofore overlooked, that forms lactic acid from amylum and many kinds of sugar and is of technical and toxicological importance. Possibly it might be used in the preparation of alcoholic beverages. There also exists in the seeds of the blue lupine a nonpoisonous agglutinizing enzym, a "phasin," as defined by Wienhaus and Kobert. On heating this enzym to from 70 to 75° C., it is rapidly destroyed. The enzym ricin, on the other hand, is not affected by this temperature, and this distinction between the two ferments serves as a useful test for detecting an admixture of castor oil seeds with blue lupine seeds. Further investigations are necessary to determine what kind of substance takes the place of phasin in the white and yellow lupines.

The influence of the composition and amount of the mineral content of the ration on growth and reproduction, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 21 (1915), No. 3, pp. 615–643, figs. 11*).—In these studies with rats, a ration was given the organic constituents of which were believed to be perfectly satisfactory for complete nutrition, but which was so low in mineral content that it would not suffice for growth at the normal rate. A mixture of a small amount of milk powder with purified sucrose, casein, butter fat, agar-agar, and dextrin was used. By lowering the content of milk powder, the only ingredient which carried appreciable amounts of bases, it was possible to regulate the base content of the diet at will. The rations ranged from an acidity of 14.31 cc. to an alkalinity of 102.09 cc. normal solution per 100 gm. In modifying the balance between the acid and basic radicals, additions of a salt mixture were employed.

Records of the growth and reproduction of the 20 groups of rats, and records of reproduction and certain details regarding the histories of the young were taken. A surprising uniformity of growth in all the animals of the various groups except the two receiving the highest additions of salts, which were stunted by the high salt content, was found. It was demonstrated that, provided the other factors in the ration are adequate, young rats can grow normally and remain in apparent good health on rations whose base content varies widely in amount.

Confirming the results of previous experiments, in which egg yolk as a restricted diet was found not to be deleterious as the result of its acid character, four of the rations employed in this work were highly acid, yet growth and well-being were not markedly interfered with. It was further found that growth to the normal adult size at the usual rate and a continued well-nourished appearance are not sufficient evidence that a ration is fully adequate. Only when normal reproduction and rearing of the young is repeated at normal intervals can a ration be said to be physiologically sufficient.

The improvement in the growth of rats noted as the result of adding suitable salt mixtures to rations restricted to corn or wheat kernel, or to other rations made up of purified food substances, is attributed to the fact that there is a correction of the mineral content of the ration. On the other hand, the addition of salts alone to a ration derived entirely from wheat or wheat and wheat gluten gives a diet which is a wonderful improvement over the grain alone, yet such rations give less than half normal growth and do not suffice for prolonged maintenance.

The query is made whether there is an interdependence between an unfavorable mineral content and other factors in the diet which causes the inorganic deficiencies to be more pronounced in some cases than in others. See also previous notes (E. S. R., 26, p. 467; 29, p. 64).

[Animal husbandry work in Alaska], C. C. Georgeson et al. (*Alaska Stas. Rpt. 1914, pp. 32–34, 40–42, 74, 75, 76–77*).—It is noted that two dairy herds are being kept near Fairbanks. The cows are kept warm and comfortable in winter, while in summer they run at pasture for about three or four months.

There are no herds of beef cattle in the interior, owing to the cold winters, and the beef consumed consists almost wholly of cold-storage meat brought from the outside. It is thought that a hardy beef animal for the interior can be developed by making reciprocal crosses between the yak and the Galloway. While it is true that some of the hybrids are not fertile, there are others that are fertile, especially when the bull is crossed on the female yak. A letter from V. Pisareff, director of the experiment station in the Government of Irkutsk, Siberia, is given in which it is said that the yak is frequently crossed on common cattle in Mongolia, that both the yak and his hybrid offspring are exceedingly hardy, that they obtain their feed through the long and extremely cold winter practically without the aid of the owners, and that they are much used for beef and for milk, as well as for work animals. It is suggested that an experiment of this nature be conducted at the Fairbanks Station.

At the Kodiak Station the herd has been reduced, the animals retained being mostly those proved to have some milking qualities. It is said that the Alaska settler needs milk quite as much as beef, and inquiries from prospective buyers are mostly for family cows. The destruction of the greater part of the sheep flock by brown bears at Kodiak Station is reported. It is stated that so long as the brown bear is protected by law there can be little encouragement for the live-stock industry. Galloway cattle at this station are doing well. The cattle are maintained on feed natural to the country, along with what can be grown by cultivation. Experiments are being made with all kinds of promising fodder crops that can be grown in this country for winter feed for live stock.

A contribution to our knowledge of the chemistry of coat color in animals and of dominant and recessive whiteness, H. ONSLOW (*Proc. Roy. Soc. [London], Ser. B, 89 (1915), No. B 609, pp. 36–58*).—The author concludes from his studies that "the existence of a tyrosinase in the skins of vertebrates is inconclusive. A peroxidase can, however, be extracted from the skins of certain colored rabbits and mice, which behaves like a tyrosinase toward tyrosin in the presence of hydrogen peroxid. It can be precipitated from solution by saturation with ammonium sulphate or by an excess of alcohol. The peroxidase present in agouti, chocolate, and blue rabbits is indistinguishable in its reactions from that present in black rabbits; but no peroxidase could be extracted from yellow and orange rabbits.

"'White melanin' is not a pigment substance, nor is it the cause of dominant whiteness, which is due to the presence of an inhibitor or antityrosinase in the skin. Dominant whiteness in the English rabbit is due to the presence of a tyrosinase inhibitor in the skin, which destroys the activity of tyrosinase; and the dominant white bellies of yellow and agouti rabbits are due to the same cause. The inhibitor can be precipitated by saturation with ammonium sulphate, and is destroyed by boiling or by standing for 48 hours. Recessive whiteness in rabbits and mice is due to the lack of the enzym unit of the pigment-producing system, for no tyrosinase or antityrosinase could be extracted from their skins.

"There is not sufficient evidence to decide whether a chromogen is present or not. The presence of an unoxidized chromogen might, however, serve to explain the occurrence of certain colorless granular particles which are found in the medullary cells of the hairs of some white animals. These particles are microscopically visible when stained, and in appearance very closely resemble colored pigment granules.

"The capacity of both white and colored skin extracts to oxidize dihydroxyphenols, but not monophenols, is more probably due to the catalyzing effect of organic colloidal material than to a true enzym. The extreme resistance to high temperatures shown by these extracts excludes the presence of an enzym as generally understood. Variations in coat color are due probably to a quantitative rather than to a qualitative difference in the pigment present, for the pigments isolated from black, chocolate, and yellow rabbits show very little difference either in the depth of their color or in their chemical behavior. Blue and the other dilute coat colors are not caused by a lack of pigment in the medulla, but by the absence of granules in the cortex, which, being present in the intense colors, absorb the light which in the dilute colors is reflected from the vacuoles."

Note on a case of Hunter's freemartin, where there was reversion to the wild park cattle type, D. B. HART (*Edinb. Med. Jour., n. ser., 14 (1915), No. 3, pp. 194–198, pl. 1; abs. in Jour. Roy. Micros. Soc., No. 3 (1915), p. 238*).—A freemartin is described "which resembled the wild park cattle in having a white hide, black muzzle, black hoofs, blackish spots on the legs, and great timidity. The mother was a normal Shorthorn; the cotwin a normal bull. A typical Hunter's freemartin is a sterile, genitally malformed bull, with small undescended testes and rudimentary epididymes, vasa deferentia, and Müllerian elements. Vesiculæ seminales are present. The external genitals consist of labia majora, clitoris, and the urinogenital sinus element (one in. in length) of the vagina.

"The potent bull calf and the freemartin are produced from one fertilized ovum, but the freemartin has allotted to it the hydatid testis and prostatic utricle normally given to the single bull. This produces an exaggerated simulacrum of the female genital tract.

"The thyroid, thymus, and suprarenals were found to be normal. The internal genitalia showed fatty degeneration, and were represented only by the urinogenital sinus and the epididymes. The skull was normal. The chief point of interest was the (ectodermic) reversion to the wild park cattle type. A theoretical interpretation is given of the way in which this reversion might come about—by retention of certain ancestral chromosomes normally lost in polar body formation."

German breeds of live stock (*Arb. Deut. Landw. Gesell., No. 235 (1912), English ed., pp. 93, pls. 53, figs. 12*).—Descriptions of the principal breeds of horses, cattle, sheep, and swine of Germany are given. The book is profusely illustrated with photographs of the prize-winning animals of each breed.

The value of German breeding cattle in German Southwest Africa, J. NEUMANN (*Abhandl. Hamburg. Kolon. Inst. 26 (1914), Ser. E, pp. 35, pls. 16*).—An account of the distribution of the various breeds of cattle in German Southwest Africa, together with measurements of representative animals of each breed.

Lincolnshire Red Shorthorns, G. E. COLLINS (*Jour. Roy. Agr. Soc. England, 75 (1914), pp. 33–40, pl. 1*).—An account of the early history, development, and utility value of the Lincoln Red breed of cattle.

Profits in southern cattle feeding, R. S. CURTIS (*Breeders' Gaz., 67 (1915), No. 10, p. 510*).—In order to obtain data on the beef cattle feeding industry members of the North Carolina Beef Breeders' and Feeders' Association purchased cooperatively, in 1914, 730 feeding cattle weighing from 900 to 1,100 lbs. from the western or mountainous portion of the State. These cattle were shipped to various farms throughout the State, where they were fed under ordinary farm conditions, the feeder placing his own valuation on the feed, bedding, manure, and other incidentals.

The gain of the average steer was 1.03 lbs. per day for the 121-day feeding period. The tons of manure per steer totaled 3.98, valued at $2.44 per ton. The average profit per steer, including the value of the manure, was $6.99.

These results are not taken as conclusive but merely as indicative of the average profit which may be expected from the industry.

Data on sex determination in cattle, R. Pearl and H. M. Parshley (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 24 (1913), No. 4, pp. 205–225*).—In this paper statistics collected some years ago (E. S. R., 4, p. 359) at the Maine Experiment Station in regard to the relation between time of service in the œstrous period and the sex of the subsequent offspring in domestic cattle are subjected to biometric analysis. It is stated that these statistics are much more extensive than any which have hitherto been collected for the study of this problem in cattle.

It is shown "that as the time of coitus approaches the end of the œstrous period there is a progressive increase in the proportion of male young born. In the extreme case this increase in the proportion of male births is probably statistically significant and not to be attributed to errors of random sampling. These modifications of the sex ratio can not be attributed to age differences or to any other factor yet suggested." It is thought that possibly "the observed changes in the sex ratios are correlated with changes in the relative freshness (or staleness) of the ova at the time of fertilization."

The facts set forth in this paper warrant the breeder in paying attention to the time of service in his cattle breeding operations, but he must not suppose that by so doing he can absolutely control the sex of the offspring, or even approach measurably close to absolute control. He can at best merely modify, over a period of years, the sex ratio in greater or less degree, in the direction which he desires.

Study of the form and weight of young cattle, K. Indermühle (*Jahresber. Landw. Schule Rütti, 1912–1914, pp. 129, 130*).—The average weight and body measurements of cattle from six months to three years of age are given.

The rearing of calves on substitutes for milk fat and milk, B. N. Wale (*Jour. Brit. Dairy Farmers' Assoc., 29 (1915), pp. 110–119, pl. 1*).—A résumé of English and American experiments along this line.

Blackface sheep, R. M'Millan (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 142–158, figs. 8*).—An account of the development and characteristics of this breed of sheep.

Border Leicester sheep, J. R. C. Smith (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 159–167, figs. 5*).—An account of the development and characteristics of this breed of sheep.

"Blanket" system of handling sheep on the Madison National Forest, C. E. Fleming (*Nat. Wool Grower, 5 (1915), No. 5, pp. 7–10, figs. 2*).—In an experiment conducted by the Forest Service of the U. S. Department of Agriculture it was found that the sheep which were run under the old system of close herding and returning to a permanent camp ground each night used 47 per cent more range than the sheep that were allowed to graze quietly and openly and bedded where night overtook them, except when it was clearly impracticable to move the camp due to rainy weather or heavy fogs. The average gain per day of the lambs under the new system was 0.43 lb. compared with 0.38 lb. made under the old system. It is estimated that each lamb grazed under the blanket system made a gain of 22½ cts. per head more for a period of 90 days than the lambs grazed under the old method.

It is stated that any of the standard breeds of sheep adapted to western conditions may be economically handled under this new system. The fine-wooled sheep are much more easily herded than either the medium-wooled or coarse-wooled breeds. By the use of a cross between the Rambouillet, or one of the members of the fine-wooled breeds, with the Hampshire, Shropshire, Lincoln, or Cotswold, the weight and fineness of the fleece can be increased, the size of the carcass maintained, and the herding qualities improved. The blanket system is especially adapted to the production of an early maturing lamb.

Possibility of producing more and better sheep by improvement in methods of handling on the range, J. T. JARDINE (*Nat. Wool Grower, 5 (1915), No. 4, pp. 15-18, figs. 2*).—Another description and account of "bedding out" or "blanketing" experiments with sheep on the range, as reported above.

The "bedding out" system of handling sheep on Big Horn Forest, Wyoming, L. H. DOUGLAS (*Nat. Wool Grower, 5 (1915), No. 6, pp. 13-16, figs. 2*).—The results of the experiments here reported confirms those noted above.

Handling sheep on timber and brush ranges of Idaho, B. S. MARTINEAU (*Nat. Wool Grower, 5 (1915), No. 7, pp. 7-11, figs. 2*).—The "bedding out" method of handling sheep on the timber and brush ranges of Idaho proved to be satisfactory and in line with the results secured on other ranges (see above).

The properties of wool, W. DAVIS (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 168-191, figs. 9*).—The subjects discussed in this article are requirements of "handle," wool varieties in a fleece, classing of fleeces, structure of the fiber, color, disposition of fiber, the Cheviot fleece, the Southdown fleece, the Blackface fleece, felting property, influence of crossing on the wool structure, abnormal fibers, moisture in wool, and utility of the hygroscopic quality.

Dried chicory roots as horse feed, A. W. DONEGAN (*U. S. Dept. Com., Com. Rpts., No. 156 (1915), pp. 74, 75*).—It is reported that chicory roots make an excellent substitute for oats, containing moisture 13.79, protein 4.85, fat 0.85, and nitrogen-free extract 69.73 per cent, with 4.35 per cent of sugar. There are estimated to be about 87 feed units as compared with 82 feed units in dried sugar beets.

No digestive troubles have been noticed in feeding the chicory; in fact it is thought to have a favorable influence on the digestion. The material is readily consumed by horses in quantities up to 10 lbs. daily per horse. It is thought that if the material could be ground up and sugar or molasses mixed in, an ideal feed could be made.

Alfalfa hay for hogs, L. FOSTER and H. H. SIMPSON (*New Mexico Sta. Bul. 96 (1915), pp. 32, figs. 3*).—Supplementing previous work (E. S. R., 31, p. 470), two lots of three 125-lb. Tamworth barrows each were fed 63 days in winter as follows: Lot 1, 4.7 lbs. of grain (shelled corn and Kafir corn) per head daily, and lot 2, 6.9 lbs. of grain, both lots receiving what alfalfa hay they would consume. The respective lots made average daily gains of 1.13 and 1.61 lbs. per head, consuming 4.14 lbs. of grain and 0.92 lb. of alfalfa and 4.28 lbs. of grain and 0.554 lb. alfalfa per pound of gain, and costing 6.83 and 6.85 cts. per pound of gain.

The results of this experiment indicate that about 15 per cent more profit can be made by feeding a heavy grain ration, at least 2 lbs. per 100 lbs. live weight, with alfalfa hay than by feeding a medium grain ration. The largest returns per ton for the alfalfa, after paying for the grain consumed, were made by lot 2. However, the small amount of roughage that the hog will economically use when being fattened makes this a secondary consideration. The desirability of the bacon breeds of hogs for New Mexico conditions is noted.

Four lots of three or four 8-months-old Duroc-Jersey and Tamworth pigs each were fed 135 days as follows: Lot 1, skim milk and alfalfa hay; lot 2, skim milk, a grain mixture of shorts and bran, and alfalfa hay; lot 3, shelled corn and alfalfa hay; and lot 4, skim milk, ground corn, and alfalfa hay.

The alfalfa hay was fed in racks, and just as much as they would clean up without waste. The amount of skim milk and grain fed was regulated by the size of the pigs, and increased as the pigs gained. It was considered that 6 lbs. of skim milk was equal to 1 lb. of grain as a feed, and that the most economical proportion to feed it in conjunction with grain was 4:1.

The respective lots made average daily gains per head of 0.33, 0.43, 0.54, and 0.54 lb., consuming per pound of gain 3.92, 3.99, 3.52, and 3.32 lbs. of grain or equivalent, and costing 9.35, 8, 6.49, and 6.83 cts per pound of gain. The results of the experiment indicate that when skim milk is fed with alfalfa hay it should be supplemented with one of the concentrated carbohydrate grains, such as corn, barley, or milo maize, rather than with either a concentrated nitrogenous or a bulky grain.

It was noted that the Duroc-Jersey pigs gained more than the Tamworths on all feeds except shelled corn and alfalfa. Considering the two breeds regardless of the rations fed, the Durocs made an average gain of 66 lbs. per head and the Tamworths 60 lbs.

Four lots of eight 8-month-old Duroc-Jersey and Tamworth pigs each were fed 90 days as follows: Lot 1, soaked barley and alfalfa hay; lot 2, soaked wheat and alfalfa hay; lot 3, ground wheat, wet with water, and alfalfa hay; and lot 4, ground wheat and skim milk 1:4, and alfalfa hay. The respective lots made average daily gains per head of 0.718, 0.8, 0.958, and 0.899 lb., consuming 4.48, 4.02, 3.35, and 2.61 lbs. of grain and 0.99, 0.66, 0.98, and 1.17 lbs. of alfalfa hay per pound of gain, costing 6.82, 4.99, 4.63, and 5.29 cts. per pound of gain, and returning a profit of $0.856, $2.215, $2.865, and $2.205 per head. The Durocs in every lot but one (lot 4) made the larger gains, but the Tamworths seemed better able to utilize the bulky skim milk plus wheat ration. Both breeds gained more on wet ground wheat than on soaked, and the Tamworths seemed to relish it more than did the Durocs.

Four lots of eight pigs each were fed 36 days as follows: Lot 1, ground barley and silage; lot 2, ground barley and shorts, 2:1, and silage; lot 3, ground barley and alfalfa hay; lot 4, ground barley and shorts, 2:1, and alfalfa hay. The respective lots made average daily gains per head of 0.48, 0.5, 0.68, and 0.7 lb., lots 1 and 2 consuming 10.33 and 9.8 lbs. of silage and 6.7 and 6.04 lbs. of grain per pound of gain and lots 3 and 4 consuming 4.72 and 4.27 lbs. of alfalfa hay and 4.7 and 4.45 lbs. of grain per pound of gain, and costing, respectively, 12.94, 11.74, 10.36, and 9.7 cts. per pound of gain.

As between silage and alfalfa the average total gain per head was 17.6 lbs. and 24.8 lbs., the average cost per pound of gain 12.34 and 10.02 cts., and the average profit by carload $9.55 and $38.37. As between the barley and the barley and shorts rations the average total gain per head was 20.7 and 21.6 lbs., the average cost per pound of gain 11.65 and 10.72 cts., and the average profit per carload $15.43 and $32.67.

It is estimated that 585 lbs. of alfalfa hay replaced 500 lbs. of concentrate of the kinds used in these experiments, and that the hay has a value of $25.64 per ton.

Ground corn gave better results than skim milk supplemented with shorts and bran or skim milk supplemented with ground corn, though when a portion of the ground corn was replaced by skim milk the gains were as high but made at a greater cost.

Taking the average results of three experiments in which Tamworths were used, including 26 hogs, and comparing with the results of two experiments in which Duroc-Jerseys were used, including 27 hogs, the average daily gain of the Tamworths per head was 31 per cent greater than that of the Duroc-Jerseys, but it required 3.5 per cent more feed to make 100 lbs. of gain with Tamworths than with Duroc-Jerseys. In prolificacy both breeds stood high, the Tamworths averaging in 15 litters 3.8 pigs to the litter and the Duroc-Jerseys in 21 litters 9.1 pigs per litter.

The general average of the several lots of the four experiments shows that alfalfa hay constituted 31.9 per cent of the feed eaten. The quantity ranged from 11.4 per cent with a heavy concentrate ration to 51 per cent with a ration of skim milk. In general, the percentage was high with a light or medium concentrate ration and lower with the heavier concentrate rations.

The use of the paunch contents of freshly slaughtered cattle as a pig feed (*Deut. Landw. Presse, 42* (*1915*), *No. 12, pp. 90, 91*).—The paunch contents of freshly slaughtered animals is being used as a pig feed in Germany, 100 lbs. of this material being mixed with 10 liters of blood, 20 lbs. of molasses peat meal, 3½ lbs. of salt, and a little whiting. This has about one-fourth the feeding value of an equal quantity of potatoes.

The Large White Yorkshire pig, S. HEATON (*Jour. Roy. Agr. Soc. England, 75* (*1914*), *pp. 40–50, pl. 1, fig. 1*).—A discussion of the breeding, feeding, care, and management of the Large White Yorkshire breed of hogs.

Poultry, A. F. ROLF and L. F. PAYNE (*Oklahoma Sta. Bul. 106* (*1914*), *pp. 31, pl. 1, figs. 8*).—Part 1 of this bulletin deals with breeds and breeding, poultry diseases, and farm poultry housing. Part 2 discusses incubation, brooding, and feeding.

Telling the sex of day-old chicks, W. F. FRY (*Rel. Poultry Jour., 22* (*1915*), *No. 5, pp. 593–595, 629, figs. 4*).—It is said that the sex of day-old Barred Plymouth Rock chicks can be determined without difficulty. The male characteristics are the coarser appearance of the chick's head, the greater admixture of white with black in the plumage, which gives a lighter-gray effect, and the clear yellow color of leg and beak. The female characteristics are a neater head, stronger-black coloring, and dark beak and legs.

Third annual international egg-laying contest, W. F. KIRKPATRICK and L. E. CARD (*Connecticut Storrs Sta. Bul. 82* (*1915*), *pp. 57–99, figs. 21*).—In experimental pens in connection with this contest it was demonstrated that milk may be substituted for green feed or for meat but not for both when the regular contest ration was fed. Birds supplied with a prepared feed for which they did not have to scratch did not do so well as those receiving the ordinary contest ration.

It was found that the weight of eggs from the different breeds varied considerably. The Leghorn eggs averaged about 1.5 lbs. to the dozen, the Wyandotte eggs 1.483 lbs., the Plymouth Rock eggs 1.588 lbs., and the Rhode Island Reds 1.602 lbs. The average for all breeds was 1.537 lbs.

The highest percentage of broody birds was found in the Rhode Island Reds and the lowest in the Leghorns, the average number of days lost for all breeds being 20.9 days per hen per year, while each broody hen lost 56 days. The average for the heavy breeds was 34.3 days.

At the close of the contest the Leghorns averaged in weight 3.51 lbs. per bird, the Wyandottes and Rhode Island Reds 5.45 and 5.59 lbs., and the Plymouth Rocks 5.94 lbs. The Plymouth Rocks, Wyandottes, Rhode Island Reds, and the miscellaneous group all reached their highest production in the month of April, while for the Leghorns May was the best month. The cost of feed to produce a dozen of eggs was in the case of the Plymouth Rocks 16.1 cts., the Wyandottes 14.3 cts., the Rhode Island Reds 15.8 cts, and the Leghorns 12.4 cts.

Yield data, etc., are also included.

Report on the fourth egg-laying competition at Burnley, 1914–15, A. HART (*Jour. Dept. Agr. Victoria, 13* (*1915*), *No. 6, pp. 321–339, figs. 13*).—In this competition six White Leghorn hens on dry mash feed laid during the 12-month period 1,699 eggs, six Black Orpingtons on wet mash feed 1,562 eggs, six White Leghorns on wet mash feed during a 4-month winter test of the light breeds 565 eggs, and six Black Orpingtons on a wet mash feed during a 4-month winter test of the heavy breeds 502 eggs. These are said to be world records.

Parafield egg-laying competition, D. F. LAURIE (*Jour. Dept. Agr. So. Aust., 18* (*1915*), *Nos. 9, pp. 741–747; 10, pp. 870–888; Dept. Agr. So. Aust. Bul. 93* (*1915*), *pp. 23*).—A report of the Parafield egg-laying competitions of 1914–15.

Control of the marketing of eggs, A. BEHRE and K. FRERICHS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 27* (*1914*), *No. 1–3, pp. 38–59*).—In these studies it was found that the specific weight of absolutely fresh eggs varied between 1.068 and 1.1, while general market eggs varied between 1.073 and 1.094, only 6 per cent being above that and 5 per cent below these figures. The absolute weight of the eggs ranged from 44.5 to 69.5 gm. apiece, but there appeared to be no relation between absolute and specific weights. Under storage there was a decrease in absolute weight of from 0.054 to 0.167 gm., with an average of 0.086 gm., per day, and a decrease in specific weight of from 0.001 to 0.0034, with an average of 0.0017, per day.

DAIRY FARMING—DAIRYING.

Report of the progress made in the field of milk chemistry and dairying during the year 1913, W. GRIMMER (*Milchw. Zentbl., 43* (*1914*), *Nos. 19, pp. 481–486; 20, pp. 497–503; 21, pp. 513–517; 22, pp. 530–535; 23, pp. 551–556; 24, pp. 569–572; 44* (*1915*), *Nos. 1, pp. 3–8; 2, pp. 17–23; 3, pp. 33–40*).—The subject is dealt with under the following headings: Keeping of animals and milk production; various kinds of milk; milk constituents; changes in milk and its constituents; bacteria; enzyms; immune bodies; milk as antigen; rennet and rennet coagulation; milk as food; dairy products; dairy apparatus; milk distribution; and investigational methods.

The practicability of starch values in dairy cattle feeding, B. SJOLLEMA (*Jour. Landw., 62* (*1914*), *No. 4, pp. 345–375*).—The author concludes that Kellner's starch values are not a safe measure in the feeding of dairy cows. The quantity of protein necessary to produce the unit of milk (10 kg.) can not be exactly determined; it is, however, not far from 0.4 kg., assuming that out of 100 parts of digestible protein in the ration 88 parts are transformed into milk protein. For the formation of milk sugar probably 0.5 kg. of carbohydrates is necessary for 10 kg. of milk, assuming that 90 parts out of 100 are converted into sugar. In practice, taking into account individual differences, etc., it will be better to feed a little more protein and carbohydrates, that is, from 0.45 to 0.6 kg., respectively. The milk fat will be formed, as a rule, partly from the fat and partly from the carbohydrates of the food.

In establishing the rations of milch cows which have reached full growth the author considers that provisionally the following quantities may be accepted, taking into account individual conditions: Three-tenths kg. of protein and 3 kg. of starch value for the maintenance ration per 500 kg. live weight; 0.45 kg. of protein for the formation of the protein for 10 kg. of milk; and 0.6 kg. of carbohydrates for the formation of the milk sugar in 10 kg. of milk. Besides these, there are the carbohydrates and fats required for the production of milk fat.

Feeding experiments with dairy cows, A. Flückiger and K. Indermühle (*Jahresber. Landw. Schule Rütti, 1912–1914, pp. 105–117*).—In experiments to determine the amount of grain to feed cows yielding various amounts of milk it was concluded that cows giving 15 kg. of milk daily should receive 2 kg. of grain mixture per head per day; cows giving 12 kg. of milk, 1.5 kg. of grain; and cows giving 10 kg. of milk, 1 kg. of grain. Cows giving more than 15 kg. of milk demand a correspondingly richer feed.

The effect of palm-oil cakes upon milk production in cows, J. Hansen (*Landw. Jahrb., 47 (1914), No. 1, pp. 1–70*).—The author concludes from a critical review of the experiments made by other workers and from the results of his own experiments that palm-oil cake does not affect the milk yield, but increases its fat content. This specific action increases with the increase of the amount of cake in the ration and with the quantity of fat in the palm-oil cake itself. In order to obtain a perceptible specific effect, at least from 2.5 to 3 lbs. per 1,000 lbs. of live weight should be used if the cake is somewhat deficient in fats, or 2 lbs. per 1,000 lbs. live weight if it is rich in fats.

The effect of the palm-oil cake varies with the individual cows, but is in every case perceptible when the cake is fed in sufficient quantities. Neither the milk yield nor the period of lactation, when the palm-oil cake is introduced into the rations, seems to have any influence upon its action. It is thought that an increase of from 0 to 0.14 per cent in the fat content of the milk is small; from 0.14 to 0.2 per cent, average; and above 0.2 per cent, large.

The influence of sugar beet feeding on the composition of the milk fats, J. Boes and H. Weyland (*Ztschr. Untersuch. Nahr. u. Genussmtl., 29 (1915), No. 12, pp. 473–475*).—A résumé of investigations on this subject. In general there is an increase in the Reichert-Meissl, Polenske, and saponification numbers, a lowering of the ash content, and an increase in the volatile soluble and insoluble fatty acids of the milk fat with the feeding of sugar beets to cows.

Grass palatability tests, E. Breakwell (*Agr. Gaz. N. S. Wales, 26 (1915), No. 6, pp. 485, 486*).—In feeding trials with Jersey cows, in which records were kept of the time taken to consume a given amount of the different grasses, it was found that prairie, Paspalum, and Hungarian brome grasses were easily the most palatable species in the young stages, and Paspalum and Hungarian brome grass in the seeding stages. Contrary to expectations, the Paspalum was eaten very readily, even in its mature stages. In both cases Rhodes grass was only eaten on compulsion. The native grasses were disregarded in favor of the cultivated. This happened at both stages of growth.

The results of the experiments are deemed only suggestive, as it is thought that several factors, such as the chemical and physical texture of the soils, climatic conditions, and individual variation among the animals, must be taken into account as affecting the palatability of grasses.

The reaction and calcium content of milk as factors in the coagulation process, T. H. Milroy (*Biochem. Jour., 9 (1915), No. 2, pp. 215–228*).—The author concludes from his studies that "during the course of rennin action there is no change in the hydrogen ion concentration of milk, either in the earlier stage or in the actual separation of the clot. The addition of an alkaline oxalate to milk lowers, while that of $CaCl_2$ raises, the hydrogen ion concentration. Fresh milk which has been subjected to a temperature slightly below boiling point for one hour shows a rise in the hydrogen ion concentration, and a fall in the calcium content. Such milk is only very slowly acted upon by rennin.

"The coagulability of heated milk may be raised either by the addition of $CaCl_2$ or by raising the hydrogen ion concentration. The former does not act simply by raising the hydrogen ion concentration nor the latter from its effect upon the soluble calcium content. The acid precipitation zone of caseinogen lies on the acid side of the rennin zone of action, but the latter gradually approaches the former as the calcium content of the mixture is lowered, so that in all probability the latter is an extension of the former toward the neutral point. Calcium chlorid, apart from its effect upon the hydrogen ion concentration, increases the activity of the rennin ferment from the beginning of the digestion process."

Relation of numbers of Streptococcus lacticus to amount of acid formed in milk and cream, P. G. Heinemann (*Abs. in Science, n. ser., 42 (1915), No. 1079, p. 321*).—Flasks of both sterilized and raw milk and cream inoculated with *S. lacticus* were incubated at temperatures of 37, 20, and 7° C. and the bacteriological results compared with flasks left to sour spontaneously.

It was found that "the amount of acid formed during the souring process of milk or cream is not solely dependent upon the number of bacteria present of the *S. lacticus* group. Temperature and the presence of other bacteria may influence the result. In raw milk or cream or in raw milk or cream inoculated with cultures of *S. lacticus* the number of bacteria increases to a given point and then decreases. The higher the temperature up to 37° the earlier is the maximum number reached. Coagulation of milk or cream is not dependent solely upon a certain amount of acid or a certain number of bacteria. After the decline in numbers the amount of acid continues to increase, probably due to enzym action. At 37° extraordinarily large amounts of acid may be formed, due probably to the presence of members of the group of lactobacilli."

The alkali-forming bacteria found in milk, S. H. Ayers and P. Rupp (*Abs. in Science, n. ser., 42 (1915), No. 1079, pp. 318, 319*).—A brief account.

The preservation of milk by freezing, G. Fascetti (*Staz. Sper. Agr. Ital., 48 (1915), No. 1, pp. 61–65*).—A discussion of the effect of freezing upon the physical characteristics of milk.

The refrigeration of a city's milk supply, C. Bates (*Abs. in Science, n. ser., 42 (1915), No. 1079, p. 319*).—In bacteriological examinations of a city's milk supply the Bureau of Chemistry of this Department has found that the chief cause of high bacteriological counts was due to nonrefrigeration of milk in transit, the average temperature of the milk upon receipt in the city being about 65° F. This milk was en route from 6 to 12 hours. Refrigeration has now been provided by the railroads, and the milk at the present time is being received in the city at about 48°.

Factors influencing the resistance of lactic acid bacteria to pasteurization, K. Peiser (*Abs. in Science, n. ser., 42 (1915), No. 1079, p. 320*).—In milk and cream pasteurized at 63° C. were found a number of strains of the *Bacterium lactis acidi* type, whose thermal death point in broth is below the pasteurization temperature. The average thermal death point is in whole milk 5°, in separated milk 2.5°, and in whey 0.5° higher than in bouillon. These results indicate that the protection given to the suspended lactic bacteria by the casein and coagulated albumin of separated milk raises their thermal death point 2.5° and that the protein and fat of whole milk raises their thermal death point 5°.

Silicic acid in milk from sterilization in glass bottles, B. Pfyl (*Molk. Ztg. Berlin, 25 (1915), No. 23, pp. 177, 178*).—Ordinarily there is from 0.8 to 1.1 mg. of silicic acid (SiO_2) per 500 cc. of milk. When milk is sterilized in glass bottles there is an increase of from 0 to 0.7 mg., depending upon the condition of the bottles.

[Waste in milk delivery] (*U. S. Dept. Agr., Weekly News Letter, 2 (1915), No. 51, pp. 1, 2*).—From data collected by the Dairy Division of this Department it was found that in the District of Columbia the shortest distance traveled by any wagon was 10.4 miles per day and the longest was 30, the average distance being 19.1 miles. The total distance covered by all the wagons was 93 times the entire distance of all the streets in the District. Data from three other cities are given bearing out the same results.

While much of the waste in milk deliveries can not be prevented, because there are so many dealers in each locality, it is suggested that efforts should be made by the dealers to concentrate their business as much as possible so as to lessen the distance traveled by the wagon for each quart of milk delivered. They should try to secure a large number of customers in a small area.

Using the Babcock test, J. M. Fuller (*Oklahoma Sta. Bul. 107* (*1915*), *pp. 3–15, figs. 16*).—General instructions are given.

VETERINARY MEDICINE.

Department of veterinary science and bacteriology, W. B. Mack (*Nevada Sta. Rpt. 1914, pp. 21–24*).—A brief statement of the work of the year with equine anemia, hog cholera, chicken cholera, and umbilical necrobacillosis.

The use of suspensions of the dead virus during an outbreak of chicken cholera in a flock of more than 300, of which 170 were treated, apparently gave successful results, since the loss promptly ceased. An outbreak of umbilical necrobacillosis during the lambing season in a large flock resulted in the death of 1,540, or about 70 per cent of the total number. It is stated that the results obtained in the use of antihog-cholera serum have been uniformly successful and every outbreak promptly suppressed with insignificant losses. But slight progress has been made in the work with equine anemia owing to the number of cases being few.

The detection of anthrax bacilli in the bone marrow, K. Grabert (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16* (*1915*), *No. 5, pp. 324–336*).—The Foth azure dye-staining method gave good results. The procedure, aside from the long time required for its execution, is simple to conduct and it can be carried out where the autopsy is conducted. The cultural test was found less reliable. Fifty-two animals, chiefly bovines, were under examination. The bones best suited for taking the marrow samples are named.

Foot-and-mouth disease in Denmark, J. J. Dunne (*Hoard's Dairyman, 50* (*1915*), *No. 7, p. 190*).—The author here quotes an interview had with Dr. B. Bang in August, 1915, concerning the recent outbreak of foot-and-mouth disease in Danish dairy herds.

It is stated that from November, 1914, up to August 5, 1915, the disease has been detected in no less than 5,734 herds, with a total of 200,000 cows and 130,000 pigs.

"Cows suffering from the disease go back in their milk to such an extent as to entail a loss of \$5 to \$7.50 for each animal. If we take \$6.25 as the average, the loss of milk alone amounts to \$1,250,000. In addition to this the mortality in 1911–12 constituted ½ per cent for adult animals; ¾ per cent for young stock; and over 23 per cent for calves. In 1914–15 the percentages all round were higher; 37 adult animals died at Koselitz and 100 at Brattingsborg on the island of Samso. Nearly all the young hogs and many adult hogs attacked by the disease died also.

"The only things that help are care, caution, isolation, and regular disinfection. Laxity in regard to those things will entail still larger losses than those already sustained."

Studies on the biochemistry and chemotherapy of tuberculosis.—X, An experimental study of the influence of iodin and iodids on the absorption of granulation tissue and fat-free tubercle bacilli, E. F. Hirsch (*Jour. Infect. Diseases, 15 (1914), No. 3, pp. 487–500*).—"The use of iodin and iodids in facilitating the absorption of necrotic material and organization of tuberculous and other granulation tissues has no experimental proof. The daily administration of potassium iodid does not hasten the removal of foreign substances, like tubercle bacilli, by stimulating the phagocytic properties of the endothelial cells. The presence of free iodin in such areas may influence the process only by favoring an inflammatory reaction, if the amount of iodin is sufficient, but has no effect in promoting absorption. Iodized fat-free tubercle bacilli are absorbed no faster than are the noniodized."

Studies on the biochemistry and chemotherapy of tuberculosis.—XI, The therapeutic value of copper and its distribution in the tuberculous organism, H. J. Corper (*Jour. Infect. Diseases, 15 (1914), No. 3, pp. 518–540*).—"Copper, in simple salt form (sulphate, acetate, oleate, and copper amino-acid mixture prepared from hydrolyzed egg albumin), injected intramuscularly into normal and tuberculous guinea pigs, in total amounts from 0.75 mg. up to about 19 mg. for about 2 to 100 days, enters the animal organism and is found mainly and in largest amounts in the liver, in small amounts in the kidneys, in traces in the spleen, lungs, and blood, and not at all in the tuberculous lymph glands and pus. After cessation of injections the copper slowly but gradually decreases in amount in the liver.

"Copper, in simple salt form, injected intramuscularly in guinea pigs in amounts varying from 2.7 to 22.1 mg. during a period of 13 to 34 days, previous to (19 days), coincident with (2 days before), or after (11 days) infection with tubercle bacilli, has no appreciable effect upon the progress of the tuberculosis, as indicated by the lesions present after death.

"Copper, in simple salt form, fed to rabbits in amounts up to 1,380 mg. of copper, during a period of 97 days, and injected (copper sulphate and copper amino acids) intramuscularly into rabbits, in amounts up to 55.1 mg. of copper, during periods to 90 days, enters the blood and is found mainly and in largest amounts in the liver, in small amounts in the kidneys, in traces in the lungs and blood, and not at all in either the tuberculous or normal eyes. Copper, in the form of copper sulphate, fed to rabbits in amounts of 1 to 2 cc. of a 1 per cent solution daily for up to 100 days, begun 5 days before infection, has no appreciable effect upon the course of the tuberculosis of the eye, as indicated by the progress of the disease and the final weight of the eye.

"Copper, in simple salt form, injected intramuscularly into rabbits, in amounts of 12 to 42.9 mg. copper, for 37 days, begun on the eleventh day after infection, has no appreciable effect upon the course of the tuberculosis of the eye, as indicated by the development of the disease in the eye.

"Colloidal copper, prepared electrolytically by Bredig's method, injected intravenously into normal and tuberculous rabbits in amounts totaling 9.6 mg., from 4 to 12 days, is found mainly and in largest amounts in the liver, in smaller amounts in the kidneys, in traces in the lungs, and not at all in the normal or in the tuberculous eyes. This distribution of colloidal copper seems to favor the conception that copper in simple crystalline form, fed or injected intramuscularly into the animal organism, does not circulate in this simple form, but rather immediately forms colloidal combinations. If such is the case, this would readily explain its inability to enter tuberculous tissues, since it was found by Wells and Hedenburg that colloids (egg albumin) are not suited as entrants into the tubercle or other necrotic areas.

"Copper, in the form of copper amino acid mixture, does not differ greatly in its systemic (tested in mice with the lethal dose intraperitoneally and intramuscularly about 0.05 to 0.1 mg. copper per mouse of 10 gm.) and local (tested intracutaneously in guinea pigs) toxicity from that of copper sulphate when equal copper contents were compared. Locally, however, a difference existed in the fact that the copper amino acid mixture produced a hemorrhagic necrotic lesion, whereas the copper sulphate produced a simple necrosis. The local nonnecrotizing concentration proved to be 0.01 per cent copper, while 0.001 per cent copper still produced a slight duration.

"Copper, in the form of copper oleate (50 per cent) in lanolin by inunction, and copper amino acid mixture applied to the skins of guinea pigs is absorbed, but only to a very slight extent and with uncertainty, as shown by the presence of small amounts of copper in the liver."

About the occurrence of tubercle bacilli in nontuberculous respiratory passages with some secondary findings of capsule diplococci, C. TITZE and H. LINDNER (*Arb. K. Gsndhtsamt., 47 (1914), No. 3, pp. 478–490*).—The Scharr and Opalka method (E. S. R., 33, p. 387) for collecting mucus for the purpose of diagnosing by bacteriological means the presence or absence of open pulmonary tuberculosis is not deemed an entirely harmless procedure. It can, however, be easily conducted in ordinary practice.

A diagnosis of open tuberculosis can not be made entirely on the basis of the findings of a few tubercle bacilli in the mucus of the respiratory tract, as the clinical signs must be duly considered. In these investigations tubercle bacilli were noted in 4 out of 45 cows which were apparently free of tuberculosis. In the respiratory passages of 5 out of 51 bovines which showed no evidences of disease encapsulated diplococci were noted.

Investigations of hog tuberculosis and its significance for meat hygiene, C. NIEBERLE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1914), No. 1–2, pp. 56–80, figs. 3*).—Thirty-four cases of tuberculosis in swine were studied. In every instance histological and bacteriological examinations were made of the carcass and the press juice from the muscular tissues was injected into guinea pigs.

Glässer's findings relative to the existence of two different forms of lymph gland tuberculosis were confirmed; sometimes these were found together in the same lymph gland. Tubercle bacilli in the lymph glands of hogs, as in bovines, developed tubercles from the cytoblastic tissue. The specific cells of the tubercle, i. e., epithelioid cells, which come from the reticulum cells could be detected in the tubercle with ease, but the lymphocytes had no part in the special development process. Additional histological findings relative to development, etc., of the tubercle and the significance of mixed infections with pus organisms are given.

Tuberculosis with typical tubercle formation is most often noted in the lymphatic glands, but changes similar to the so-called rayed caseation noted in bovines are less often observed in cases of this kind. No lymphoid stage seems to be present in this purely infiltrative tuberculosis. In the majority of the cases, the foci macroscopically noticeable in the lungs having the appearance of pneumonic areas were not primary pneumonic areas but simply closely crowded miliary tubercles with lesser or greater secondary pneumonic foci. No extension of a tuberculosis process either in the lungs or lymph glands into the blood or lymph stream was noted.

It is thought that generalization of tuberculosis in swine must occur indirectly by way of the thoracic duct. As the number of tubercle bacilli present in the tuberculous process of swine are few, the filtering power of the lymph glands of these animals is apparently weak.

When the findings are considered from the standpoint of meat inspection, the author believes the so-called tuberculous soft areas, when present, have no significance. In no case when these were present, even in large quantities, did the press juice produce tuberculosis in guinea pigs that received 10 cc. subcutaneously.

Investigations upon the occurrence of antibodies against the Bacillus abortus infectiosi in the blood and milk of animals affected with abortion, R. Reinhardt and K. Gauss (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 4, pp. 219–238*).—The serum and milk from cows and goats infected with *B. abortus* were found to contain antibodies which could be noted by the complement fixation and agglutination tests. The amount of antibodies present in milk was much less than in serum.

For preparing the milk serum, the milk is treated on the water bath at 45° C. with rennet and filtered. The filtrate is used for the test. The agglutination titer of animals affected with abortion ranged beween 1:20 and 1:1,000 and as a rule between 1:100 and 1:500. The complement binding test is regarded positive where the deviation is obtained with 0.2 cc. or less of milk serum. Milk is given the preference over blood serum because it can be easily obtained and on account of the fact that some owners object to having blood examinations made.

Some further experiments in the prevention of bovine epizootic abortion, J. B. Buxton (*Vet. Jour., 70 (1914), No. 472, pp. 507–512*).—These experiments in immunization were conducted with rabbits, goats, and cows located on farms where abortion was known to exist. The experiments indicated "that it is possible to produce in susceptible animals a sufficiently high degree of immunity against *Bacillus abortus* by means of suitable doses of a vaccine composed of killed organisms. The figures at present available are not sufficiently numerous to permit of a definite assertion being made. In view, however, of the many advantages which this method of protection possesses over that entailing the use of living organisms in which the element of risk of infection from the vaccine has to be taken into consideration, further work in this direction is of the utmost importance."

The action of arsenical dips in preventing tick infestation, H. W. Graybill (*Jour. Parasitology, 1 (1914), No. 1, pp. 48, 49*).—Experiments in continuation of those published in Bulletin 167 of the Bureau of Animal Industry (E. S. R., 29, p. 287), conducted with a view to determining what protection dipping offers for a period of 3 or 4 days after and the effect upon the ticks, are briefly reported upon. Two experiments were conducted, in the first of which cattle were exposed to infestation on the third and fourth days after dipping, and in the second ticks were applied to animals 5 days after the last of 4 dippings at intervals of 2 weeks and of 1 week.

In the first experiment it was determined that animals dipped once in a dip containing sodium arsenite equivalent to 0.1863 per cent as As_2O_3 were not protected from infestation when ticks were applied 3 days and 4 days after dipping. It was found, however, that the infestation of the dipped animals was light, whereas that of the controls was heavy. Thus it appears that dipping reduced markedly the degree of infestation.

The results of the second experiment indicate that dipping animals 4 times at intervals of 1 and of 2 weeks will not protect them from becoming infested when ticks are applied 5 days after the last dipping. The degree of this infestation did not appear to be reduced in the case of the animals dipped at intervals of 2 weeks but in the case of those dipped at intervals of 1 week the infestation was reduced to a very marked extent. Ticks placed on animals 5 days after the last of 4 dippings at intervals of 1 week and of 2 weeks and permitted to engorge showed no indication of arsenical poisoning.

The chemical control of cattle dipping tanks, C. WILLIAMS (*So. African Jour. Sci., 11 (1915), No. 8, pp. 287–296*).—The author reports upon investigations of oxidation in arsenical solutions made up in the laboratory and of arsenical fluids in dipping tanks, substantially noted from another source (E. S. R., 31, p. 776).

[Disease of sheep at the Kodiak Station], M. D. SNODGRASS (*Alaska Stas. Rpt. 1914, pp. 77, 78*).—A description is given of an outbreak of a disease in the flock of sheep at the Kodiak Station. It appears that the sheep had been fed partly upon hay of poor quality and somewhat moldy, and that this was apparently the cause of the disease since none were affected after changing to a different hay. Of the 30 ewes affected 17 died and 13 recovered. All of the sheep which survived shed their wool, some losing practically all of it.

Otacariasis in the Bighorn, H. B. WARD (*Jour. Parasitology, 1 (1915), No. 3, pp. 121–127, pl. 1*).—A new sarcoptid mite which heavily infested the ear of a mountain sheep at Estes Park, Colo., is described as *Psoroptes cervinæ*. It is pointed out that this mite is quite similar to one found in the Pyrenees and in the Congo.

A list of 11 papers referred to is included.

Dipping vat for hogs and dips; hog worms, lice, and mange; hog lots, houses, and water supply, C. A. CARY (*Alabama Col. Sta. Bul. 185 (1915), pp. 35–58, fig. 1*).—Practical information is here supplied as to building a dipping vat (see p. 691), with brief descriptions of the more important parasites of swine, and notes on hog cholera, sanitation, etc.

Combating hog cholera, NEVERMANN (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 13, Beilage, pp. 19–21; Nos. 25, pp. 441–445, 26, pp. 457–459, figs. 3*).—The chief reason given for the great increase in the number of cases of hog cholera in Germany is the failure to report the existence of the disease to the authorities. The veterinarians may also be at fault. Another reason is the shipping of animals from districts where the disease is prevalent and where vaccinations of hogs against erysipelas have taken place. The difficulty in differentiating hog cholera from swine plague in some instances is pointed out. Various recommendations are made for the purpose of improving conditions.

The bacillary pest, typhus, or paratyphus of shoats, L. COMINOTTI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 37 (1914), No. 23, pp. 989–1004, pls. 2; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 267, 268*).—The investigations conducted by the author in Italy have been summarized as follows:

"There is also a bacillary disease of pigs in Italy of a morbid type having enzootic characters and a bacillus of the paratyphus B group and which, though distinguished by its epidemiological, clinical, anatomical, and pathological characters from swine fever with a filterable virus, has great affinity with it. The Voldagsen bacillus which causes this form of the disease is distinguished from the swine fever bacillus by certain cultural characters and especially by determined biological characters. The disease produced artificially in young pigs less than four months old by the ingestion of a culture of Voldagsen bacillus is transmissible by contact to healthy young pigs of the same age. Similar infection under the same conditions in pigs of the same age with the swine fever bacillus is not transmissible by contact. In small doses (2 to 5 cc.) the anti-Voldagsen vaccine does not protect the young pigs from infection by contact."

A list of 25 references to the subject is appended.

Casuistical, bacteriological, and patho-anatomical discussions of shoat typhoid with special regard to the distribution of this disease, W. PFEILER and K. HUBLER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914),* *No. 4, pp. 261–283; abs. in Berlin Tierärztl. Wchnschr., 30 (1914), No. 31, p. 555)*.—The authors find that this is a disease more widespread than is usually supposed. In the course of two years it was located in 22 establishments, in which 100 pigs were found infected. See also a previous note (E. S. R., 32, p. 378).

The cause of pernicious anemia of the horse.—A contribution to the problem of the ultravisible virus, K. R. and R. SEYDERHELM (*Arch. Expt. Path. u. Pharmakol., 76 (1914), No. 3–4, pp. 149–201, figs. 10*).—After briefly reviewing the literature the authors report at length upon investigations which they have conducted. They find that pernicious anemia of the horse can be produced artificially through the injection of aqueous extracts from the larvæ of horse botflies (*Gastrophilus equi* and *G. hæmorrhoidalis*). The effect was found to be due to a toxin to which they have given the name "œstrin," the toxic action of which appears to be specific for the horse and donkey. The œstrin, which is a natural excretion of Gastrophilus larvæ, is said to be absorbed through the gastrointestinal canal of the horse. The toxic action of *G. hæmorrhoidalis* was found to be very much greater than that of *G. equi*. Pernicious anemia can be produced in the horse through the injection of blood from animals in which the disease has been brought about by the extract from Gastrophilus larvæ.

A bibliography of 25 titles is included.

Experimental investigations of the cause of pernicious anemia of the horse, K. R. and R. SEYDERHELM (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 34, pp. 609–612*).—A somewhat briefer report of the investigations above noted.

Poultry diseases, E. J. WORTLEY (*New York: Orange Judd Co., 1915, pp. XI+123, figs. 34*).—A popular work dealing with the causes, symptoms, and treatment of diseases of poultry, with notes on post-mortem examinations.

Experiments on cysticerci of Tænia pisiformis and of T. serialis, J. E. ACKERT (*Jour. Parasitology, 1 (1915), No. 3, pp. 151–153*).—The author's experiments indicate that the dog tapeworms *T. pisiformis* and *T. serialis* will not develop in fowls. Previous investigations show that *T. pisiformis* fails to develop in man and in swine, and that *T. serialis* does not develop in man, swine, cats, or ferrets.

Experimental ingestion by man of cysticerci of carnivore tapeworms, M. C. HALL (*Jour. Parasitology, 1 (1914), No. 1, pp. 42–44*).—Ingestion experiments have led to the conclusion that records of the development of *Tænia pisiformis* in men are erroneous. The other species referred to are *Multiceps serialis, T. teniæformis, T. krabbei, T. tenella, T. ovis, T. hydatigena*, and *M. multiceps*. The facts presented indicate the correctness of the generally accepted view that adult cestodes of the genus Tænia occurring in Carnivoræ do not occur in man.

Observations on the eggs of Ascaris lumbricoides, W. D. FOSTER (*Jour. Parasitology, 1 (1914), No. 1, pp. 31–36, figs. 4*).

A peculiar morphologic development of an egg of the genus Tropidocerca and its probable significance, W. D. FOSTER (*Jour. Parasitology, 1 (1914), No. 1, pp. 45–47, fig. 1*).

Rhabditin.—Contribution to a science of nematology, N. A. COBB (*Jour. Parasitology, 1 (1914), No. 1, pp. 40, 41, pl. 1*).

RURAL ENGINEERING.

Practical talks on farm engineering, R. P. CLARKSON (*New York: Doubleday, Page & Co., 1915, pp. XV+223, pls. 17, figs. 21*).—This book, written in popular form, gives simple explanations of several everyday problems in farm engineering and farm mechanics for the use of the practical farmer. The following general topics are discussed: Farm buildings and building materials, farm water supply and sewage disposal, farm power, drainage and irrigation, the cost of road building, the working principles of orchard heaters, and the forms of electricity. A final section gives useful tables for engineering calculations.

Irrigation laws of the State of New Mexico (*Santa Fe, N. Mex.: State Bd. Water Comrs., 1914, pp. 67*).—The text of the laws is given.

The Colorado statute inch and some miner's inch measuring devices, V. M. Cone (*Colorado Sta. Bul. 207 (1915), pp. 3–16, figs. 5*).—This bulletin, based on a cooperative agreement between the Office of Experiment Stations and the Colorado Station, reports the results of a series of experiments on box tubes, thin-edged orifices with free flow, and the so-called Uncompahgre orifice, the object of which was to secure definite information concerning the Colorado statute inch and experiments on the so-called Azusa hydrant, a miner's inch device used in southern California (E. S. R., 32, p. 683).

In the box-tube experiments the boxes used were 16 ft. long and were given a descending grade of ⅛ in. to the foot, the discharge end being, therefore, 2 in. lower than the intake end. Metal strips ⅛ in. thick were placed around the intake end of each box so the inside dimensions of the orifice could be accurately determined. The inside depth of the box was practically 6 in. in every case and the water surface was 5 in. above the top of the orifice. A thin metal slide was made to fit between the metal strips on the end of the box, and this was adjusted to give any width of opening from 2 to 16 in. It was found in general that the discharge for any certain size of orifice increased as the width of the boxes increased, except for a slight reduction when the orifice was nearly the same size as the box. "The number of statute inches to one second-foot, therefore, decreases with a decrease in the size of the box, and also the number of statute inches to one second-foot increases as the size of the orifice is increased, which means that the discharge of each square inch of orifice decreases as the size of the orifice is increased. This is the opposite to the results obtained with thin-edged orifices having free flow. Box tubes with orifices from 12 to 96 sq. in. gave discharges with the number of statute inches to 1 second-foot varying from 33.7 to 38.4, and a greater number would no doubt be obtained for still larger orifices."

In the experiments with thin-edged orifices with free-flow sizes of orifice ranging from 1 in. square to 6 in. deep by 6 in. wide were used. The depth of water above the top of the orifice was 5 in. in every case. A concrete box was used having a cross section of 10 ft. by 6 ft. It was found that the discharge for each square inch of opening increased as the size of the opening was increased. "For a constant depth of orifice the discharge per square inch of opening is the greatest for a width of 1 in., decreases as the width is increased for a few inches, or approximately until the orifice is square for the larger sizes of orifices, and then increases as the width is increased. The number of statute inches to 1 second-foot varies from 42.9 to 35.5, but for the sizes of orifices commonly used for measuring water to the individual irrigator it is probable the value would be from 36 to 37, and as low as 35 might be obtained for wider orifices. . . . The discharge through full contraction, thin-edged, free-flow orifices having a depth or vertical dimension of 6 in. and a head of 5 in. above the top of the orifice, is represented by the formula

$$Q=0.169b-0.06+\frac{0.06}{1+0.015b^{2.6}}$$

in which Q is in second-feet and b is the breadth or horizontal dimension of the orifice in inches."

In the experiments with the Uncompahgre orifice it was found that the discharge was greater than through the sharp-edged orifices with free flow on account of the comparatively high velocity of approach in the orifice box.

In the experiments with the Azusa hydrant it was found that the actual discharges were from 2 to 6.4 per cent less than the intended discharges. "However, in actual practice the orifices become larger, due to the edges rusting, and the head of water is usually greater than 2 in., because a small amount is allowed to pass over the spillway or overflow."

While the value of the Colorado statute inch has been assumed to be 1/38.4 part of a cubic foot per second, it is concluded that this does not constitute a legal definition of the statute inch, since the number of statute inches to the second-foot may vary from at least 33.7 to 42.9 and still conform to the law in every particular.

Sixth biennial report of the state engineer to the governor of North Dakota for the years 1913–14 (*Bien. Rpt. State Engin. N. Dak., 6 (1913–14), pp. 157, pls. 11*).—This report covers the operations of the state engineer's office during 1913 and 1914, giving special attention to drainage, highways, stream measurements, and coal mining.

Irrigation and water conveyance and diversion (*Verslag Burgerl. Openb. Werken Nederland. Indië, 1912, pt. 4, pp. IX+163, pls. 16*).—This reports the progress of irrigation and water conveyance and diversion works for the year 1912.

The practical operation of irrigation works, S. G. PORTER (*Dept. Int. Canada, Irrig. Branch Circ. 1 (1914), pp. 10*).—This is a discussion of practical points in irrigation.

Report on irrigation experiments at Rochester, New York, conducted jointly by Rochester Railway and Light Company and New York State College of Agriculture at Cornell University, season of 1913, E. H. FISHER (*Manuscript (not printed), pp. 19, blue prints 10, photographs 10*).—This manuscript contains the results of irrigation experiments with raspberries, blackberries, beans, peaches, and apples, using furrow irrigation and the so-called Skinner overhead irrigation. The furrow system was used with peaches and apples and the overhead system with the beans and berries.

While the results obtained are for one season only, it is stated that they were in general fairly satisfactory. It is thought to be reasonably certain that irrigation will pay on berries and that there is some hope of success on other crops.

[Irrigation experiments], GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1915), No. 5, pp. 328–359*).—Four years' irrigation experiments with different field and truck crops on light loamy sand soils are reported.

During the four years irrigation on light soils was generally accompanied by marked increases in crop yield, particularly in the years with greater rainfall. In such years certain crops were especially responsive to irrigation, particularly those whose most luxuriant development occurred during short dry periods.

It was further found that on these light soils fertilization favorably influenced the utilization of irrigation water.

Problems relating to the tile drainage of irrigated lands, H. C. MILLER (*West. Engin., 5 (1915), No. 10, pp. 431–434, figs. 2*).—The design and construction of a tile drainage system for irrigated land is discussed and methods and a chart for calculating sizes of tile are given.

Contributions of the chemist to the potable water industry, W. P. MASON (*Jour. Indus. and Engin. Chem., 7 (1915), No. 4, pp. 289, 290*).—This article explains especially how chemical and bacteriological examinations supplement one another in determining the character and quality of potable water.

The treatment of waste waters from tin and lead mines, gut factories, and piggeries, G. B. Kershaw (*Surveyor, 47 (1915), No. 1209, pp. 404, 405*).—This article states that the sewage from piggeries is often ten to fifteen times as strong as domestic sewage of average strength. "The total dry-weather volume of liquid sewage per pig may amount to some 4 to 5 gal. daily, and during rainy days there will be a considerable addition to this quantity. . . .

"Preliminary treatment of such a strong liquid is best carried out by precipitation with lime in settling tanks, constructed in duplicate, each of them having a capacity equivalent to about 1½ days' flow of sewage. The tank liquor is best treated on deep percolating filters of medium-sized material, and the filter effluent should be passed through shallow sand-straining filters. Unless a very low rate of treatment is adopted—say 20 to 25 gal. per cubic yard per 24 hours—a good effluent can not, as a rule, be uniformly obtained, and in general it is much better, wherever practicable, to dilute the tank liquor with from two to three times its volume of clean water, and then to filter at a rate of about 75 gal. per cubic yard per 24 hours."

The separation and removal of microbes suspended in water by a stream of air, A. Trillat and M. Fouassier (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 7, pp. 518–521; abs. in Chem. Zentbl., 1914, I, No. 13, pp. 1294, 1295; Wasser u. Abwasser, 8 (1914), No. 8, p. 481*).—An experiment is described which showed that with a water of constant surface tension containing different microbes in suspension the admission of a stream of air not only forced the microbes to follow the air but effected their separation according to their size.

Dynamite experiment, F. G. Spring (*Agr. Bul. Fed. Malay States, 2 (1914), No. 11, pp. 297, 298*).—The results of experiments conducted at the Experimental Plantation at Kuala Lumpur on soil of a poor lateritic nature on which the rubber plants were backward in growth are reported.

Three rows, each containing 34 trees were used, two rows being kept as controls. The cartridges were placed at a depth of 2½ ft. below the ground surface, one between two trees 12½ ft. apart. After seven months and a few days the average increase in girth was 2.56 in. in the dynamited row, and 1.81 and 1.62 in. in the control rows.

On the use of explosives and of the blow lamp in the garden, H. E. Durham (*Jour. Roy. Hort. Soc., 40 (1914), No. 1, pp. 7–18*).—This report is in two parts.

The first, dealing with the use of explosives, briefly describes methods of procedure in blasting soils and reports experiments made to determine the value of explosives for loosening the soil on small areas, such as intensely cultivated gardens.

Cheddite cartridges with 2, 1½, 1, and ½ oz. charges were placed 3 ft. apart and at a depth of 3 ft. Potatoes responded in a marked manner to the use of the explosive, the ½-oz. charges being accompanied by about 15 per cent increase, the 1-oz. by 43 per cent, and the 2-oz. by 88 per cent. Cauliflower and cabbages showed no appreciable difference in blasted and unblasted soils. With peas the number of plants was much smaller on the unblasted side but they blossomed and matured a week earlier than on the blasted soil. Carrots, onions, and Scorzonera gave a greater number of plants and germinated and developed much better on the blasted soil. This was particularly marked in the case of Scorzonera.

In the second part the use of the plumber's blow lamp for the destruction of weeds and insects is briefly described.

Blast furnace slag in concrete, W. A. Aiken (*Iron Trade Rev., 55 (1914), No. 1, pp. 31, 32; abs. in Indus. Engin. and Engin. Digest, 14 (1914), No. 9,* *pp. 380, 381*).—An extended series of tests in which five lots of 100 each of 6-in. cubes, mixed in the proportions of 1 part cement, 2 parts sand, and 4 parts blast furnace slag and passing the 1½-in. sieve but retained on the 1¼-in. sieve, were crushed at periods of 28 days, 3 months, 6 months, 9 months, and 1 year, respectively, is reported.

The results indicate that slag may be employed as an aggregate in competition with broken stone or gravel. "From the actual strength of the concrete developed in these tests, its weight per cubic foot, the recognized solubility of slag which permits it to act as a puzzolanic material, its alkaline nature which is especially conducive to rust-proof in the case of reinforced concrete, and from the relatively high combined percentages of silica, alumina, and iron, which make for permanency of the resulting concrete, the conclusion is that slag is satisfactory for use as an aggregate in concrete."

Oil-mixed Portland cement concrete, L. W. PAGE (*U. S. Dept. Agr. Bul. 230* (*1915*), *pp. 26, pls. 6, figs. 7*).—This is a revision of Office of Public Roads Bulletin 46 (E. S. R., 28, p. 85) and presents the results of more recent laboratory and service tests of oil-mixed concrete.

The conclusions so far reached are summarized as follows: "The admixture of oil is not detrimental to the tensile strength of mortar composed of 1 part cement and 3 parts sand when the oil added does not exceed 10 per cent of the weight of the cement used. The compressive strength of mortar and of concrete suffers slightly with the addition of oil, although when not to exceed 10 per cent of oil is added the decrease in strength is not serious. Concrete mixed with oil requires a period of time from 50 to 100 per cent longer to set hard than does plain concrete, but the increase in strength is nearly as rapid in the oil-mixed material as in the plain concrete. Concrete and mortar containing oil admixtures are almost perfectly nonabsorbent of water and are therefore excellent materials to use in damp-proof construction. The addition of oil, however, does not appear to increase to any great extent the impermeability of concrete subjected to heavy water pressure, and this method alone will probably not make the concrete proof against the actual percolation of water through the mass . . . . Laboratory tests show that oil-mixed concrete is just as tough and stiff as plain concrete, and, furthermore, its elastic behavior within working limits of stress is identical with that of plain concrete. The bond between concrete and plain-bar reinforcement is decreased by the use of oil in the concrete, but when deformed bars, wire mesh, or expanded metal is used there is no apparent decrease in the bond."

A series of experiments to determine what effect the addition of oil has in retarding the action of alkali salts on the cement indicated that the action of a 10 per cent solution of sodium sulphate was materially retarded by the addition of 5 to 10 per cent of oil to a 1:3 mixture.

Of 29 replies to letters inquiring as to the success or failure obtained by users of oil-mixed concrete, only three were wholly unfavorable.

Portland cement concrete pavements for country roads, C. H. MOOREFIELD and J. T. VOSHELL (*U. S. Dept. Agr. Bul. 249* (*1915*), *pp. 34, pls. 11*).—It is the purpose of this bulletin to supply information on the subject of Portland cement concrete pavements for the use of highway engineers and others interested in the improvement of public roads.

It is stated that the economic efficiency of concrete roads is undetermined at present, but the indications are that this type of construction will prove to be well suited for certain conditions. The principal advantages possessed by concrete pavements are briefly stated as follows: "(1) As far as can be judged, they are durable under ordinary suburban and rural traffic conditions. . . . (2) They present a smooth, even surface, which offers very little resistance to traffic. . . . (3) They produce practically no dust and may be easily cleaned. (4) They can be maintained at comparatively small cost until renewals become necessary. (5) They may be made to serve as an excellent base for some other type of surface when resurfacing becomes desirable. (6) They present a pleasing appearance." The principal disadvantages are "(1) They are somewhat noisy under horse traffic. (2) There is no method of constructing necessary joints in the pavements which will entirely prevent excessive wear in their vicinity. Furthermore, joints do not altogether eliminate cracking, and wherever a crack develops it must be given frequent attention in order to prevent rapid deterioration of the pavement. (3) They can not be as readily and effectively repaired as many other types of pavements. . . .

"The one-course type of concrete pavement is greatly to be preferred to the two-course type, but there are conditions under which the adoption of the two-course type of construction may be justified. The proportion of cement to the sand and coarse aggregate combined should not be less than about 1:5, and the proportion of sand to coarse aggregate should not be less than 1½:3, nor greater than 2:3. Ordinarily, when gravel is used as coarse aggregate, the proportions may be made 1 part of cement to 1½ parts of sand to 3 parts of gravel, and when crushed stone is used as coarse aggregate 1 part of cement to 1¾ parts of sand to 3 parts of crushed stone.

"All types of contraction joints which have yet been devised require careful and frequent attention in order to prevent rapid deterioration of the pavement in their vicinity. It appears that better results are obtained by spacing the joints at an angle of about 75° to the center line of the road than when they are placed at an angle of 90°. Thin bituminous wearing surfaces for concrete pavements can not be economically justified at present. . . .

"Intelligent engineering supervision is absolutely essential in concrete pavement construction, because defective materials or workmanship can not be readily repaired after the pavement is completed, and they are not usually apparent until the pavement has been in use for some time."

Specifications are given which are believed to typify the best practice which has been developed in concrete pavement construction.

Vitrified brick pavements for county roads, V. M. PEIRCE and C. H. MOOREFIELD (*U. S. Dept. Agr. Bul. 246 (1915), pp. 38, pls. 10, figs. 3*).—This is a revision of Department Bulletin 23 (E. S. R., 30, p. 86).

Notes on the width, alignment, grade, and drainage features of the designing of country roads, R. A. MEEKER (*Engin. and Contract., 42 (1914), No 15, pp. 346, 347*).—This is a brief summary of important details connected with the preparation of plans for rural road improvements under New Jersey conditions.

It is stated as axiomatic that the width of roads should be in multiples of 8 ft., and that in order to obtain a roadway of sufficient width to accommodate travel passing in both directions 24 ft. may well be taken as the minimum allowable width. The important considerations in alignment are pointed out as direct distance, grades, and the economic features of grading. Grade is considered to be the most important economic feature in road design. As regards drainage, it is thought that for earth roads a fall of 1 in. per foot from the center to the gutters, for water-bound macadam ¾ in. per foot, and for bituminous concrete ½ in. per foot is sufficient. For country roads gravel or plain macadam is thought to be sufficient for surfacing.

Progress reports of experiments in dust prevention and road preservation, 1914 (*U. S. Dept. Agr. Bul. 257 (1915), pp. 44*).—This bulletin reports the results from a number of experiments in dust prevention and road preservation conducted by the Office of Public Roads in 1914, a similar report for 1913 having been noted (E. S. R., 31, p. 686). The materials used and methods employed in the experiments, the several kinds of roads and varying conditions of traffic, and analyses of materials and cost data are also given.

A second series of experimental bituminous treatments of coralline rock roads in Dade County, Fla., using light and heavy oils and two water-gas tar products, "clearly demonstrated that the greatest difficulty to be overcome in any future large-scale construction of bituminous coralline rock roads is the harmful effect of rains on the prepared surface before the application of the bitumen. The high cementing power of the rock causes it to bind strongly when wet unless the dust is entirely removed in the screening. The surface is thus rendered more or less impervious, and the treatment becomes in effect only a surface treatment. This difficulty may be met by performing such work in the dry season of the year or by keeping at all times the prepared surface work and the bituminous application well together." After a year of service none of these experiments showed any decided evidence of failure. In connection with these experiments a section of ordinary coralline rock surface was treated with calcium chlorid at the rate of 1.49 lbs. per square yard, the purpose being to maintain a damp surface on the coralline rock road. After several weeks of wear the surface was damp at all times, but pitted to some extent, showing bare rock in spots.

Experiments were also conducted at West Palm Beach, Fla., with oil, tar, oil asphalt, and coralline rock to develop a more economical and durable road surface than is obtainable by the use of coralline rock under ordinary methods of construction. Experience gained from the construction in the experiments at Miami, Fla., previously noted, and from their inspection after long usage by traffic "showed conclusively that the best method of treatment involved the use of rock from which the finer particles had been removed to provide for uniform penetration of the bitumen. . . . The general method of construction preparatory to the application of the bitumen was, in brief, as follows: The preparation of a thoroughly compacted subgrade parallel to the finished surface and composed of the rock originally in the roadbed; upon this, a course of screened rock with a uniform loose depth of 3 in., lightly compacted to allow a maximum penetration of bituminous material." An inspection of these experiments the following year showed that the residual asphaltic petroleum was used with uniformly good results in one case, while in a second case the section, although in good condition and free from any wearing defects, presented a varied appearance which is attributed to the varied weather conditions under which the experiment was constructed. The refined coal-tar experiments were in good condition in one case, but in a second case the tar had become hard and friable, necessitating a surface treatment to prevent wear. One oil asphalt section was in excellent condition, while a second section had a mottled appearance, due to bleeding of the bitumen to the surface. A water-bound coralline rock macadam section showed a smooth, unbroken surface true to cross section. A comparison of this experiment with the bituminous-bound experiments indicated that the water-bound macadam had worn down about $\frac{3}{4}$ in. below the adjacent bituminous-bound section.

Supplementary reports of experiments at Miami, Fla., with oil and coralline rock in 1913; on Rockville Pike, Md., with tar and asphaltic petroleum in 1913; at Washington, D. C., with surface treatment with tar preparations and oils in 1912; at Chevy Chase, Md., with bituminous concrete, cement concrete, oil-cement concrete, vitrified brick, and bituminous surface treatments on concrete in 1912; at Chevy Chase, Md., with bituminous construction and surface treatment in 1911; at Jamaica, N. Y., with oil-cement concrete, oil asphalt, tar, and fluxed native asphalt in 1911; at New York, N. Y., and Ridgewood, N. J., with oil-cement concrete in 1910; at Boise, Idaho, with oil-gravel macadam in 1910; at Ames, Iowa, with oil-asphalt gravel in 1910; at Knoxville, Tenn., with tar and oil preparations in 1910; at Youngstown, Ohio, with slag, slag and lime, slag and waste sulphite liquor preparation, and slag and tar in 1909; at Newton, Mass., with asphaltic preparations, tar preparations, residual oil, and molasses-oil-lime in 1908; at Garden City, Dodge City, Bucklin, and Ford, Kans., with sand-clay in 1908; and at Bowling Green, Ky., with Kentucky rock asphalt in 1907 are also included.

Proceedings of good roads institute held at University of North Carolina, March 17–19, 1914 (*N. C. Geol. and Econ. Survey, Econ. Paper 39 (1914), pp. 117, pls. 4, figs. 15*).—This report includes the following special articles: Road Surveying and Mapping, by T. F. Hickerson; The Use of the Abney Hand Level, by T. F. Hickerson; Economics of Road Construction, by W. S. Fallis; Sand Clay and Topsoil Roads the Economic Roads for North Carolina, by J. H. Pratt; Natural Sand Clays in the North Carolina Piedmont Belt, by J. E. Smith; Dirt Roads, by J. H. Pratt; Drainage of Roads, by T. F. Hickerson; County Highway Bridges, by J. M. Ambler; Culverts, by R. T. Brown; Road Machinery Required in County Road Construction, by N. C. Hughes, jr.; Road Surfacing Materials in North Carolina, by C. Cobb; and Lignin Liquor as a Binder for Macadam, Gravel, and Sand-clay Roads, by G. N. Moore.

Steam as the by-product of internal combustion engines, J. B. Meriam (*Gas Engine, 16 (1914), No. 11, pp. 704–709, figs. 6*).—The author shows by discussion and experiment that if an inclosed cooling system is used and only steam is allowed to escape, all of the water used must eventually be turned into steam. The total heat units of the fuel lost to the water jackets are fully recovered and restored to the steam. In tests of such a system no difficulty or detrimental effects were experienced when operating the engine at maximum load with the jackets under full steam pressure and temperature. "Another marked advantage in this process is found in the fact that the thermal efficiency of the engine is improved so that the fuel consumed is at least 2 per cent less at maximum load and fully 15 per cent less at one-fourth load."

Increasing output of gas engines (*Power, 40 (1914), No. 10, pp. 340, 341, figs. 4*).—A method is described for increasing the output of gas engines, in which the burnt gases are first scavenged and the working charge then admitted under pressure, thus increasing the weight of the charge and consequently raising the mean effective pressure.

Gas-engine valve setting, G. W. Muench (*Power, 40 (1914), No. 15, pp. 547, 548, fig. 1*).—This paper discusses the causes leading to altered valve timing and gives simple directions for the proper resetting of the valve gear.

Oil engines for pump irrigation and the cost of pumping, G. E. P. Smith (*Arizona Sta. Bul. 74 (1915), pp. 379–450, pls. 4, figs. 16*).—This bulletin describes fuel oils and their tests and oil engines of the Diesel, modified gasoline engine, and hot-ball groups, reports tests of the last two types as to fuel economy, capacity, speed regulation, and power development, discusses oil engine characteristics based on the tests reported, and gives data on the cost of pumping for irrigation.

It is pointed out that gasoline is too expensive a fuel for pumping engines in Arizona. Cheap distillates of from 39 to 44° Baumé with low flash point are deemed the most advisable to use at the present time, these being preferably purchased in carload lots.

It is thought that Diesel engines are not adapted to farm conditions. "Four-cycle gasoline engines with electric ignition and suction fuel feed can be modified to burn heavier distillates successfully by feeding water with the charge.

Preheating of the charge, also, is necessary in cold weather, and the heavier distillates require higher compression and earlier ignition than gasoline in order to give the best results. The water feed is the most important factor. . . . Gasoline engines already in service can be altered by replacing the fuel mixer and the exhaust block with specially designed ones, or by adding a homemade device for feeding water into the air inlet pipe. . . . The effects of the water in the charge are softened explosions, more complete combustion of the fuel, a cleaner cylinder, cleaner valves, uniform temperature with reduced loss of power in the jacket water, and no preignition. Despite the loss of power in the heat of vaporization of the feed water, the fuel economy of the engine is not lowered.

"Two-cycle engines with hot-ball ignition and fuel injection at the end of the compression stroke can be operated on low gravity distillate, even down to 30° Baumé for small engines, and to 24° Baumé for large engines, provided the compression pressure is increased to 180 lbs. per square inch. As in the case of 4-cycle engines, water feed is essential except perhaps when the engine is carrying less than one-third of its full load. . . . Forced-feed lubrication is necessary for hot-ball engines and is desirable for large 4-cycle engines. Pump circulation gives much better results than the thermosiphon system for hot-ball engines.

"Fuel economy of 9 or 10 brake horsepower-hours per gallon of fuel oil is possible with farm engines of either type, assuming the engine to be in good condition. In the average ranch pumping plant the fuel economy is about 6 or 7 horsepower-hours per gallon. The determining factor of fuel economy is the adjustment of the fuel valves. . . . Nearly all oil engines are operated with the fuel valves opened wider than is necessary. . . . Mechanical losses of power in an engine are most important when the engine is only partly loaded. An engine should be run at from three-quarters to full load. A purchaser should compute his power requirements carefully and then add about 15 per cent to determine the size to buy. At altitudes of from 3,000 to 5,000 ft. from 25 to 30 per cent should be added to the computed capacity. . . . The piston displacement per minute per horsepower is the best indication of the capacity of an engine. . . . The quantity of humidifying water should be controlled by the governor. . . .

"Four-cycle oil engines with electric ignition are proving to be quite as reliable as gasoline engines. The combustion of the fuel oil is perfect and there is no exhaust smoke. The explosions can be timed perfectly and they occur with great regularity. Compared with gasoline, the only disadvantage in burning tops is with respect to starting in cold weather, when it is necessary to run for from one to five minutes on gasoline and then change over to tops.

"The experience had with hot-ball engines in Arizona to date has been unsatisfactory. The combustion is imperfect, usually bad. Hot-ball ignition has serious disadvantages. The evil effects of leaky compression are very great. Pump lubricators, water-circulating pumps, and friction-clutch pulleys are required even on small engines. On careful analysis the hot-ball engines do not have any advantage in simplicity. Their useful life will be less than that of 4-cycle engines. . . .

"The use of tops in place of engine distillate decreases the cost of pumping from 20 to 40 per cent. The cost of pumping on a 40-ft. lift with 4 ft. depth of application varies from $8 to $20 per acre, according to whether the plant is used much or little. Under the most favorable conditions the cost of pumped water is no greater than the cost of river water. The cost of pumping on a 100-ft. lift with 4 ft. depth of application varies from $20 to $40 per acre.

Ranches dependent upon so high a lift should be devoted to high-priced crops, such as orchard fruits and vegetables, or to crops whose water requirements are low, such as millet, sorghums, corn, and sugar beets. Not over one-fourth of the acreage should be used for alfalfa. Electric power at the rates prescribed by the Arizona Corporation Commission is much more costly than the use of oil engines. The largest item of cost is the fixed charges. In order to reduce these charges the plant should be used all possible. Never shut down at noon or at night through the irrigating season from March to July. One pumping plant should serve two or more ranches."

Testing small centrifugal pumps, M. R. Blish (*Power, 41 (1915), No. 11, pp. 370–373, figs. 7*).—Methods and apparatus for making capacity tests of centrifugal pumps are described and the apparatus is illustrated.

Sizes of motors driving centrifugal pumps, E. M. Marshall (*Power, 40 (1914), No. 11, pp. 383, 384, fig. 1*).—The calculations necessary for determining the proper size of motor to drive a centrifugal pump under given conditions of delivery and head are outlined and a chart for simplifying these calculations is given.

A graphical process for choosing the electrical drive for pumps, M. Gaze (*Jour. Gasbeleucht., 57 (1914), pp. 726–730, figs. 11; abs. in Wasser u. Abwasser, 9 (1914), No. 2, p. 44*).—A graphical process for facilitating the choice of electrical driving equipment for pumping machinery is described.

Electricity for the farm, F. I. Anderson (*New York: The Macmillan Co., 1915, pp. XXIII+265, pls. 8, figs. 42*).—This book is intended primarily to give the farmer a practical working knowledge of electricity for use as light, heat, and power on the farm. It is divided into three parts with reference to power sources, namely, water power; electricity; and gasoline engines, windmills, etc.

The following chapters are included: A working plant; a little prospecting; how to measure water power; the water wheel and how to install it; the dynamo, what it does, and how; what size plant to install; transmission lines; wiring the house; the electric plant at work; gasoline-engine plants; the storage battery; and battery-charging devices.

Electro-culture (*Sci. Amer. Sup., 79 (1915), No. 2051, pp. 258, 259*).—This is a resumé of the literature and a summary of facts from scattered sources.

It has been found that the experiments of the past fall naturally into five classes, differing principally in the method of application of electrical energy. These are (1) illumination by electric light, (2) conduction of atmospheric electricity from an elevated collector to an electrode in the soil or to discharge points above the plants, (3) constituting the soil the electrolyte of a voltaic cell by burying in it two plates of dissimilar metal connected by a conductor, (4) passing current from an external source through the soil between electrodes buried therein, and (5) production of a silent or glow discharge through the air from overhead antennæ to the soil.

"The impression gained from the literature of electro-culture is that the last word is by no means said. From the nature of the publications it would appear that the individual investigations have been too cursory. There has been too little systematic variation of conditions, and especially of the electrical conditions. It seems highly desirable that a much more extensive investigation, providing the possibilitiy of trying different intensities of electrification under various conditions of cultivation, irrigation, etc., all during the same season, should be carried out. It is significant that the only investigator to attempt an extended examination of the field was able to locate and eliminate many faults in his method, and thus obtain good results in the end in almost every case, often reversing his previous experience."

The silo and its use, C. H. ECKLES (*Missouri Sta. Bul. 133 (1915), pp. 3–19, figs. 5*).—This bulletin gives general information regarding silos and silage and briefly describes the stave, concrete, plastered, and tile silo types.

Hog, calf, sheep, and goat dipping vat, C. A. CARY (*Alabama Col. Sta. Bul. 185 (1915), pp. 38–41, fig. 1*).—Directions, with a plan, for constructing a concrete dipping vat are given.

Poultry house construction, R. E. JONES and L. E. CARD (*Connecticut Storrs Sta. Bul. 81 (1915), pp. 31–55, figs. 16*).—The purpose of this bulletin is to present in concise form some of the essential points to be considered in poultry house construction and to give plans and specifications for some of the houses that have given good results at the station, including the so-called contest house, the Gilbert farm poultry house, and the colony brooder house. The Connecticut trap nest and dry mash hopper are also described.

Features of construction that are especially emphasized are proper window space, ventilation, and floors. "All windows or openings should be so located that the sun may reach every part of the interior of the house as many hours as possible during each day. A safe proportion of glass to use is 1 sq. ft. of glass to each 12 sq. ft. of floor space. . . . A curtain made of very thin unbleached muslin will allow fresh air to pass in and the moist, foul air to pass out, thus furnishing plenty of ventilation without drafts These curtains are for use only during cold weather and should always be open during the day except when it is necessary to close them for protection against storm. Windows may be placed either in the front or ends as best suits the type of house, but the curtain area should be as near the center of the front as possible in order to prevent the wind blowing in one end of the house, sweeping across the floor, and out at the other end. A safe rule to follow in estimating the curtain area is to allow 1 sq. ft. of cloth to each 6 sq. ft. of floor space. . . . The hens seem to prefer a dirt floor and it provides a natural dust bath at all seasons of the year. . . . It is best to put a layer of sand 5 or 6 in. deep over the dirt as this will help to keep the house dry and at the same time will prevent excessive dust. For a permanent, moisture-proof and rat-proof floor, concrete well insulated with a layer of tarred paper is best. All concrete floors should be covered with a layer of sand and a thick layer of litter to make the birds more comfortable and to facilitate cleaning. A board floor can be used to best advantage in a portable house that is likely to be moved at any season of the year.

The main consideration in the selection of material for a poultry house is that the house must be tight on three sides.

Advisory pamphlet on camp sanitation and housing (*San Francisco: Com. Immigr. and Housing Cal., 1914, pp. 54, figs. 43*).—This pamphlet prepared for owners and superintendents of labor camps on hop and other ranches, contains specific suggestions pertaining to the housing of men in camps, with particular reference to sanitation. The main points covered are location, size and area of sleeping, cooking, and eating quarters, water supply, garbage and refuse disposal, toilet and bathing facilities, flies and manure, and mosquitoes and malaria.

Domestic hygiene: The septic tank, R. SOUÈGES (*Bul. Sci. Pharmacol., 21 (1914), Nos. 8–9, pp. 470–476; 10–12, pp. 510–539, figs. 4*).—The first part of this article discusses physical, chemical, and biological methods for the purification of dometic sewage, taking up particularly the biological action which is generally supposed to occur in septic tanks and filters. The second part deals more particularly with the disposal of residential sewage and sketches the history of small septic tank systems for this purpose.

RURAL ECONOMICS.

Outlets and methods of sale for shippers of fruits and vegetables, J. W. Fisher, Jr., J. H. Collins, and W. A. Sherman (*U. S. Dept. Agr. Bul. 266 (1915), pp. 28*).—This bulletin attempts to show the available outlets for the individual producer in marketing his fruits and vegetables and how he can get in touch with these outlets. The authors call attention to the following points in summarizing:

"Cooperation is desirable between grower and grower, and grower and consumer, but is needed especially between the producer and the distributor. The grower must realize the necessity of living up to an agreement and doing business on a businesslike basis.

"The grower should keep in constant touch with the market, either through the newspapers, trade papers, private firms, auction reports, or by telephone, telegraph, or mail. In offering goods for sale, shippers should give definite and detailed information regarding the prospective shipments, such as the probable date of shipment, the commodity, number of packages, kind and size of package, quantity and quality of each variety, whether freight or express shipment, and the road and route. . . .

"Personal visits to the market patronized will enable the grower to obtain the proper market perspective. He will see the difficulties under which the distributors work, he will see his products in competition with those from the most highly specialized districts, and he will learn the necessity of good quality, honest packing, and standardization.

"Before establishing market connections, the dealer's commercial standing should be studied very carefully. Commercial credit agencies, trade papers, chambers of commerce, and local bankers all can be of assistance in this respect.

"The producer can sell either individually or cooperatively. Cooperative associations assume all marketing responsibilities for the individual shipper and are in a much better position to keep in touch with the market and to secure an equitable distribution.

"Sales direct to the consumer are not always advisable owing to the difficulties of transportation and the problems of collections and bad accounts. Direct-to-the-consumer sales are usually possible only with highly specialized commodities of small bulk. . . .

"Under present methods of distribution most car-lot shipments must be sold through wholesale distributing agencies.

"Sales to country merchants, country collecting agents, country buyers of special products, and traveling buyers are desirable in that the grower deals with the buyer in person and receives cash at the time of sale. . . .

"One advantage of selling goods f. o. b. destination is that although they are liable to rejection in case of damage in transit or a decline in the market, there is at least the prospect of a buyer, and, with reasonable allowances made, the car usualy will return a greater profit than if it had been shipped to the market unordered."

Methods of wholesale distribution of fruits and vegetables on large markets, J. H. Collins, J. W. Fisher, Jr., and W. A. Sherman (*U. S. Dept. Agr. Bul. 267 (1915), pp. 28, figs. 2*).—The authors of this bulletin attempt to explain certain general practices at large distribution centers which receive fruit and vegetables in car-lot quantities.

"The widening distance between producer and consumer has called into existence the middleman of to-day. The fact that the middleman has certain useful functions to perform makes it inadvisable to eliminate him without arranging for some other agency to assume his duties.

"The shipper who starts a car toward market should notify the consignee in such detail that prompt disposition of the goods may be made after the arrival of the car. . . . As perishables should always be inspected promptly on arrival at destination, the shipper should give shipping instructions which permit inspection without unnecessary delay at destination. . . .

"In case a buyer rejects a car the shipper has the option of selling elsewhere or making an allowance to the original purchaser in order to close the transaction immediately. Claims against railroads should be filed in proper form and supported by a presentation of the facts in the case. . . .

"Brokers act as shippers' or buyers' agents. They handle car lots only and offer their services at very low rates. While many brokers are charged with abusing their privileges, they often save the shipper several times the brokerage fee by insuring the acceptance of goods at destination.

"Fruit auctions sell goods for shippers, dealers, and others who have local representatives to withdraw offerings if prices are unsatisfactory. They secure their revenue by levying definite assessments against each package sold, and by attracting buyers and stimulating competition often expand the market for particular commodities. . . .

"The commission merchant receive goods on consignment and acts as the shipper's agent in disposing of these products to the jobbing and retail trade. While the commission merchant is viewed with much suspicion by many shippers, he nevertheless is a very important factor in that he furnishes to shippers the services of a skilled specialist in salesmanship.

"The jobber acts as a secondary distributor, buying from car-lot receivers and selling largely to the retail trade. His chief usefulness lies in facilitating rapid distribution of highly perishable products and in preventing a congestion of business on large wholesale markets.

"Public markets are not important in distributing fruits and vegetables arriving at market in car lots, but do offer direct outlets for neighboring producers. . . .

"Losses and wastes are a very heavy tax on food distribution. The prevention of much needless waste would reduce present marketing costs very materially.

"One of the most practical steps the shipper can take to better his condition is to familiarize himself with business practices and to secure a better knowledge of the way his produce is handled on the market."

A glossary of trade terms is included.

Markets for potatoes (*Univ. Oreg. Bul., n. ser., 12 (1915), No. 5, pp. 41*).—This study was made in an effort to determine possible markets and methods for making the production of potatoes in Oregon more profitable. The author concludes his discussion with the following suggestions:

"A solution of the problem of profitable potato growing and marketing might be found in a cooperative plan that would assure the farmer of his full share of every cent of profit there might be extracted from the business. To this end it might be advisable to establish a central depot at a convenient shipping point readily accessible to the growers of the district in which the association is formed. To this depot all of the growers would ship all of their potatoes, where they would be inspected and sorted.

"Only those of the very highest quality in every respect would be marketed for seed and table use. and these carefully packed and sold under a name or brand that would establish their reputation. . . . All culls and surplus then could be worked up for industrial purposes, and the volume of supply probably would warrant the erection and operation of the necessary plants for drying, starch manufacturing, and alcohol distilling. The peelings from the dryer and the residue from it and the starch factory, including the water from the latter, could be used by the distillery for the extraction of all remaining fermentable values. Pulp mash from the distillery and the 'slop' could be returned to the growers for stock food in proportion to their contribution of potatoes or their needs, and all that finally remained returned to the ground for fertilizer.

"In every stage of the operation every pound of potatoes raised might be made to yield a profit to the growers. This presupposes and includes mutual efforts for the improvement in quality and quantity of potatoes grown and for the combating and eradicating of disease. It might be advisable to grow different varieties especially adapted for baking, frying, boiling, and for high starch content."

Suggestions from America for cooperative selling, A. W. Ashby (*Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 201–210, pl. 1, figs. 2*).—This article contains suggestions for British farmers as to methods of marketing their products, and describes successful American cooperative associations, methods of packing and marketing, the use of brands, and advertising.

How farmers cooperate and double profits, C. Poe (*New York: Orange Judd Co., 1915, pp. 244, pl. 1, fig. 1*).—This book discusses cooperation as found in the United States and European countries, describing typical cooperative organizations. The author believes that the success of cooperation depends upon local leadership and loyalty of the cooperators to their organization, and advocates having a farmers' organization in every rural community.

Report of the committee on production of the New York State Food Investigating Commission, 1913 (*Rpt. Com. Prod. N. Y. State Food Invest. Com., 1913, Apr. 18, pp. 31*).—This report gives detailed statistics concerning the number of farms reporting 1 acre or more of vegetables, with their acreage and value, the cost of producing important vegetables and fruits, and the cost of producing milk in Delaware County for the year 1911–12. For this county it is reported that on 165 farms with 5,164 cows the average cost of keeping a cow was $122.13, and the average returns $90.89, making a loss per cow of $31.24. The report shows details for the different items of expense.

Lower living costs in cities, C. L. King (*New York and London: D. Appleton & Co., 1915, pp. VIII+355*).—This book discusses the problem of food distribution from the point of view of the city consumer, and points out defects in the present system and methods that may be used to bring about a more effective and cheaper distribution. He states that the urban prosperity of the future will be dependent upon paying equal heed to the needs, conveniences, and living costs of the urban worker, and that the city should be planned for economic and social efficiency.

Rise of prices in France on account of the war (*Écon. Franç., 43 (1915), I, No. 23, pp. 723–725*).—In this article is discussed the influence of the war on the price of bread, meat, and other provisions.

Letters from settlers and reports from the seed distribution (*Alaska Stas. Rpt. 1914, pp. 78–89*).—The usual extracts from letters of settlers and other persons, telling of their success with various crops and live stock and describing the possibilities and drawbacks in Alaska, are presented.

Rural survey of Clarke County, Georgia, with special reference to the negroes, W. B. Hill (*Bul. Univ. Ga., No. 236 (1915), pp. 63, figs. 19*).—There are outlined in this report the physical characteristics of the county, and the economic, educational, religious, and social conditions of its rural population.

Nineteenth biennial report of the Kansas State Board of Agriculture, 1913–14 (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. VII+1024, pls. 2, figs. 325*).—This report contains a number of articles relating to rural schools, churches, social centers, cooperative organizations, farm management, public highways, and agricultural education, and statistics relating to crop production and the number of animals by counties.

[Agriculture and rural population in Roumania] (*Bul. Statis. Romaniei, 3. ser., 12 (1915), No. 36–37, pp. 429–545*).—This report shows that of the total population of 7,234,919, 5,904,787 were living in "communes rurales" on December 19, 1912. The increase in the rural population since 1899 amounted to 22.3 per cent. The total area used for agricultural purposes during the crop season 1913–14 was 6,779,609 hectares (16,745,634 acres), of which 4,589,521 hectares were cultivated by farmers with small acreage. The report gives comparative data for earlier years and for minor subdivisions, and for the area devoted to specific crops by the large and small farmers.

[Agriculture in Japan] (*Résumé Statis. Empire Japon, 29 (1913), pp. 21–32*).—These pages of the report give the area cultivated, average and total yield for the principal crops grown in 1913, and comparative data for earlier years.

AGRICULTURAL EDUCATION.

Agricultural education (*Landw. Jahrb. Schweiz, 28 (1914), No. 3, pp. 235–248*).—The development of agricultural education in Switzerland is shown by a historical review beginning with the work of Emanuel v. Fellenberg (1771–1844) and by statistical data.

The statistics show that from 1885 to 1912 the theoretical-practical farm schools with 1-year courses have increased from 3 schools with a total of 130 students and a total state appropriation of $4,988 to 4 schools with 196 students and $10,667; the agricultural winter schools, from 1886 to 1912, from 3 schools with 96 students and $1,507 to 15 schools with 940 students and $23,916; and 2 dairy schools with 18 students and $1,986 to 3 schools with 109 students and $6,506; and the pomological, viticultural, and horticultural schools, from 1887 to 1912, from 1 school with 27 students and $1,790 to 2 schools with 56 students and $4,904. The state aid for itinerant lecturers and special courses increased from $1,603 to $8,262, and the total state aid for the promotion of agricultural education from $4,558 to $56,392.

Alberta schools of agriculture (*Rpt. Demonstr. Farms and Schools Agr. Alberta [1915], pp. 63–87, figs. 16*).—This report outlines the work for the first term just closed of the three schools of agriculture opened in 1913 on demonstration farms at Claresholm, Olds, and Vermilion, and gives a general statement of the results. The attendance for the three schools was 166 boys and 102 girls.

[Reading courses in agriculture and home economics] (*Cornell Reading Courses, 4 (1914), Nos. 73, pp. 20; 74, pp. 16, figs. 9; 75, pp. 21–44; 76, pp. 17–56, pl. 1, figs. 35; 77, pp. 45–73; 78, pp. 57–72, figs. 7; 4 (1915), Nos. 79, pp. 77–100; 80, pp. 73–100, figs. 27; 81, pp. 101–115; 82, pp. 101–120, figs. 16; 83, pp. 117–139, figs. 4; 84, pp. 121–144, figs. 34*).—These reading courses treat of the following subjects: Making cake, introduction to the principles of soil fertility, birds in their relation to agriculture in New York State, songs that live, land drainage and soil efficiency, programs for use in study clubs, incubation, potatoes in the dietary, cream separation, raising vegetables for canning, and insects injurious to the fruit of the apple.

Elementary vocational agriculture for Maryland schools, E. A. Miller (*Md. Agr. Col., El. Vocational Agr. for Md. Schools, 1 (1915), No. 1, pp. 24, figs. 7*).—This is the first of a series of publications to be issued, one for each school month, setting forth lessons in elementary vocational agriculture, outlined after a monthly sequence plan and adapted to the seasonal, agricultural, and school conditions of Maryland. This number is devoted to soil, green feed, crops, hog, orchard, vegetable, fruit and flower gardening, and poultry topics.

and management suggestions for September, including in addition to the classroom instruction in underlying principles practical exercises consisting largely of club activities and home projects, suggested correlations, and references to literature.

A uniform course of study in agriculture for the elementary schools of Ohio (*Ohio Dept. Pub. Instr. Bul. 5* (*1915*), *pp. 65*).—This is a suggestive outline of a course in elementary agriculture, arranged in seasonal sequence, for grades 1, 2–4, inclusive, 5 and 6, and 7 and 8, including laboratory and field work, correlations, and references to literature. A price list of agricultural apparatus for a first grade one-room rural elementary school is appended.

Environment of plants.—II, Soils, J. W. Hotson (*Wash.* (*State*) *Dept. Ed. Bul. 24* (*1914*), *pp. 62, figs. 9*).—This bulletin for high schools contains exercises intended to illustrate certain phenomena that have been or are occurring in the soil, and is based on 12 years' experience in agricultural teaching.

The home vegetable garden (*Cornell Rural School Leaflet, 8* (*1915*), *No. 4, pp. 337–344, figs. 2*).—This article offers suggestions to the older boys and girls for planning and conducting a home vegetable garden to provide food for the home table.

[Tree study] (*Davey Inst. Tree Survey Instr. Book, 1914, Nos. 1, pp. 16, figs. 7; 2, pp. 16, figs. 5; 3, pp. 16, figs. 11; 4, pp. 24, figs. 18; 5, pp. 31, figs. 18; 6, pp. 19, figs. 26; 7, pp. 24, figs. 17; 8, pp. 28; 9, pp. 24, figs. 2; 10, pp. 32, figs. 12; 11, pp. 40, figs. 13; 12, pp. 24, figs. 19*).—This is a series of lessons devoted to a study of the structure of the tree, agencies which destroy trees, including insects, fungi, and bacteria, and other agencies, with the remedies and preventives, pruning, thê use of dynamite in tree culture, correct tree planting, spraying materials and machinery, proper treatment of tree diseases, shade tree insects, and city forestry.

Productive feeding of farm animals, F. W. Woll, edited by K. C. Davis (*Philadelphia: J. B. Lippincott Co., 1915, pp. XI+362, pl. 1, figs. 96*).—This text, prepared for use of agricultural schools and colleges as well as practical farmers, is a systematic treatment of the main principles relating to the feeding of farm animals, and of various feeding stuffs available to stockmen.

Materials for a course in animal husbandry, W. H. Smith (*School Sci. and Math., 15* (*1915*), *No. 2, pp. 100–104*).—This article contains an outline and a discussion of subject matter and of the use of supplementary materials for a course in animal husbandry in the secondary schools. The author deems it "more advisable to make a detailed study of a few classes of animals common to the community than to touch lightly on many with which the student, perhaps in the course of a lifetime, would never come in contact."

Cattle husbandry in rural education for Georgia schools (*Bul. Univ. Ga., No. 218* (*1914*), *pp. 39, figs. 24*).—This bulletin is not intended as a manual for a detailed course of study, but as an appeal to the historical and economic interests of the pupils and to the home and farm interests centering around cattle husbandry. It discusses the educational, social, and economic importance of the subject, the field and the need of cattle husbandry in Georgia, possibilities for progress, types and breeds of cattle, and Georgia boys' cattle clubs, including score cards for beef and dairy cattle.

Judging of draft horses, W. H. Palmer (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *10* (*1915*), *No. 8, pp. 24, figs. 37*).—A study of requirements and relative values for judging draft horses.

Outlines for work in domestic science and domestic arts for the elementary schools in Illinois (*Univ. Ill. Bul., 12* (*1915*), *No. 18, pp. 16*).—These outlines are given for fifth and sixth grade sewing requiring 60 minutes a week and seventh and eighth grade cooking requiring one double period a week. They are the result of several years of work by the committee of the domestic science section of the Illinois High School Conference.

Home canning of fruits and vegetables, J. C. HOGENSON (*Utah Agr. Col., Ext. Div. Circ., 2 (1914), No. 25, pp. 10*).—Instructions to girls for the home canning of fruits and vegetables are given.

How to teach birds, F. O. PAYNE (*Chicago: A Flanagan Co., 1913, pp. 57, figs. 16*).—The author gives an outline of subject matter for the study of birds as a branch of nature study. A list of books helpful to beginners is added.

Outlines in domestic science (*Iowa State Col., Teachers' Short Course Class Notes, 1914–15, pp. 13*).—Lessons in eggs and milk, cereals, meat and meat substitutes, and bread and bread making, are outlined for the use of teachers.

A study of poultry, M. J. ABBEY (*W. Va. School Agr., 5 (1914), No. 3, pp. 28, figs. 16*).—This bulletin is a guide for the study of poultry raising in the months of November to February, inclusive.

A laboratory guide and notebook for use in the study of food preparation for high-school classes in domestic science, BETH W. MULL (*Topeka Kans.: Domestic Science Publishing Co., 1914, pp. 160*).—The material in this notebook is suggested as the result of several years of experience in teaching and supervising secondary domestic science and each experiment has been tried out in both upper-grade and high-school classes. Only a few recipes are given in the practical application of each experiment to illustrate the possibilities of discoveries made.

Conducting a colt show, W. A. BUCHANAN (*Iowa State Col. Agr. Ext. Bul. 21 (1914), pp. 12, figs. 4*).—The author gives directions for organizing and conducting colt shows.

A successful corn growing contest in Black Hawk County, A. A. BURGER (*Iowa State Col. Agr. Ext. Bul. 28 (1915), pp. 8, figs. 5*).—This bulletin contains an account of the rules, conduct, arrangement of exhibit, judging, and results of an acre-yield corn contest open to every corn grower in Black Hawk County, Iowa.

Profit competitions, W. B. ROADHOUSE (*Agr. Gaz. Canada, 2 (1915), No. 2, pp. 145–149*).—Tables are given showing the results of the acre profit competition and the hog feeding competition carried on by the Ontario Department of Agriculture during the past season. These competitions were open to boys who had taken the six weeks' short course with the district representatives who conducted the contests.

Field crop competitions and seed fairs (*Agr. Gaz. Canada, 2 (1915), No. 1, pp. 62–72, figs. 3*).—This article contains reports of progress of the field crop competition and seed fair movement in Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia.

Uniform county fair premium lists, R. F. O'DONNELL (*Iowa State Col. Agr. Ext. Bul. 30 (1915), pp. 12, fig. 1*).—The author suggests a uniform classification of horses, cattle, swine, and sheep which can be used in exhibits at all fairs.

Boys' and girls' agricultural clubs (*Timely Helps for Farmers* [*Col. Agr. Univ. Maine*], *8 (1915), No. 7, pp. 49–56, fig. 1*).—This circular outlines the purpose and results of boys' and girls' club work in Maine, together with the organization of local, general, and state clubs and the county association of agricultural clubs.

Farmers' clubs (*Univ. Minn., Dept. Agr., Ext. Bul. 56 (1915), pp. 16, figs. 5*).—This bulletin reports the progress made by the farmers' club movement in Minnesota and suggests programs for 1915.

The county farm adviser, B. H. CROCHERON (*California Sta. Circ. 133 (1915), pp. 8, figs. 7*).—A revision of Circular 112 (E. S. R., 30, p. 695), describing the work of the farm adviser and how it is organized and conducted.

Annual report of director of extension for the year ending November 1, 1914 (*N. J. Agr. Col. Ext. Bul., 1 (1915), No. 1, pp. 16*).—This report deals with the farm demonstrations, county work, lectures, correspondence, publications, farmers' week, etc.

Farmers' cooperative demonstration and extension work, W. W. LONG (*Clemson Agr. Col. S. C., Ann. Rpt. Demon. and Ext. Work, 1914, pp. 63*).—This report includes a review of an experiment conducted by J. M. Napier, demonstrator in agricultural education, in teaching agriculture in five rural consolidated schools in Darlington County. Each school was visited twice a week by the demonstrator and has 3 acres devoted to soil-building demonstrations by means of a 3-year rotation and 1 acre to orchard.

Farmers' institute work in the United States in 1914, and notes on agricultural extension work in foreign countries, J. M. STEDMAN (*U. S. Dept. Agr. Bul. 269 (1915), pp. 21*).—This is the annual report of the Farmers' Institute Specialist of the Office of Experiment Stations on the progress of the farmers' institute movement in the various States and Territories for the fiscal year ended June 30, 1914, including a list of the officials in charge of farmers' institute work in the United States and the usual statistical tables covering various lines of institute effort. Notes on agricultural extension work in foreign countries are also given.

MISCELLANEOUS.

Annual Report of Alaska Stations, 1914 (*Alaska Stats. Rpt. 1914, pp. 96, pls. 12*).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1914. Meteorological data and accounts of the extensive tests with field and garden crops, live-stock operations, and of other lines of work are abstracted elsewhere in this issue.

Annual Report of Nevada Station, 1914 (*Nevada Sta. Rpt. 1914, pp. 55, pls. 2*).—This contains the organization list, a report of the director on the work of the station and including a discussion of a number of problems of experiment station organization and policy, departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue, a financial statement for the fiscal year ended June 30, 1914, and a list of the publications of the year.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1915), Nos. 4, pp. 8; 5, pp. 16*).—These numbers contain brief articles on the following subjects:

Vol. 3, No. 4.—Managing the Bull, by H. L. Blanchard; Summer Care of Strawberries, by J. L. Stahl; Plant Diseases are Prevalent, by H. L. Rees; Late Sown Feed Crops, by E. B. Stookey; and Care of Moulting Hens, by V. R. McBride.

Vol. 3, No. 5.—Agricultural Fairs; Always Hill Select Potato Seed, by H. L. Rees; Preparing for Fall Planting, by E. B. Stookey; Common Errors in Poultry Keeping, by V. R. McBride; The Queen Bee, by J. W. Ware; and A Remedy for Clover Bloat.

Program of work of the United States Department of Agriculture for the fiscal year 1916, E. H. BRADLEY (*Washington: Govt., 1915, pp. XXVI+447*).—The proposed activities of this Department are set forth in project form.

Laws applicable to the United States Department of Agriculture, compiled by O. H. GATES (*Washington: U. S. Dept. Agr., Office Solicitor, 1915, 3. Sup., pp. 71*).—This publication represents a revision of that previously noted (E. S. R., 32, p. 693), embracing legislation enacted from October 25, 1914, to March 4, 1915, inclusive.

NOTES.

Arizona University and Station.—Director R. H. Forbes has been granted a year's leave of absence, a part of which will be spent in research at the Graduate School of Agriculture at Riverside, California. During his absence G. F. Freeman, head of the department of plant breeding, has been designated acting dean of the college of agriculture and acting director of the station.

Connecticut College.—Dr. Edmund W. Sinnott, of the Bussey Institution of Harvard University, has been appointed professor of botany and genetics, vice Dr. A. F. Blakeslee whose resignation has been previously noted.

Georgia College.—L. M. Roderick, D. V. M. (Ohio State University, 1915), has been appointed instructor in veterinary medicine.

Hawaii Station.—D. T. Fullaway resigned as entomologist June 30 to become field entomologist of the territorial board of agriculture and forestry. W. T. McGeorge, chemist, was transferred July 7 to the San Francisco branch of the food and drug division of this Department and was succeeded July 25 by Maxwell O. Johnson, transferred from the meat inspection division of the Bureau of Animal Industry. J. B. Thompson, formerly in charge of the Guam Station, was appointed assistant agronomist in charge of the Glenwood substation July 5, succeeding F. A. Clowes, resigned to take charge of the agricultural work at the Lahainaluna School at Lahaina.

Massachusetts College and Station.—Stockbridge Hall, the new agricultural building, is nearing completion. This will be the largest and finest building on the campus, costing with equipment $210,000. It is a three-story and basement structure, with a fourth floor attic containing a cereal and crop storage room constructed as a mouse-proof vault. The basement contains soil laboratories, a cement laboratory, and several offices, dark rooms, storage rooms, etc. The first floor is largely devoted to offices and lecture rooms and to the auditorium. This auditorium seats about 900, and is bowl-shaped with a stage 22 by 36 feet. The second and third floors contain laboratories, offices, a library, the agricultural museum, etc.

The entering class numbers over 200 and the entire enrollment over 650.

Recent appointments include the following: John Phelan, professor of rural sociology; Andrew S. Thomson, assistant professor of market gardening; Charles H. Thompson, assistant professor of horticulture; Earl Jones, assistant professor of agronomy; O. A. Jamison, assistant professor of dairying; Eric N. Boland, in charge of boys' and girls' pig club work; Paul Serex, Jr., instructor in chemistry, vice Robert H. Bogue, appointed assistant professor of agricultural chemistry in the Montana College; Alfred G. Lunn, extension assistant in poultry husbandry; Arnold P. Sturtevant, assistant in veterinary science in the station for work in bee diseases; F. G. Merkle, assistant in agronomy; R. P. Armstrong, graduate assistant in pomology, vice John B. Norton, resigned July 1; Donald White, graduate assistant in poultry husbandry beginning September 1; and Harold F. Tompson for station work in market gardening.

George F. Story has resigned as extension instructor in animal husbandry to become professor of animal and dairy husbandry in the Vermont University and Station, and J. A. McLean as associate professor of animal husbandry to engage in commercial work. R. W. Ruprecht, assistant chemist, has been given a year's leave of absence for graduate work at Cornell University.

The veterinary and poultry departments of the station are cooperating with the college extension service in a campaign to eliminate bacillary white diarrhea from the State.

Michigan College and Station.—President J. L. Snyder has been appointed president emeritus, and Dr. F. S. Kedzie acting president. O. F. Jensen has resigned as assistant chemist to pursue graduate studies at the Iowa College. E. J. Miller and E. F. Berger have been appointed assistant chemists.

New Hampshire College and Station.—Charles H. Otis, Ph. D., instructor in botany in the college of arts and sciences of Cornell University, has been appointed assistant in botany and assistant botanist.

Oklahoma College.—Dr. L. Charles Raiford of the department of chemistry of the University of Chicago has been appointed professor of chemistry.

Pennsylvania College and Station.—Work has been started by the experiment station to determine the fertilizer needs of the Dekalb soils, which comprise 43 per cent of the area of the State. A preliminary test, made near Snow Shoe, indicates that abandoned land, as well as virgin soil, responds well to the application of lime. Pot experiments with this soil at the college show that the prime needs are lime and phosphorus. The experiment will be continued and field plats laid off on a larger scale next spring.

R. U. Blasingame resigned August 1 as instructor in agronomy, and A. R. Bechtel as instructor and assistant botanist, September 1. Recent appointments include the following: A. A. Borland as professor of dairy husbandry extension, beginning October 1; Miss M. Jane Newcomb as instructor in home economics extension, beginning September 1; and beginning July 1 A. F. Mason, instructor in horticultural extension, C. W. Clemmer, assistant in agricultural extension, W. D. Swope, assistant in dairy husbandry, F. P. Weaver, transferred from instructor in agricultural chemistry to instructor in farm organization, H. D. Edmiston, transferred from assistant in experimental agricultural chemistry to assistant in agricultural extension, and H. R. Kraybill, transferred from assistant in experimental agricultural chemistry to instructor in agricultural chemistry.

Texas College and Station.—Wilmon Newell, professor of entomology in the college, entomologist in charge of the division of entomology in the station, and ex-officio state entomologist, resigned October 1 to accept a position in Florida under the State Plant Act. The college and station work in entomology have now been separated, and F. B. Paddock has been appointed entomologist in charge of the division of entomology and state entomologist. O. K. Courtney, formerly assistant entomologist in the college, has been appointed assistant entomologist in the station and assistant state entomologist. Louis Wermelskirschen, of the Office of Cereal Investigations of this Department, has been appointed agronomist beginning October 15. H. H. Jobson has been granted two years' leave of absence, beginning November 1, to accept a position as cotton expert with the Chinese Government.

Washington College and Station.—H. W. Reough has been appointed agriculturist of Grant County with headquarters at Ephrata. R. L. Buchanan, assistant in farm crops, has resigned to become county agent with headquarters at Parkersburg, W. Va.

The station has received a donation of $1,000 from William Anderson, of Winthrop, for use in the investigation of the diseases of domestic animals.

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THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. XXXIII DECEMBER, 1915 No. 8

EXPERIMENT STATION RECORD

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1915

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State Station: *Raleigh;* } B. W. Kilgore.[a]
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State College: R. L. Watts.[a]
State College: Institute of Animal Nutrition, H. P. Armsby.[a]
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[a] Director. [b] Agronomist in charge. [c] Acting director.

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[a] Printed in scientific and technical publications outside the Department.

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EXPERIMENT STATION RECORD.

Vol. XXXIII. December, 1915. No. 8.

The recent convention of the International Association of Dairy and Milk Inspectors in Washington, D. C., has directed attention anew to the systematic efforts being made to safeguard on a scientific basis the milk supply of the Nation, and to the remarkable progress achieved in ideals and methods of carrying on this important function. This association, it may be recalled, was organized in 1912 "to develop uniform and efficient inspection of dairy farms, milk establishments, milk, and milk products," but its program has a much wider significance and interest than is attached to technical details of detecting violations of law and conducting prosecutions.

Milk inspection, as was pointed out by a number of speakers at this meeting, has come to be far more than a matter of routine police work. It rests upon a foundation of scientific research in such branches as chemistry, bacteriology, human and veterinary medicine, sanitary science, rural engineering, and economics, as well as of dairying and dairy-farm management. Its aim, also, is not merely regulatory but constructive and educational. This is exemplified in the program of its meetings, the range of subjects including scientific, technical, economic, and educational papers, as well as those dealing with administrative details. Its meetings, therefore, partake of the nature of a national conference of all who are interested in the milk question.

Thus, at the recent Washington meeting, an entire session was devoted to a discussion by Drs. Melvin, Mohler, and Schroeder, of the Bureau of Animal Industry, of problems related to tuberculosis, foot-and-mouth disease, and contagious abortion in dairy cattle. Dr. J. W. Kerr, of the United States Public Health Service, took up the control of milk-borne diseases of man, and Ernest Kelly, of the Dairy Division, the need of medical inspection of employees engaged in the production and handling of milk. There was a technical discussion of the significance of bacteriology in milk by L. A. Rogers, also of the Dairy Division, and a popular address on inspection from the standpoint of the milk and cream producer by Dr. H. W. Wiley, formerly chief of the Bureau of Chemistry.

The work of the agricultural colleges and experiment stations in relation to a better milk supply was a topic assigned to Prof. W. A. Stocking, of the Cornell University and Station. The relations of milk inspection to other forms of food control were outlined by Dr. C. L. Alsberg, chief of the Bureau of Chemistry, who spoke with special reference to the policy of that Bureau in dairy and milk inspection under the Food and Drugs Act; and Dr. John F. Anderson, president of the American Public Health Association, discussed milk standards or grades. The committee reports likewise covered a wide range of subjects, such as bovine and human diseases in their relation to the milk supply and to the public health, dairy farm and city milk plant inspection, the chemical examination of milk and milk products, methods of appointment and compensation of inspectors, and legislation and legislative limits for the control of milk and cream.

This program amply indicates the manifold phases and breadth which this subject has assumed within recent years. From being primarily an examination by rather crude methods to detect watering or skimming, milk inspection has become a far-reaching and many-sided function, involving the health of the animals producing the milk, the sanitary conditions under which it is produced and handled, and the large question of disease transmission, quite as much as the strictly chemical control. All this has developed through and along with investigation, much of it in the field of agricultural investigation.

The response of dairying to the progress of investigation has perhaps been more rapid than that in almost any other branch of agriculture. Here, to a very notable extent, the rule of thumb has given way to the rule of reason, and the progress of the industry has been with and as a result of a clearer understanding. As it has become a more intelligent industry, so it has likewise become a more technical and complicated one, success requiring higher skill and superior judgment, and more attention to the ultimate use of the product.

The relations of the producer and consumer have become increasingly evident as investigation has developed, and this has led to larger reliance upon the inspection service to look after the consumers' interests, and at the same time to instruct the producers. Assistance to the producer has not been overlooked, for success does not flourish under an attitude of antagonism growing out of compulsion, but under one of cooperation. The inspection agencies have thus been a medium of instruction, and the experiment stations and this Department, in their investigations, have had the producer in mind quite as much as the consumer, in order that he might improve his business in producing a better quality of product. This dual relationship gives to the meeting general agricultural interest, which takes account of the progress in the production of a safe milk supply.

How large and important the question of milk supply has become may be seen from a recent estimate that in 1909 4,260,324,206 gallons of milk were consumed as such in this country. This represented an estimated value to the producer of $647,569,279, and to the consumer of $1,463,847,397. The perishable nature of this food and its peculiar susceptibility to contamination and the transmission of infectious diseases, coupled with its extensive use in the feeding of infants and invalids, make manifest the need of adequate systems of inspection.

Efforts to safeguard the milk supply against adulteration began in this country many years ago. In fact, many communities had laws or ordinances for the prevention of milk adulteration long before making any attempt at general regulation of the entire food supply. Probably the first dairy laws were those enacted in Massachusetts in 1856 against the adulteration of milk by adding water, and in 1859 prohibiting the feeding of brewery waste to cattle. During the latter year the appointment of dairy inspectors was authorized, and in 1880 a minimum standard was fixed for total solids in milk.

Much of the earlier legislation, as already pointed out, was directed against the deliberate adulteration of milk, as by watering, skimming, and the addition of preservatives, artificial color, or thickening agents, and was based upon a more or less crude examination of the milk as it appeared in the market. The necessity for inspection of the dairies and of the cattle producing the milk became apparent with the increased knowledge of the sources of milk infection and its dangers, and the sanitary side assumed a prominence fully equal to the chemical and physical. In 1895, a milk law was enacted for the District of Columbia under which permits were required for the sale of milk, and one condition for granting these permits was the maintenance in a sanitary condition of the cattle producing the milk wherever located, as well as of the premises where it was produced and handled. In 1898, the city of Boston adopted somewhat similar ordinances governing the sanitary condition of its milk supply, and since then regulation along these lines has become quite general.

The first attempt to rate conditions on dairy farms in terms of figures was in the District of Columbia in 1904, when Dr. Woodward, of the Health Department, originated a score card for this purpose. In 1905, R. A. Pearson evolved the Cornell score card, and in 1906 a modified score card was issued by the Dairy Division of this Department. In 1907, the Association of Official Dairy Instructors prepared a card, which has been revised in succeeding years and is now in extensive use.

Practically contemporaneous with the development of the inspection movement has been that of the medical milk commission, which started as a professional crusade in 1889 of the Medical Society of New Jersey, but which united with it sanitarians, health authorities, and other agencies striving for pure milk. The purpose of these commissions, which numbered in 1914 about 75, was primarily the production of what came to be known as "certified milk," but with the organization of the American Association of Medical Milk Commissions in 1907, it took on a wider scope and included an educational propaganda looking toward the betterment of all milk supplies. This movement has had considerable influence in improving the general milk supplies of cities where such commissions exist, by setting a higher standard of quality and by creating a public sentiment in favor of pure milk. In 1910 a commission appointed by the New York Milk Committee advised the establishment of milk standards, with proper labeling. The State of New York subsequently defined grades of milk for sale in cities and villages, and many communities throughout the country have taken similar action.

The change in spirit manifested in the administration of milk inspection regulations was a theme referred to by many of the speakers. Thus, Professor Stocking declared that "formerly the prime object of the inspector was to bring legal action against and impose a penalty upon every man who did not conform to the established ideals. Fortunately, this spirit has given place to one of helpfulness, and the prime object of the inspector now is to assist the producer and handler in so conducting his business that his product will be of the best quality." Similarly, Dr. Alsberg referred to the present day ideal, not of mere prosecution of offenders but of cooperation and constructive work with all concerned. The inspection of milk and dairies has come to be looked upon as less a police than as an educational duty, and the inspector, so far as possible, as an educator and advisor to both producer and consumer.

One result of this change in attitude has been the increased weight attached to the qualifications of the inspector. Whereas a few years ago appointing officials did not always appreciate the importance of this factor, the need of selecting men with thorough scientific training and experience, so far as available, is now becoming more generally recognized. It was pointed out by Professor Stocking that one function of the agricultural colleges is to train men for this line of work.

Even more fundamental is the establishment of a body of scientific knowledge as the foundation for a sound practice. If regulations, however salutary in purpose, are promulgated without sufficient consideration as to their necessity or practicability, friction in their enforcement is well-nigh inevitable. It is the function of science to forestall the possibility, in the zeal for improvement, of arbitrary requirements and consequent injustice by providing a definite answer as to what conditions are fair and essential.

The experiment stations and the Dairy Division of this Department, as was frequently pointed out at the meeting, have been prominent among the many agencies instrumental in supplying information along these lines. A resolution was adopted by the association endorsing the work of the Dairy Division, and especially that pertaining to its market milk investigations. The stations have not, of course, been directly engaged in enforcing inspection laws, but matters relating to inspection problems have received careful attention, and much of their work has been fundamental. The composition and properties of milk, its cost of production, the effect of various dairy practices on its quality, and many other factors have been studied, and knowledge acquired which has been useful in the drafting and administration of fair and adequate regulations and also in many other ways. For instance, early in the history of the stations, the invention of the Babcock test at the Wisconsin Station in 1890 provided a means of rapidly ascertaining the fat content of milk and cream in place of the former cumbersome and time-consuming extraction methods, and its adoption not only facilitated the campaign against adulteration by skimming but led to far-reaching changes in the whole dairy industry by its intimate relations to herd improvement and similar phases.

It is probable that the stations have also rendered much useful service by dispelling popular prejudice against certain dairy methods and showing that these were unobjectionable. As an example, the introduction of the silo has revolutionized dairy practice in this country, yet for many years there was a strong prejudice on the part of some consumers against milk from cows fed corn silage. The studies of the Wisconsin Station, reported in 1897, and of the Illinois Station reported in 1905 demonstrated that corn silage, fed under proper precautions, did not produce objectionable flavors in milk and its use in high-grade dairies is to-day well-nigh universal.

Another early popular fallacy was that yellow color in milk and cream is indicative of richness in butter fat. Palmer, of the Dairy Division, and Eckles, of the Missouri Station, however, have demonstrated that very little relation exists between the two characteristics, the color being identified as mainly the substance carotin found in certain feeds which, when consumed by cows, imparts its shade to the milk and cream.

The readiness with which milk absorbs odors from the air was early demonstrated by station workers and led to radical reforms in methods of milk production and care. The discovery of the value of the covered and the small-topped milk pail was a consequence of the experiments at the Connecticut Storrs Station and elsewhere, demonstrating that dirt particles and bacteria from the cow's body and the air found their way into the milk. That feeding after milking, washing and clipping the cow's udder and flank, and other aseptic measures all aided in the production of a cleaner and more sanitary milk, was also indicated. The accumulated results of such studies as these pointed to the cow as a leading source of infection and logically led to effective and practical remedies. The importance of prompt and efficient cooling of milk followed studies of the temperature relations of dairy bacteria, and has become a part of good practice. The effect of milking machines on the germ content of the milk has been studied by various institutions, and the necessity of exercising proper precautions, especially in washing and cleansing all parts, has been amply demonstrated through practical trials.

The subject of pasteurization has received no little attention from the Dairy Division and from many station workers. The pasteurization of milk in the bottle has recently been found to be entirely feasible and to be even more efficient in reducing the bacterial content of milk than the customary "holder" system of pasteurizing. The relation of proper pasteurization as an efficient safeguard against the spread of communicable diseases has likewise been shown in both a scientific and a practical way. Aside from the effects of pasteurization in reducing the bacterial content of milk, the influence of heat upon the composition and properties of milk has received attention, notably that upon the viscosity of milk and the proteids and fat globules.

The sources of bacteria in milk have been studied as well as the fermentations produced by various species. Particular attention has been paid to the prevention of bacterial contamination, and methods of destroying or delaying the development of the organisms that do gain access to milk have been repeatedly tested. Much valuable information has been acquired, but as was pointed out by Rogers at this meeting, bacteriology is still a young science with a constantly changing technique and frequent discoveries of unexplored fields. This is illustrated by the experience with the bacterial count as an indicator of pollution. For some years, it has been generally assumed that the bacterial content is a measure of the sanitary quality of milk, and the plate method a measure of the bacteria. Recent tests, however, have indicated in the opinion of Professor Stocking, that "extreme liberality must be used in the interpretation of the plate count, and that it can be depended on only between wide limits for setting definite bacterial standards until we have a means of determining the germ content of milk with greater accuracy. We look to the experiment stations for help in this problem."

A factor of increasing importance to inspection work considered at the meeting of the association is the medical inspection of dairy employees. In reply to questions sent out by the Bureau of Animal Industry to health officials of cities of populations of 5,000 or over, it was found that cities generally have maintained a very incomplete supervision over the health of employees in places where dairy products are handled. Less than one-half of the 560 cities replying claimed to have laws concerning the control of communicable diseases among employees of places where dairy products were produced, and only 10 per cent required reports from milk producers in the event of the occurrence of disease among these families and employees. It was suggested by speakers at the meeting that if municipalities were to require certificates of inspection from the health authorities of counties from which their milk supply came, and regular reports of the health of all dairy employees, a powerful impetus would be given toward the reduction of milk-borne diseases.

An entire session of the meeting, as already stated, was very properly given to the question of diseases of dairy animals. Ever since the discovery of the relation of human and bovine tuberculosis, this subject, in particular, has been one to which much persistent study has been devoted. It has escaped the consideration of neither the inspector nor the health official, as well as the veterinarian and scientific investigator.

In 1907, the Bureau of Animal Industry began its first systematic cooperation with cattle owners looking toward the eradication of bovine tuberculosis by an educational campaign in and around the District of Columbia. The tuberculin test was made compulsory in the District of Columbia in 1909. At that time 18.87 per cent of the cattle were found tuberculous; the following year 3.2 per cent; and in January, 1915, 1.75 per cent. The results in connection with tests conducted in 1913 revealed the interesting facts in that out of 203 herds of cattle in Virginia and Maryland, under continuous supervision by the Bureau of Animal Industry, 69 formerly tuberculous herds were free from the disease and that in 56 herds where cooperation had been effective during the period of five years, no case of tuberculosis had been found during that period. As outlined by Dr. Melvin at the meeting of the association, it is now purposed to establish a system of cooperation between the Bureau and breeders of pure-bred cattle, state live-stock authorities, and breed-record associations, it being the intention to maintain an official public record for all pure-bred herds which can be certified as safe herds from which tuberculosis-free cattle may be purchased. It was announced that this proposal has met with favorable replies from cattle breeders and if put in operation will mark a material advance in the campaign for better milk.

In what has been said no attempt has been made to present a comprehensive review of either the history and present status of milk inspection or of the scientific work related thereto. The aim has been rather to indicate some of the principal lines toward which attention is being directed and to point out the dependence of the inspection service on scientific work for the solution of many of its unsolved problems. Some of these problems are, of course, outside the field of experiment station activity, but others appear both appropriate and feasible, and it is thought that their consideration may prove suggestive of opportunities for research at once fundamental and of immediate application.

There are several lessons to be drawn from the history of milk and dairy inspection as developed in the last quarter of a century. One is that safe progress in defining methods and standards must rest upon investigation, which must often be thorough and far-reaching in order to serve as an intelligent basis for action. Nowhere is the danger of imperfect information and too broad generalization more strikingly enforced by possible consequences. The investigation can not safely stop with the empirical fact but needs to disclose the cause and the relationships.

Nor can it be restricted to the laboratory and to laboratory conditions. It is when laboratory studies have been supported by studies and trials on a practical scale and under practical conditions that the results have been most convincing and have proved most dependable. And finally, the investigator must take full account of the producer, in the effort to help him to make his practice more scientific and the science of production more practical.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A study of the soft resins in sulphured and unsulphured hops in cold and in open storage, G. A. Russell (*U. S. Dept. Agr. Bul. 282 (1915), pp. 19, figs. 10*).—The commercial value of hops is almost entirely contingent upon two considerations, viz, the nature and quantity of the soft resins and the aroma. In order to get additional data (E. S. R., 29, p. 13) regarding the effect of various storage conditions upon the soft resins of sulphured and unsulphured hops, a quantity of material obtained from Perkins, Cal., was prepared and held under observation for several years.

"Although sulphuring and cold storage are efficient factors in retarding the diminution of the quantity of soft resins in hops, they do not prevent chemical changes from taking place therein. Nevertheless, the data obtained by the study of these changes indicate that they are influenced to a considerable degree by both sulphuring and cold storage. . . .

"Determinations were made of the moisture, the percentage of soft resins, hard resins, and total resins, of the color, odor, and taste of the soft resins, and of the acid, ester, saponification, and iodin values of the soft resins. The moisture content in the sulphured and unsulphured hops held in cold storage increased during the first year and then remained practically constant in all the samples throughout the period of storage. The moisture content of the sulphured and unsulphured hops in open storage varied from year to year, according to existing weather conditions.

"The percentage of soft resins in all the samples decreased with each year of storage, becoming very pronounced in the third year. The percentage of hard resins in all the samples increased with each year of storage, approaching a uniform figure at the close of the third year. Both sulphuring and cold storage retarded the decrease in the percentage of soft resins and increased the percentage of hard resins. A combination of the two factors was more effective in retarding these changes than either factor alone.

"The percentage of total resins in all the samples varied from year to year, and in the third year it became materially less than that of the original sample. The low total is probably due to the formation of products insoluble in the solvents used.

"The color, odor, and taste of the soft resins are of very little value in determining quality and are not indicative of any changes that may have taken place therein.

"The acid value in general decreased in the sulphured hops in cold and in open storage, and increased in the unsulphured hops in cold and in open storage. Sulphuring apparently retards the formation of free acids, and a combination of sulphuring and cold storage is most effective in retarding changes in free acidity.

"The ester value in general increased in all the samples of hops. Sulphuring apparently favors the formation of esters, and this factor in combination with open storage appears to be the least effective in retarding the formation of esters. Nonsulphuring and open storage appears to be the most effective in retarding the formation of esters.

"The saponification value in general increased in all the samples of hops. The unsulphured hops showed the least change, and of these, the ones held in open storage were the least affected.

"The iodin value in general increased in all the samples. It was most pronounced in the second year of storage and in the third year was uniform in all the samples. Sulphuring in combination with open storage appears to cause a uniform rate of increase in the iodin value from year to year. The sulphured hops in open storage showed the least variation in changes in the chemical values of the soft resins.

"During the period of storage, at least some of the components of the soft resins underwent rearrangement. This rearrangement was most marked during the first year, after which it decreased to such an extent that thereafter comparable values for the chemical constants were readily obtained."

The amount of arsenic in solution when lead arsenate is added to different spray solutions, W. B. Ellett and J. T. Grissom (*Virginia Sta. Tech. Bul. 8 (1915), pp. 160–164; Rpts. 1913–14, pp. 160–164*).—"Sodium and potassium sulphids dissolve more arsenic when mixed with lead arsenate than the commercial lime and barium sulphur spray solutions. When arsenate of lead is added to either the summer strength of sodium sulphur or potassium sulphur, a large percentage of arsenic goes into solution. Barium chlorid retards the solubility of the arsenic when added to sodium and potassium sulphids.

When lead arsenate is added to the different sulphur spray solutions, the amount of arsenic in solution is increased. This accounts for the burning effect when used together as a spray. . . . If mixtures with arsenic are desired for spraying, lead arsenate is less harmful than Paris green.

"With calcium and barium the arsenic is less soluble than with sodium and potassium. . . . Barium arsenate, when used with the different sulphur sprays, indicates that slight burning would take place with lime and barium sulphur, and that the amount of arsenic in solution is less than when used with water. With sodium and potassium sulphids this substance would be harmful."

Two rapid methods for determining potassium, F. Crotogino (*Kali, 8 (1914), pp. 332–334; abs. in Ztschr. Angew. Chem., 27 (1914), No. 99, Referatenteil, p. 697*).—The first method is approximate and consists of adding dropwise sodium perchlorate to the potassium chlorid solution until no further precipitation is obtained.

A more exact method is as follows: To 5 cc. of the solution (3.395 gm. in 50 (cc.) add 4 cc. sodium perchlorate solution (2,100 gm. in 2,110 cc. of water), rotate, and filter through a weighed filter paper with the aid of the air pump; then wash with alcohol, dry the filter paper and contents at from 135 to 140° C., and weigh. The method requires 15 minutes to carry out. The variation in the results of 35 determinations was 0.23 per cent.

Greeff's method for the volumetric estimation of fluorin, I. Bellucci (*Ann. Chem. Appl. [Rome], 1 (1914), No. 9–10, pp. 441–446; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 621, II, p. 574*).—Tests were made with varying amounts of sodium fluorid in order to ascertain the accuracy and limits of applicability of the method.[a]

"The conditions given by this method yield accurate results only when the amount of alkali fluorid does not differ greatly from 0.2 gm.; thus 0.05, 0.04, and 0.02 gm. taken gave, respectively, 0.0449, 0.0336, and 0.0078 gm. found. With

[a] Ber. Deut. Chem. Gesell., 46 (1913), No. 12, pp. 2511–2513.

these smaller quantities of fluorids approximate estimations may be effected if the titrations are carried out in the presence of proportionately small amounts of sodium chlorid."

Carbon dioxid apparatus III.—Another special apparatus for the estimation of very minute quantities of carbon dioxid, S. TASHIRO (*Jour. Biol. Chem., 16 (1914), No. 4, pp. 485–494, figs. 2*).—Although the apparatus previously mentioned (E. S. R., 28, p. 410) is deemed satisfactory for almost all micrometabolic problems, it is sometimes inconvenient for the complete determination of the carbon dioxid production of a single tissue, the metabolic rate of which is constantly changing and the available amount of which is not very great. The device described in this paper was constructed for satisfying this need.

The estimation of nitrogen in Norwegian saltpeter, N. BUSVOLD (*Chem. Ztg., 38 (1914), No. 75, pp. 799, 800, fig. 1; abs. in Ztschr. Angew. Chem., 27 (1914), No. 75, Referatenteil, p. 545*).—It has been found that analyses of Norwegian saltpeter made with the ordinary Kjeldahl apparatus give low results for nitrogen, and a study was therefore made of various other methods. The method finally decided upon was the one utilizing the principle of converting nitrate into ammonia reported by Treadwell and Wegelin.[a]

Determination of nitrogen in mixtures of calcium nitrate and cyanamid, A. STUTZER (*Chem. Ztg., 38 (1914), No. 56, p. 597; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 11, p. 606*).—In the method nitrite and nitrate are determined first by Schlösing's method (reaction with ferrous chlorid). Then an aliquot made free from nitrate is treated by Kjeldahl's method. "By heating 1 gm. with 5 gm. of dry ferrous chlorid and 25 cc. of concentrated hydrochloric acid, under slight pressure (in a flask fitted with a Bunsen valve), the nitrate may be completely eliminated on the water bath in half an hour. In preparing a mixture of calcium nitrate and cyanamid for use as a fertilizer, loss of nitrogen is liable to occur if the temperature be raised above 60° C."

The vegetation test as a basis for fertilizer analysis, MITSCHERLICH (*Landw. Vers. Stat., 85 (1914), No. 3–5, pp. 202–218, figs. 2*).—A discussion of the methods for making vegetation tests and their interpretation on a mathematical basis.

The estimation of silicic acid in natural waters, L. W. WINKLER (*Ztschr. Angew. Chem., 27 (1914), No. 66–69, Aufsatzteil, pp. 511, 512*).—The method is based on the yellow color produced when ammonium molybdate is added to a water containing silicic acid and then acidified with hydrochloric acid. The intensity of the color is proportional to the amount of silicic acid present. A solution of potassium dichromate is used as the colorimetric standard.

Note on a new apparatus for use with the Winkler method for dissolved oxygen in water, H. L. SHOUB (*Pub. Health Surv. U. S., Hyg. Lab. Bul. 96 (1914), pp. 83–85, fig. 1*).—A description with illustrations of the apparatus.

Nitrogen-protein table, R. S. CALLAWAY (*Jour. Indus. and Engin. Chem., 7 (1915), No. 2, p. 161*).—A table for chemists making analyses of feeding stuffs using the factors 5.7 and 6.25.

Apparatus for the determination of fat by the Roese-Gottlieb method, W. BRINSMAID (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, pp. 324, 325, figs. 4*).—A modified Roese-Gottlieb tube differing somewhat from the Patrick modification of the apparatus.

The unsaponifiable constituents of natural and hardened fats, J. MARCUSSON and G. MEYERHEIM (*Ztschr. Angew. Chem., 27 (1914), No. 28,*

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[a] Kritische Prüfung der wichtigsten Methoden zur Bestimmung der Salpetersäure. Zurich, 1907, pp. 135.

Aufsatzteil, pp. 201–203).—Phytosterol is far more resistant to catalytic reduction than cholesterol. At 200° C. 75 per cent of the latter becomes resinified while phytosterol is hardly affected at this temperature by the catalyst. Hydrogenation at 250° of cholesterol no longer yields crystalline products, whereas appreciable amounts can be obtained from phytosterol under the same conditions. This explains why some of the transformation products of stearins in lard oil are not detected by the examination of the fat. Cholesterol is evidently transformed in a way that will not allow its detection by the digitonin method.

The detection of plant fats in animal fats, H. SPRINKMEYER and A. DIEDRICHS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No. 5, pp. 236–244*).—The Fritzsche procedure was so modified as to eliminate any possibility of digitonin decomposition products interfering with the melting point determination. When this is not taken into consideration erroneous results may be obtained in regard to the presence of phytosterol in animal fat. The modification was tested on oleomargarin, butter, lard, "premier jus," cotton-seed oil, sesame oil, coconut fat, oleomargarin with 2, 5, and 10 per cent cotton-seed oil, and butter with 10 and 15 per cent coconut fat. The third crystallization usually gave the desired results. Unsatisfactory results were obtained with the method for the detection of 2 per cent cotton-seed oil in oleomargarin, and 10 per cent coconut fat in butter.

The Klostermann method, a modification of the Marcusson and Schilling method (see abstract above), is not deemed as simple nor as cheap to conduct as the Fritzsche modification. A modification of the Klostermann method was studied with lard, "premier jus," oleomargarin, goat tallow, wild hog lard, horse fat, wool fat, whale oil, cotton-seed oil, peanut oil, olive oil, soy-bean oil, linseed oil, poppy-seed oil, corn-seed oil, tea oil, rape-seed oil, niger oil from *Guizota oleifera*, mustard oil, coconut fat, hydrogenated linseed oil, palm fat, cacao butter, Chinese vegetable tallow, Enkabang (Borneo), mowrah butter, shea butter, and mixtures of lard and cotton-seed oil, oleomargarin and cotton-seed oil, wool fat and cotton-seed oil, wool fat and soy-bean oil, wool fat and peanut oil, and oleomargarin and mowrah butter. By this work it was established that cholesterol in animal fats is in the free state, whereas the phytosterol present in plant fats seems to be an ester combination. The lowest melting point was found with the esters of olive oil. The detection of the 2 per cent cotton-seed oil in lard was easily accomplished by this method, but 10 per cent could not be noted, nor could 10 to 15 per cent of peanut oil in wool fat. Ten per cent of soy-bean oil was noted, however. Ten per cent of mowrah fat could not be discovered in oleomargarin. It is concluded that the Klostermann method can in some instances be used in place of the Fritzsche test.

The estimation of carbohydrates.—IV, The presence of free pentoses in plant extracts and the influence of other sugars on their estimation, W. A. DAVIS and G. C. SAWYER (*Jour. Agr. Sci. [England], 6 (1914), No. 4, pp. 406–412*).—Continuing previous work (E. S. R., 32, p. 314), the present paper brings forth evidence that free pentoses are usually present in alcoholic extracts of plants and have to be taken into consideration in the scheme of analysis. "Their amount can be estimated with a fair degree of accuracy by the ordinary distillation process or by the reducing power of the purified liquor after other sugars have been fermented away. When, however, small amounts of pentose have to be estimated accurately in presence of large quantities of other sugars, it is advisable, as suggested by Kluyver,[a] to ferment away these sugars before applying Kröber's process" (E. S. R., 13, p. 320).

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[a] Biochemische Suikerbepalingen. Leyden: E. J. Brill, 1914, pp. XI + 223.

A large number of estimations made with the leaves of different plants (mangolds, turnips, *Tropæolum majus*, Helianthus, carrot, potato, etc.) showed the percentage of pentose obtained by the distillation method, when applied to the alcoholic extract treated according to the author's scheme of analysis, to range from 0.3 to 1 per cent, calculated on the total vacuum-dried matter. Tests were also carried out with sugars.

In regard to the utility of the Tollens-Krüger method for estimating pentosans, O. Fallada, E. Stein, and J. Ravnikar (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 3, pp. 425–432*).—Crystalline sucrose submitted to test by the phloroglucin method yielded a higher amount of furfurol than previously reported by Andrlik.[a] This is probably due to the fact that an oil bath with a higher temperature (155° C.) was used in the operation. When the distillations were conducted under uniform conditions, contrary to Andrlik's opinion uniform results could be obtained if amounts of 5 gm. sucrose were used for the determination. Above this point ununiformity of results began.

Dextrose and levulose when used in the proportion yielded when 10 gm. of sucrose is hydrolyzed gave 107.4 mg. of phloroglucin, and about the same amounts when treated separately.

Another precipitation method, that of Jager and Unger with babiturenic acid,[b] was also studied. Babiturenic acid in warm 12 per cent hydrochloric acid yields a condensation product with furfurol. In this method the pentosan determination is carried on as in the phloroglucin procedure save that the distillation should be carried quickly to a point of 400 cc. of distillate. The babiturenic acid yielded lower results for furfurol than the phloroglucin method, but it is thought that it should be studied further, as the results obtained with it are deemed more exact.

The present position of the chemistry of starch, H. Pringsheim (*Landw. Vers. Stat., 84 (1914), No. 3–4, pp. 267–282*).—A digest of the literature.

Determination of calcium in solid substances and fluids derived from the animal organism, S. Gutmann (*Biochem. Ztschr., 58 (1914), No. 6, pp. 470, 471*).—In Aron's method (E. S. R., 19, p. 1009) in which the calcium salts are precipitated by alcohol after destruction of the organic matter by a nitric-sulphuric acid mixture, some of the calcium sulphate adheres to the walls of the flask. This error may be obviated if alcohol is added after eliminating the excess of nitric acid and the precipitate is filtered off after standing until the next day. The precipitate thus obtained is returned to the flask and dissolved in a 10 per cent sodium carbonate solution and heated for one-half hour. The carbonate formed is dissolved in acetic acid and the excess of acid neutralized with ammonia, when the calcium is precipitated in the usual manner as calcium oxalate.

A method for determining small amounts of boron in organic materials, G. Bertrand and H. Agulhon (*Ann. Falsif., 7 (1914), No. 67, p. 223*).—A correction to the work previously noted (E. S. R., 32, p. 206).

Rapid detection for quantitative estimation of small amounts of esterase, A. Bach (*Fermentforsch., 1 (1915), No. 2, pp. 151–154*).—Tyrosinase is a mixture of amino acidase and ordinary phenolase. The latter does not oxidize tyrosin as such, but only after it has been converted by amino acidase into paraoxyphenyl acetaldehyde, ammonia, and carbon dioxid. As phenol esters

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[a] Zeitschr. f. Zuckerindustrie in Pöhmen. XXXIII, 1898–99, p. 314.

[b] Ber. Deut. Chem. Gesell., 35 (1902), No. 20, pp. 4440–4447; 36 (1903), No. 6, pp. 1222–1229.

are not destroyed by phenolase or by peroxidase plus hydrogen peroxid, the following method is employed for noting esterase activity:

One gm. of the material to be tested is rubbed up with quartz sand, and 5 drops of glycerol are incorporated with 500 cc. of lukewarm water and strained through a cloth. Ten cc. of the emulsion-like cloudy fluid is mixed in a test tube with 0.1 gm. of guaiacol carbonate and a few drops of toluol and placed in an incubator at 40° C. At the same time a control test is made under similar conditions but the emulsion added is previously heated to the boiling point. After 5 to 30 minutes both samples are heated rapidly to the boiling point for the purpose of destroying catalase and perhydrase, then cooled, and 1 drop of peroxidase and 1 drop of a 3 per cent solution of hydrogen peroxid are added. According to the quantity of esterases present a more or less brownish red coloration ensues. The control remains colorless.

A method is also given wherewith one can follow the quantitative cleavage of guaiacol carbonate.

International review of the literature of food, its composition, analysis, and adulteration, for the year 1911, A. J. J. VANDEVELDE (*Répert. Internat. Comp., Anal. et Falsif. Denrees Aliment., 12 (1911), pp. 88+10*).—A continuation of the work previously noted (E. S. R., 29, p. 360).

The decomposition of protein substances of milk through the action of lactic ferments, W. C. DE GRAAFF and MLLE. A. SCHAAP (*Ann. Falsif., 6 (1913), No. 62, pp. 639–645*).—With the aid of the method previously noted (E. S. R., 31, p. 413) it was found that the aldehyde index of buttermilk was much greater than that of fresh milk. This is due to the decomposition of the protein substances of milk by the microscopic flora which develop and cause proteolysis. The cocci and bacilli producing lactic acid are not the only microorganisms which peptonize.

A rapid method for casein in milk, W. O. WALKER (*Jour. Indus. and Engin. Chem., 6 (1914), No. 4, p. 356*).—An addition to the article noted (E. S. R., 32, p. 413). "Since the above work was completed it has been found that beechwood creosote serves as an admirable preservative for milk. When added in the proportion of 5 cc. to 1 pt. of milk, the latter keeps in good condition for several months if placed in the dark. The preservative does not interfere with the casein test, nor the Babcock fat test, provided only one-half the usual amount of sulphuric acid is used.

The judgment of adulterated milk, R. EICHLOFF and H. BLECKMANN (*Milchw. Zentbl., 43 (1914), No. 24, pp. 561–569, fig. 1*).—This investigation was conducted for the purpose of determining to what extent the addition of potassium bichromate employed for preserving milk samples affects the specific gravity, total solids, fat-free solids, and percentage of fat.

It is concluded that with milk samples preserved with 0.1 per cent of potassium bichromate the total solids and fat can be determined with accuracy by the gravimetric method. The results obtained with Fleishmann's formula were unsatisfactory, but incorrect results were also obtained in the case of an unpreserved sample.

A balance with which one can make a rapid estimation of total solids is shown and described.

Detecting milk adulteration by the removal of cream, L. VAN DAM (*Ann. Falsif., 7 (1914), No. 66, pp. 187–195; abs. in Ztschr. Angew. Chem., 27 (1914), No. 53, Referatenteil, p. 417*).—It is deemed possible to detect skimmed milk by determining the ratio of casein to fat in the sample. The casein can be determined according to Cornalba's method and the fats according to the Röse-Gottlieb method. In the 144 samples of milk examined the ratio of casein to fat varied from 0.53 to 0.98, with an average of 0.74. The removal of the cream increased the ratio above 1.

A new constant for detecting partial skimming of milk, R. LEDENT (*Bul. Soc. Chim. Belg., 28 (1914), No. 7, pp. 229–234; abs. in Ztschr. Angew. Chem., 27 (1914), No. 99, Referatenteil, p. 699*).—In this work an attempt was made to bring the ratio of casein to fat as determined by Van Dam (see above) into relation with Cornalba's figures.

The value of the refractometric examination of calcium chlorid serum of milk for the detection of added water, E. ACKERMANN and C. VALENCIEN (*Milchw. Zentbl., 43 (1914), No. 13, pp. 345–349*).—The views expressed by others as to the value of this method (E. S. R., 18, p. 811) are presented and discussed, and results with 108 samples of composite milk are reported. The data include the fat-free dry substance and refraction. By adding 7 per cent of water to each of the samples the fat-free dry substance was found to vary between 9.19 and 8.63 per cent and the refraction from 38.2 to 37.3 per cent (11 samples 38.2 to 38, and 97 samples 37.9 to 37.3 per cent). The Swiss food book calls for 8.5 per cent fat-free substance.

The refraction of milk serum, L. KISS (*Kisérlet. Közlem., 17 (1914), No. 1, pp. 24–34; abs. in Milchw. Zentbl., 43 (1914), No. 18, p. 473*).—The refraction of the calcium chlorid serum of milk diluted with water and preserved with formaldehyde or bichromate of potash was studied.

It was found that the refraction of the calcium chlorid serum falls after the milk is diluted with water. For each 1 per cent of water added up to 10 per cent the refraction drops approximately 0.25°. Of the preservatives recommended for keeping milk samples only formaldehyde has an inappreciable influence on the refraction. On the other hand if 0.1 per cent potassium bichromate is employed the refraction rises from 0.3 to 1.1° and with 0.05 per cent potassium bichromate from 0.1 to 0.65°. The calculation of the specific gravity with Wiegner's formula from the refraction of the calcium chlorid serum yielded very good results.

Quévenne's lacto-densimeter and the calculated extract in milk, E. ISNARD (*Ann. Falsif., 7 (1914), No. 68, pp. 327, 328*).—It is claimed that milk sold as whole milk whose density is less than 1.030 and a skim milk with a density of less than 1.032 must be considered watered.

Society of German Potato Driers (*Ztschr. Angew. Chem., 27 (1914), No. 30, Aufsatzteil, pp. 278, 279*).—This is principally the yearly report of the society, but gives an account of the status of the industry.

METEOROLOGY.

Rainfall and agriculture in the United States, B. C. WALLIS (*Mo. Weather Review, 43 (1915), No. 6, pp. 267–274, fig. 1*).—Continuing studies noted in a previous article (E. S. R., 33, p. 318), the author attempts to correlate rainfall conditions and the growth of various crops, particularly wheat, rye, barley, oats, corn, tobacco, and cotton, in the United States.

The results show that the sequence of crops tends to be consistent throughout the country and further indicates that "(1) the wettest month is usually avoided for harvesting operations; generally the harvest is taken in the period following the rainfall maximum. The rainfall maximum of sections G and H [including mainly the east Central States] falls early, so that harvesting may begin in June. In the central Eastern States, however, the harvest tends to be completed before the rainfall maximum occurs. This circumstance is strikingly illustrated in the cotton States, where the cereal harvests are gathered before the heavy rains and the maize and cotton crops after the maximum has passed.

(2) Generally the summer crops are sown almost immediately before the rains commence and the winter and fall crops immediately the heaviest rains are over; the fast-growing crops are well watered at once and the slow-growing seeds lie during a long period which is dry and cold. (3) The variations in the dates of spring sowings are governed by the dates on which the last killing frosts of spring fall due; this is remarkably shown in connection with the sowing of maize (Indian corn). It becomes, therefore, obvious that, while sowing is related to frost as well as to rainfall, there is a definite adjustment of harvesting operations to the rainfall conditions."

It is pointed out that the discussion in this paper is based almost entirely upon average values, and hence the general conclusions are valid only in a broad way. It is stated that attention is concentrated upon rainfall "for the definite purpose of determining the importance of the rainfall factor in the complex conditions of the environment of the agriculturist. In itself the rainfall régime of an area is typical of its latitude, its situation both on the continent and in relation to the ocean. Therefore, a close relationship between successful agriculture and definite rainfall conditions might have been assumed."

The effect of weather upon the yield of potatoes, J. W. SMITH (*Mo. Weather Rev., 43 (1915), No. 5, pp. 222–236, figs. 23*).—This article discusses the temperature and moisture requirements of potatoes and attempts to correlate the rainfall and temperature of periods of varying lengths during the growing season with the yield of potatoes in central Ohio. Among the conclusions reached are "that cool and wet weather during the first 10 days of July is quite essential as far as central Ohio is concerned, and that the weather of this short period has a large influence upon the final yield of potatoes."

The hottest region in the United States, G. H. WILLSON (*Mo. Weather Rev., 43 (1915), No. 6, pp. 278–280*).—It is stated "that not only the highest temperature in this country occurred in Death Valley, but that the highest shade temperature ever recorded in the open air with standard instruments and under approved methods of exposure in any portion of the world was recorded at Greenland ranch, on the edge of Death Valley, Inyo County, Cal., on July 10, 1913, when the thermometer registered 134° F."

The region of greatest snowfall in the United States, A. H. PALMER (*Mo. Weather Rev., 43 (1915), No. 5, pp. 217–221, pls. 2, fig. 1*).—It is shown that the region of greatest snowfall in the United States is that surrounding Tamarack, Alpine County, Cal., where an average season snowfall of 521.3 in. is recorded. Data for distribution of rainfall and snowfall for other places in California are given. Methods and apparatus used in the measurement of snow are described and conditions accompanying heavy snowfall, pressure from snowfall, the economic importance of deep snows, especially with regard to railway traffic, and historical influences of snowfall are discussed.

It is shown that up to a certain height there is an increase in the total annual precipitation with increase of elevation. Forty years' observations along the Southern Pacific Railway show that up to a height of 6,500 ft. there is an average increase of 0.9 in. of rainfall with every 100 ft. increase of elevation, the rate of increase being greatest between the 3,000 and 4,000 ft. levels. Beyond the 6,500-ft. level the precipitation decreases.

The fertilizing value of rain and snow, F. T. SHUTT (*Canada Expt. Farms Rpts. 1914, pp. 89, 127–129*).—The studies here reported have already been noted from another source (E. S. R., 32, p. 615).

Monthly Weather Review (*Mo. Weather Rev., 43 (1915), Nos. 5, pp. 211–260, pls. 11, figs. 25; 6, pp. 261–310, pls. 12, figs. 7*).—In addition to weather forecasts, river and flood observations and seismological reports for May and June, 1915, lists of additions to the Weather Bureau library and of recent papers on meteorology and seismology, notes on the weather of the months, a condensed climatological summary, and the usual climatological tables and charts, these numbers contain the following articles:

No. 5.—Solar and Sky Radiation Measured at Washington, D. C., during May, 1915, by H. H. Kimball; Confirmatory Experiments on the Value of the Solar Constant of Radiation, by C. G. Abbot, F. E. Fowle, and L. B. Aldrich; Solar Halo of May 11, 1915, at Sand Key, Fla. (illus.), by C. G. Andrus; Solar Halo of May 20, 1915, at Philadelphia (illus.); Halo of May 20, 1915, at New Haven, Conn., by C. S. Hastings; The Region of Greatest Snowfall in the United States (illus.), by A. H. Palmer (see p. 716); The Effect of Weather upon the Yield of Potatoes (illus.), by J. W. Smith (see p. 716); and Ice Conditions in Danish Waters, A. D. 690–1860.

No. 6.—Solar and Sky Radiation Measured at Washington, D. C., during June, 1915, by H. H. Kimball; Systematic Observation of Meteors, by S. A. Mitchell; Internal Reflection as a Source of Error in the Callendar Bolometric Sunshine Receiver (illus.), by E. R. Miller; Rainfall and Agriculture in the United States (illus.), by B. C. Wallis (see p. 715); A Revolving Cloud Camera (illus.), O. L. Fassig; A Test for Personal Error in Meteorological Observations (illus.), by E. R. Miller; The Hottest Region in the United States, by G. H. Willson (see p. 716); Summer Temperatures at Paris and at Reno, Nev., by H. F. Alciatore; Weather and Radium Emanation at Manila, P. I.; Meteorological Papers Presented at the Havre Meeting of the French Association; The Green Flash at Sunset, by A. W. Porter; and Pernter and Exner on the Green Flash.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and D. Potter (*Massachusetts Sta. Met. Buls. 319, 320 (1915), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1915, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological records for 1913 and 1914, H. L. Price (*Virginia Sta. Tech. Bul. 8 (1915), pp. 165–169; Rpts. 1913–14, pp. 165–169*).—Detailed records of tridaily thermometer readings and summaries of observations on temperature, precipitation, cloudiness, and wind for each month of 1913 and 1914 are given.

The United States Weather Bureau, H. E. Williams (*U. S. Dept. Agr., Weather Bur. [Pamphlet], 1915, pp. 58, figs. 10*).—A brief historical account of the Weather Bureau is given and the nature and value of its work are concisely explained.

SOILS—FERTILIZERS.

The development of the study of soils from its beginning to the twentieth century, O. Neuss (*Internat. Mitt. Bodenk., 4 (1914), No. 6, pp. 453–495*).—The author presents a brief historical review covering certain of the more important phases of the development of the study of soils from the time of the early Greeks and Romans.

McLean County soils, C. G. Hopkins, J. G. Mosier, E. Van Alstine, and F. W. Garrett (*Illinois Sta. Soil Rpt. 10 (1915), pp. 52, pls. 4, figs. 8*).—This is the tenth of the series of the Illinois county soil reports.

McLean County lies in central Illinois in the early Wisconsin glaciation. The general topography is undulating to slightly rolling. The soils of the county are divided into four classes as follows: (1) Upland prairie soils, rich in organic matter, (2) upland timber soils containing much less organic matter, (3) terrace soils, and (4) swamp and bottom lands. The brown silt loam of the upland prairie soil occupies 72.6 per cent of the area of the county, the black clay loam of the same class 14.5 per cent, and the yellow-gray silt loam of the upland timber soils 6.2 per cent. It is emphasized that the supplies of plant food in these soils are extremely limited when measured by the needs of large crop yields. "The most significant facts revealed by the investigation of the McLean County soils are the lack of limestone and the low phosphorous content of the common prairie soil and of the most extensive timber type."

Nova Scotia soils, F. T. Shutt (*Canada Expt. Farms Rpts. 1914, pp. 91–96*).—Physical and chemical analyses of eleven samples of typical soils of Nova Scotia are reported.

The distribution of the climatic soil types in Germany, H. Stremme (In *Branca Festschrift. Berlin: Bornträger Bros., 1914, p. 16; abs. in Zentbl. Agr. Chem., 44 (1915), No. 1, p. 6*).—Comparative studies of the existing soil types of Germany are reported.

There occur in Germany, in addition to the excessively wet swamp and moor soils, podzol and related soils of medium dampness and black soils of only moderate dampness. The swampy soils generally occur where the annual rainfall exceeds 23 or 24 in., while the podzol and black soils occur in regions having an annual rainfall of less than about 20 in. Chernozem soils occur in the far inland regions south of Breslau and Halle and podzol and related types in Pomerania in the neighborhood of the Baltic. In the podzol soil regions the humus lime soils (rendzine) from the limestone mountains are known to be endodynamorphic soils, as noted by Glinka (E. S. R., 31, p. 719). Such soils with the iron horizon very evident, just beginning, and entirely absent are described. Certain so-called black soils in East and West Prussia and other localities, which occur as moor marl in basin formations, are said to be partly humus lime soils. In Schleswig and west and south Germany the characteristic formation of the present soil types is obliterated by fossil soils.

The material carried by the streams of the Alps and the Pyrenees, A. Müntz and E. Lainé (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 11, pp. 848–851*).—In connection with investigations of the water resources of the Alps and Pyrenees mountains with reference to the possibilities for irrigation and water power development, studies were made of the silt carried by the streams and of their silt transporting capacities to determine the possibilities of silting of canals and reservoirs. Fifteen observation stations were established in the Alps and eight in the Pyrenees.

The results show that the streams of the Alps carry much more silt and matter in solution than the Pyrenees' streams. The Alps' streams, while relatively clear in the winter, are subject to extreme floods during the spring and summer, at which times they carry enormous quantities of silt. They also carry large and variable amounts of lime in solution at different seasons, these being greatest in the winter when the water is low and clear and least in spring and summer. The streams of the Pyrenees, in which glaciers are practically absent, are relatively clear the year around and carry silt in appreciable quantities only during occasional floods due to heavy rains. The proportion of dissolved matter, principally lime, is much less in these waters than in the Alps' waters and is not subject to such wide variations.

The abundant carrying of material by the streams of the Alps is attributed to the comparatively recent formation of these mountains. The Pyrenees, on the other hand, are of much more ancient formation and have undergone washing an infinitely longer time, so that their streams are clearer.

The importance of the results from the standpoint of the construction of dams, canals, and reservoirs is pointed out.

Studies on the formation of silt and its transportation by streams in the Alps and Pyrenees, A. MÜNTZ and E. LAINÉ (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 15, pp. 462–467*).—Further studies on the character and amount of the silty material carried by streams in the Alps and Pyrenees confirmed the results noted in the above report.

It was found that the quantities of soluble matter and matter carried in suspension by the streams are extremely variable according to the geological origin of the formations which are drained by them. Ancient formations, consisting mostly of rocks, yield little silt, while recent formations yield relatively more silt. Erosion is, therefore, greater in the Alps than in the Pyrenees.

Analyses of water from the more important streams with reference to the content of suspended matter and matter in solution showed that where the latter is large the former is frequently much larger. Mechanical analyses of silts showed the close relation of the physical composition of the suspended and deposited silt to the velocity of the stream.

Observations on irrigation canals in the Alps region showed that at a velocity of about 5 ft. per second, the sand grains deposited were between about 0.0039 and 0.0097 in. in diameter. With a velocity of about 2½ ft. per second the sand grains were between about 0.00195 and 0.003 in. in diameter, while with a current about 1⅓ ft. per second, the diameter of the silt particles deposited was less than 0.001 in. The matter remaining in suspension consists, therefore, of the finest particles.

It is pointed out from these results that the mountain waters, particularly those of the Alps, when used for irrigation will deposit an appreciable layer of silt on the land, the grains of which will vary in size from coarse to fine as the streams approach the plains and the grades and velocities diminish.

Studies as to the agricultural value of these deposits are in progress.

Physical and chemical conditions of cultivated and forest soils, A. PARROZZANI (*Ann. R. Staz. Sper. Agrum. e Frutticol. Acireale, 2 (1914), pp. 23–46*).—The views of others with reference to the physical and chemical properties of forest soils are briefly presented, and studies of the changes produced in the physical and chemical properties of forest soils by deforestation and cultivation are reported.

Little difference was, on the whole, observed between the nitrogen content of the forested and deforested soils. The total nitrogen content of forested soils was highest in soils partially cultivated and supporting olive and chestnut trees, and lowest in typical forest soils supporting oak and beech trees. In the oak soils the total nitrogen increased in the surface soil as the closeness of texture decreased, while the opposite was true for the subsoil. In the deforested soils the total nitrogen content was always high in those lying fallow, and especially low in those planted to beans.

The ammonia content of dense cork-oak soils was greater and the nitrate content less than in medium or loose soils of the same type. Of the deforested soils, those lying fallow contained the most ammonia. The deforested soils, in general, contained more nitrate than the forested soils, although the subsoil of olive soils contained more nitrate than deforested cultivated soils. There were more nitrates in the surface soil of the forested soils than in the subsoil.

The cultivated soils had a greater absorbing power, especially for potash, than the forested soils. The water-soluble matter in the cork-oak soils decreased as the looseness in texture increased. The total soluble matter in forested soils, especially in the surface soil, was increased after oxidation with hydrogen peroxid. The same was true for the subsoil of recently deforested soils, except fallow soil.

It is concluded that as regards the difference between forested and cultivated soils in absorbing power, concentration of soil solution, and content of easily oxidizable organic matter, the forested soil represents a state of continuous chemical and physical evolution and is profoundly modified when it reaches the cultivated condition.

A list of references to related literature is appended.

Nitrogen in forest soils, A. PARROZZANI (*Ann. R. Staz. Sper. Agrum. e Frutticol. Acireale, 2* (*1914*), *pp. 14–22*).—After presenting the views of others as to the forms of nitrogen occurring in forest soils, the results of mechanical and chemical analyses of soils from two forests growing beech, common and cork oak, and chestnut trees and broom (*Genista aetnensis*) are reported.

Nitrates were found in all of the soils, except those growing broom, and showed no relation to lime content. Deep soils contained more nitrates than shallow soils. More nitrates were found in the oak soils than in the soils growing other trees and were more evident in the surface than in the subsoil, especially in soils of medium and loose texture. Five soils were rich in nitrates and two were not. Under identical conditions the nitrite content of the oak soils was superior to that of the chestnut and beech soils.

A list of references to literature bearing on the subject is appended.

Correlation between humus and mineral matter in dark colored soils, A. A. BLAGONRAVOV (*Abs. in Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *14* (*1913*), *No. 5, pp. 457, 458*).—Assuming that degraded dark colored soils have been at one time less degraded and comparing their chemical composition by calculating the percentage composition of the zeolitic portion, the author finds that the changes in the mineral part of these soils correspond with the changes of the humus content. On this basis, and assuming that the lime is carried from the higher horizons downward in the form of calcium crenate, he calculates a series of "simple correlations" between the lime and crenic acid, for which he takes Mulder's formula $C_{24}H_{24}O_{16}$.

With the aid of these correlations it is considered possible, from the difference in the humus of any two soils and the amount of lime in one, to calculate the contents of the zeolitic lime in the other. The values so calculated differ from those found by actual analysis only in hundredths of one per cent. Other constituents of the zeolitic portion are also found by means of calculations from a whole series of ratios. On the basis of correlations between different elements so obtained the difference in the composition of two soils is expressed in the form of formulas by the aid of which, having previously determined the lime percentage, the contents of all the other constituents are calculated. Then accepting for humic acid Detmer's formula $C_{60}H_{54}O_{27}$, the ratios to humic acid of the various bases soluble in 10 per cent hydrochloric acid are found and from these ratios, guided again by the relation between humus and lime (1:4), a formula is deduced for the composition of the mineral constituents of a given soil.

In conclusion, the author reduces the soils of different regions to a small number of groups, being guided by the ratio of the amount of carbon in the humus to the sum of mineral substances (from 10 per cent hydrochloric acid solution).

Bacteria of frozen soil, III, H. J. CONN (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *42* (*1914*), *No. 17–18, pp. 510–519, figs. 3*).—Further studies on the subject (E. S. R., 26, p. 520) confirm the former conclusion that the number of bacteria in frozen soil is generally higher than in unfrozen soil. This was true not only of cropped soil but also of sod and fallow soil. Other results of these studies have been reported by the author in bulletin form (E. S. R., 32, p. 33).

The effect of green manuring on soil nitrates under greenhouse conditions, H. H. HILL ET AL. (*Virginia Sta. Tech. Bul. 6 (1915), pp. 121–153; Rpts. 1913–14, pp. 121–153*).—Pot and laboratory experiments to determine the effect of green manures on nitrate accumulation and plant growth in 5 types of Virginia soils are reported.

Preliminary experiments on the effect of vegetable matter on nitrate formation in partially sterilized and unsterilized silt loam showed that organic matter such as blue grass, clover, and alfalfa when turned under in the soil appeared to pass over into nitrates, more especially in sterilized soil.

In further experiments with soils ranging in texture from sandy loams to heavy clays to which green manures and organic matter were added in the following proportions: 0.3 per cent Swedish filter paper, 0.6 per cent straw, 0.44 per cent clover, 0.44 per cent soy beans, and 0.22 per cent blue grass, it was found that the total number of bacteria in soils treated with green manures was much greater than in soils receiving no green-manure treatment. Legumes gave in most cases the highest bacterial count. The rate of nitrate formation and plant growth in every case was greatly improved by the addition of green manures. There was a smaller amount of nitrogen in plants grown in pots treated with paper than with those grown on untreated soil. Paper in each soil type caused a depression in the number of bacteria, nitrate formation, and in plant growth, and produced a yellow appearance in the plants.

"Soils vary in their power to accumulate nitrogen. Soils, from the same field, when taken at different times, show a variation in nitrogen-accumulating power." "It is believed from the results of this paper that the open soils have a natural tendency toward nitrate accumulation and that this may be stimulated by applications of green materials."

A bibliography is appended.

Some common misconceptions with respect to soils and soil fertility, C. B. LIPMAN (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 231–239*).—In an attempt to correct certain of what are considered to be misconceptions with reference to soils and soil fertility, it is pointed out that in the light of present knowledge overirrigation is injurious to crop growth, that analysis of soils is not a criterion for their adaptability to crops or fertilizer needs, and that plant-food elements in fertilizers do not have many of the specific effects on plant growth commonly attributed to them.

The teachings of the Kentucky Agricultural Experiment Station relative to soil fertility, G. ROBERTS (*Kentucky Sta. Bul. 191 (1915), pp. 31–56*).—This bulletin, with an introduction by J. H. Kastle, is a general statement of the principles of soil fertility as taught by the station. These are based in part on a previous bulletin (E. S. R., 21, p. 316) and in part on the general results of two, four, and six year series of plat and field experiments in different parts of the State with various field crops to determine the fertility requirements of representative soil types, with particular reference to phosphorus, nitrogen, and potash, and the most effective and economical methods of supplying these when needed. The detailed results of these experiments are to be published in a later publication.

It is the belief that practically all the soils of Kentucky contain inexhaustible supplies of potash, which can be made available with sufficient rapidity through maintenance of the humus content. With the exception of the soils of the blue-grass regions, the soils of the State are considered to be deficient in phosphorus. which usually can be most advantageously supplied as acid phosphate until organic matter is restored to the soil, after which rock phosphate may be used. The purchase of nitrogenous fertilizers is considered uneconomical, nitrogen being best returned to the soil as farm manure and by the cultivation of legumes and the use of catch crops, cover crops, and crop residues. The general use of complete fertilizers is not considered economical or conducive to a condition of permanent soil fertility. It is recommended that systems of cropping be followed whereby plant food is returned to the soil through crop residues and manures, that rotations containing leguminous and cover crops be used, and that deficiencies in any plant-food element, as indicated by field experiments or chemical analyses, be supplied in the cheapest available form and in quantities sufficient to meet the requirements of a number of crops.

Barnyard manure, P. H. Moore (*Canada Expt. Farms Rpts. 1914, pp. 291, 292*).—Comparative tests of a mixture of commercial fertilizer alone and the same mixture together with 16 tons of barnyard manure per acre for mangels showed that the plat receiving the second mixture yielded over 3 tons per acre more than the plat receiving the first mixture.

Experiments comparing spring application with winter application of fresh manure, and spring application of manure stacked in the field during the winter with winter application of fresh manure, favored the spring application in both cases.

The losses and preservation of barnyard manure, O. B. Winter (*Michigan Sta. Circ. 26 (1915), pp. 2–8*).—This circular calls attention to the losses of plant food in barnyard manure under present systems of farm management and describes methods for its preservation.

The effect of fineness of peat litter on its absorptive power for water, H. von Feilitzen (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 33 (1915), No. 6, pp. 85–91, fig. 1*).—The work of others bearing on the subject is briefly reviewed and experiments with peat litter and peat dust of various kinds, with reference to their absorptive power for water, are reported. In addition to measuring the size of grains the different samples were subjected to botanical analysis.

It was found that the absorptive power for water increased with fineness of grain until a fineness of from 1 to 2 mm. was reached, after which the absorptive power gradually decreased until a fineness of 0.5 mm. was reached, and then rapidly decreased. The botanical investigation showed that the accessory plant constituents other than sphagnum, which has a much greater absorptive power for water than the others, tend to collect in the finest grains. It is concluded, therefore, that the different absorptive powers for water of the different fine particles of peat dust depend not only on the degree of fineness but perhaps more on the frequent occurrence of accessory plant constituents and humus particles.

The importance of micaceous minerals in agriculture, E. Blanck (*Fühling's Landw. Ztg., 64 (1915), No. 1, pp. 20–28*).—The author briefly reviews recent work by himself (E. S. R., 27, p. 520; 29, p. 215) and others which shows that the potassium of biotite is more available as plant food than that of feldspar and much more available than that of muscovite. Experiments by Atterberg (E. S. R., 30, p. 214) are referred to as indicating also that biotite plays a special rôle in connection with the physical properties of certain stiff clays, particularly in increasing their plasticity.

The comparative value of different sources of phosphorus, B. L. Hartwell and S. C. Damon (*Rhode Island Sta. Bul. 163 (1915), pp. 515–560, pls. 2*).—This bulletin reports the unpublished results and a summary of published results of twenty years' continuous field experiments on silt-loam soil composed of glacial drift of granitic origin to compare different phosphatic materials.

Three experiments were conducted. The first was a six-year comparison of Chincha and Lobos guanos, ground bone, and dissolved phosphate rock so applied as to furnish the same amount of phosphorus, the nitrogen and potassium of the guanos being matched by using nitrate of soda and muriate of potash to supplement the bone and dissolved phosphate rock. The soil was acid. It was found under these conditions that the phosphorus of ground bone was the most available, followed in order by that of guanos and the dissolved phosphate rock. In the second experiment the results of a seven-year comparison of Thomas slag phosphate, Lobos guano, ground bone, and dissolved phosphate rock on an equal phosphorus basis in the presence of liberal amounts of nitrogen and potassium were inconclusive.

The third experiment covered twenty years, the purpose being to determine the relative availability of the phosphorus in dissolved boneblack, dissolved bone, dissolved phosphate rock, fine ground bone, Thomas slag phosphate, raw rock phosphate, raw Redonda phosphate, roasted Redonda phosphate, and double superphosphate applied during the first half of the experiment, with liberal amounts of nitrate of soda and muriate of potash, to limed and unlimed land. In the first five years of the experiment, during which the phosphates were added on the basis of equal cost, it was found that Thomas slag phosphate and ground bone were superior even to dissolved boneblack and dissolved bone on unlimed soil, the reverse being true on limed soil. Dissolved phosphate rock ranked fifth in both the limed and unlimed soil, being markedly superior to the raw phosphate rock. In the following ten years, during which the combined phosphatic applications were adjusted to an equal phosphorus basis, it was found that the most available phosphorus for both limed and unlimed soils was apparently that in Thomas slag phosphate, ground bone, and dissolved bone. The dissolved boneblack and dissolved phosphate rock ranked next and were considerably superior to raw rock phosphate.

The final summary of the entire 20 years' work shows that the after effects of the phosphates were very marked and indicate the importance of continued tenure of the land. The rank of the different phosphates was left practically unchanged with the unlimed plats. With the limed plats the main change was that the dissolved boneblack was placed among those of first rank. Dissolved phosphate rock held an intermediate place, being decidedly superior to double superphosphate, raw rock phosphate, and Redonda phosphate on both limed and unlimed soil. The double superphosphate needed considerable lime for its greatest efficiency, for only on the limed soil did it rank next to the dissolved phosphate rock, being decidedly inferior even to the raw phosphate rock in case of the unlimed soil. With the limed soil roasted Redonda phosphate was somewhat superior to the raw phosphate rock, although decidedly inferior with the unlimed soil. The raw Redonda phosphate was practically valueless.

In connection with this experiment a comparison of the effect of 3 tons of slaked lime per acre applied to the limed phosphate plats with the effect on limed plats receiving no phosphorus showed that in the latter case the increase in the value of the crop during the twenty years, due to the lime, was about $400 per acre. With the insoluble phosphates, ground bone, Thomas slag phosphate, raw phosphate rock, and raw Redonda phosphate it was $330 and less, and with the other phosphates the increase ranged from $442 with the dissolved phosphate rock to $590 with the double superphosphate.

Use of lime on the farm, C. B. Williams (*North Carolina Sta. Circ. 28 (1915), pp. 7*).—This circular gives instructions as to the proper use of lime on North Carolina soils and a brief résumé of results secured with lime when used on various crops at the different experimental farms in the State.

Fertilizing materials, F. T. Shutt (*Canada Expt. Farms Rpts. 1914, pp. 96–104*).—Chemical analyses of 25 samples of marl and limestone, superphosphate of lime, wood ashes, sewage sludge, flue ashes, and pulp mill refuse are reported.

Commercial fertilizers, J. T. Willard et al. (*Kansas Sta. Bul. 204 (1915), pp. 3–40*).—This bulletin contains actual and guarantied analyses of 105 samples of fertilizers and fertilizing materials offered for sale in Kansas and a statement of receipts and expenditures from January 1, 1913, to June 30, 1914. On the basis of this inspection the fertilizer business of the State is considered to be in good condition.

There is also a special article by C. O. Swanson on the value and use of fertilizers designed to assist the farmers of Kansas in the intelligent use of fertilizers. It is thought probable that owing to the uncertainty regarding the climate, the tendency in Kansas will be toward the use of more slowly available plant food rather than that which is more quickly available.

A list of Kansas dealers in fertilizers is appended.

Analyses of commercial fertilizers, P. H. Wessels et al. (*Rhode Island Sta. Insp. Bul., 1915, July, pp. 8*).—This contains actual and guarantied analyses and valuations of 45 samples of fertilizers and fertilizing materials for sale in Rhode Island in the spring of 1915.

AGRICULTURAL BOTANY.

Plant anatomy, W. I. Palladin, trans. by S. Tschulok (*Pflanzenanatomie. Leipsic: B. G. Teubner, 1914, pp. IV+195, figs. 174*).—This is a translation of the fifth Russian edition. The three main divisions deal in more or less detail with the anatomy of plant cells, tissues, and organs, and modifications thereof by various agencies. It is designed for use by students of pharmacy, forestry, agriculture, and natural science.

Anatomical relations of some variegated foliage leaves, R. Kōketsu (*Bot. Mag. [Tokyo], 28 (1914), No. 336, pp. 323–325*).—The author gives briefly the results of studies carried out with several species of variegated plants.

Green coloring matter is deficient or absent in all or certain layers of variegated leaf parts. The color of such portions depends more or less upon the subepidermal air bubbles or spaces. Cells of such tissue are usually tenderer and smaller than in tissue of normal color, the colorless portions of leaves being also abnormally thin. Tissue differentiation in the mesophyll is usually indistinct or abnormal, intercellular spaces being often abnormally large or small. Starch is absent in the colorless cells. Colorless leaf cells usually contain considerable calcium oxalate, but no oil droplets. Cuticle develops in these cells much as in normal leaves. Stomata are usually about as numerous in these areas as elsewhere, but *Quercus glauca monstrosa* appears to have no stomata in the white portions. Nitrogen and fats are only sparingly present, but sugar is often plentiful. Oxidation enzyms are not abundant.

Some observations are also given in regard to coloration and anatomical correlations in these variegated portions.

Structure and function in contractile roots, G. Catalano (*Nuovo Gior. Bot. Ital., 22 (1915), No. 1, pp. 148–174, figs. 6*).—This is an account of anatomical and morphological studies on several plants whose roots show a tendency to more or less persistent shortening and thickening, as related to the storing of reserve material, to moisture as causing more or less temporary turgor, and to other conditions.

The track of stimulus in Mimosa pudica, K. Linsbauer (*Ber. Deut. Bot. Gesell., 32 (1914), No. 9, pp. 609–621, figs. 3*).—The author cites experiments and observations which are considered to show that the conduction of wound stimulus in *M. pudica* may occur in connection with considerable tracts of the woody portions of the stem, without reference to the presence or absence of the cortex.

Recent studies on mitochondria in vegetable cells, E. CARANO (*Ann. Bot.* [*Rome*], *12* (*1914*), *No. 2, pp. 209–217*).—This is a synthetic review of recent articles by several authors, appearing from 1911 to 1913.

The rôle of chlorin in plant nutrition, W. E. TOTTINGHAM (*Abs. in Science, n. ser., 42* (*1915*), *No. 1071, p. 68*).—As the result of investigations the author reports that water cultures of various plants have shown marked stimulative effects of chlorids on root development. Sand cultures of mangels, supplied sodium and chlorin separately and in combination, have developed most favorably in the latter case. Soil cultures of sugar beets in the greenhouse, where sodium chlorid was supplied, have exceeded in yield the control unfertilized cultures. The percentage of sucrose in the dry matter has also increased where the chlorin was added. Plat experiments in the field with sugar beets at Madison, Wis., are said to show increased yields due to the application of sodium chlorid, the increase amounting to as much as 500 lbs. per acre.

The experiments are to be continued, a variety of plants being tested, in the belief that in some plants at least chlorin may be found to function in specific nutrient effects.

Localization of manganese ions in roots as related to the formation of proteid substance, G. D'IPPOLITO and A. PUGLIESE (*Staz. Sper. Agr. Ital., 47* (*1914*), *No. 3, pp. 231–240, pls. 3*).—The authors present some results of experiments with wheat grown in aqueous or nutritive solutions containing manganese compounds. The claims of Acqua (E. S. R., 31, p. 325) regarding coloration as indicating and locating the utilization of such compounds are also reviewed in this connection.

The localization of manganese in plants, C. ACQUA (*Ann. Bot.* [*Rome*], *12* (*1914*), *No. 3, pp. 361–368*).—This is a reply to the above note.

Toxicity and malnutrition, R. H. TRUE (*Science, n. ser., 42* (*1915*), *No. 1075, pp. 195, 196*).—The author discusses the terms "toxicity" and "poison" in relation to their physiological significance, and attempts to arrive at a more definite understanding regarding their use. The most satisfactory solution of the problem seems to lie in the supposed relation existing between ions and the protein of the living organism.

The action of potassium cyanid when introduced into tissues of a plant, W. MOORE and A. G. RUGGLES (*Science, n. ser., 42* (*1915*), *No. 1070, pp. 33–36*).—In a previous publication (E. S. R., 32, p. 152) an account is given of experiments by Sanford on the destruction of *Icerya purchasi* by the use of potassium cyanid placed in the tissues of the tree. The authors have carried on experiments with potassium cyanid placed in the stems of geranium plants and also in apple trees to determine the path of translocation of the introduced substance.

As a result of their investigations they conclude that the treatment would have little or no value for the larger number of wood-boring insects, as the hydrocyanic acid does not travel in the cambium of the trees, but only through the old tracheæ. For the herbaceous and semiwoody plants the presence of the chemical, it is believed, would endanger the life of the plant.

The amount of creatinin in plants, M. X. SULLIVAN (*Abs. in Science, n. ser., 42* (*1915*), *No. 1071, p. 69*).—Investigations of the author have shown the occurrence of creatinin in plants, the quantity having been determined in recent experiments. Only from 1 to 6 parts per million were found in ungerminated seed of wheat and soy bean. The amount increased during germination, and in wheat seedlings 10 to 12 days old, from 40 to 65 parts per million of creatinin were found.

The formation of creatinin by bacteria, M. X. SULLIVAN (*Abs. in Science, n. ser., 42* (*1915*), *No. 1071, p. 69*).—In experiments by the author it was found that a trace of soil added to a protein-free synthetic culture medium, with ammonium sulphate as the source of nitrogen, led to the development of a strong growth of bacteria. Analysis made six months after inoculation of the soil showed the presence of creatinin, as indicated by color reactions and by the formation of creatinin zinc chlorid.

The assimilation of carbon and nitrogen compounds by mold fungi, A. Kossowicz (*Biochem. Ztschr., 67 (1914), No. 4–5, pp. 391–399*).—More recent study (E. S. R., 32, p. 728) of the nutritional relations between ten widely divergent and common mold fungi named, and several carbon and nitrogen compounds is claimed to have shown that in pure cultures these fungi were each able to utilize as the sole nitrogen source, uric acid, hippuric acid, glycocoll, guanin or its compounds, calcium cyanamid, nitrites, or nitrates, and urea, and as a carbon source any of the first four above-named substances.

The relation of yeasts and molds to nitrates, A. Kossowicz (*Biochem. Ztschr., 67 (1914), No. 4–5, pp. 400–419*).—Results are detailed of several series of experiments in which some or all of the ten fungi employed in the studies above noted were found to reduce nitrate in the nutritive medium to nitrite. Results with yeasts were either less definite or else negative.

The nitrate ferment and the formation of physiological species, M. W. Beijerinck (*Folia Microbiol. [Delft], 3 (1914), No. 2, pp. 91–113, pl. 1*).—Discussing results of further investigations (E. S. R., 32, p. 523), the author contrasts these ferments with some related kinds and discusses the difficulty or imposibility here illustrated of distinguishing sharply between mutations and hereditarily stable modifications. The two kinds of nitrate ferment are claimed to be clearly distinguishable.

Influence of hybridization and cross-pollination on the water requirement of plants, L. J. Briggs and H. L. Shantz (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 391–402, pl. 1, fig. 1*).—It having been suggested by Collins (E. S. R., 24, p. 236) that hybridization might result in increased drought resistance, the authors report on a study of the water requirements of 8 first generation maize hybrids and 1 wheat hybrid (a cross between *Triticum durum* and *T. æstivum*). The measurements were made at Akron, Colo., from 1912 to 1914, the methods previously described (E. S. R., 29, p. 825) being employed.

From the data presented, it appears that "the hybrids ranged in water requirement from 10 per cent below to 10 per cent above the parental mean. On the basis of the results so far obtained, the chances are even that a maize hybrid will not depart in its water requirement more than ±6 per cent from the parental mean. Cross-pollination between individual plants of maize leads to results similar to hybridization of different strains, so far as water requirement and yield are concerned. A wheat hybrid which had been grown for several generations gave a water requirement 14 per cent above the mean water requirement of the parental strains."

The relation between light intensity and the formation of essential oil, V. Lubimenko and M. Novikov (*Trudy Bi̊uro Prikl. Bot. (Bul. Appl. Bot.), 7 (1914), No. 11, pp. 697–727*).—In studies carried out with *Ocimum basilicum* under illumination of different intensities, the author claims to have shown that the development of plant organs and production of essential oil bear a relation to the intensity of illumination to which the plant is subjected.

A gradual decrease of intensity leads to a preponderance of development of the vegetative portions over that of both flowers and fruits. The stems attain their maximum weight under stronger illumination than that required for such attainment in case of the leaves. Production of dry substance in this plant as a whole attains its maximum in somewhat attenuated daylight, diminishing rapidly with departure in either direction from this point. Light seems to act directly upon the formation of essential oil in the leaves, flowers, and fruits, such production being retarded by an increase of illumination, and the optimum being reached in subdued daylight. The optimum light intensity for oil production is, moreover, below that for production of dry matter. Some bearings of these facts are discussed.

Artificial photosynthesis by means of chlorophyll, W. J. V. OSTERHOUT (*Abs. in Science, n. ser., 42 (1915), No 1071, p. 68*).—The author states that if Schryver's test for formaldehyde is specific, experiments show that formaldehyde produced from chlorophyll acting in the presence of carbonic acid in sunlight is due to the decomposition of the chlorophyll and not to photosynthesis, as has been supposed to be proved. Other pigments, as methyl green, iodin green, and a variety of other stains, exposed to sunlight under the same conditions as chlorophyll, also give the test for formaldehyde. From this it is considered that artificial photosynthesis by means of sunlight has not yet been accomplished.

The effects of electrolytes on oat seeds, F. PLATE (*Ann. Bot. [Rome], 12 (1914), No. 3, pp. 261–343*).—After a review of reports by others on related studies, the author gives in considerable detail the results of his own more recent work (E. S. R., 30, p. 228; 33, p. 521). The numerous organic and inorganic compounds employed are arranged in seven general groups according to their observed relations as noted in regard to their absorption and their effects on the germination and development of the seeds.

A new device for sterile preservation of seeds, M. PLAUT (*Ber. Deut. Bot. Gesell., 32 (1914), No. 7, pp. 466–471, figs. 3*).—A description is given of a combination cap of wire gauze and cotton wool for closing vessels intended to contain seeds for preservation, experimentation, etc. This is expected to give at low cost complete protection with safety, convenience, and ease of manipulation.

The heredity of fasciation in Bunias orientalis, R. PIROTTA and M. PUGLISI (*Ann. Bot. [Rome], 12 (1914), No. 3, pp. 345–360, pls. 6*).—As a result of the preliminary study here described, the authors consider the tendency to fasciation in *B. orientalis* (*Lœlia orientalis*) to be hereditary.

Flora of New Mexico, E. O. WOOTON and P. C. STANDLEY (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 19 (1915), pp. 794*).—This flora of New Mexico is based largely upon the authors' collections, supplemented by all the available material to be found in the principal herbariums of the world. Both the authors were for a time connected with the New Mexico Experiment Station, from which point their collecting work was largely done.

About 3,000 species of flowering plants and vascular cryptogams are included in the publication. Keys are given to the genera and species so that this flora may be used as a field manual in the region covered.

Tropical North American species of Panicum, A. S. HITCHCOCK and AGNES CHASE (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 17 (1915), pt. 6, pp. XII+459–539, figs. 139*).—In a preceding paper (E. S. R., 24, p. 432) the authors presented a revision of the North American species of Panicum. The present contribution is the result of further studies of the tropical species which were not fully treated in the previous publication. Keys are given for all the tropical species, although descriptions are not always included. The authors list 116 species and 3 subspecies, 9 of which are described as new.

FIELD CROPS.

On a criterion of substratum homogeneity (or heterogeneity) in field experiments, J. A. HARRIS (*Amer. Nat., 49 (1915), No. 583, pp. 430–454, figs. 3*).—In this article the author points out the need of some generally applicable measure of the degree of homogeneity of the soil of an experimental field, and proposes as a scientific criterion the coefficient of correlation between neighboring plats of the field. An exceedingly simple formula for the calculation of such coefficients has been deduced.

"Let S indicate a summation for all the ultimate or combination plats of the field under consideration, as may be indicated by the capital Cp or lower case p. Then in our present notation, which is as much simplified as possible for the special purposes of this discussion,

$$rp_1p_2=\frac{\{[S(Cp^2)-S(p^2)]/m[n(n-1)]\}-\bar{p}^2}{\sigma p^2}$$

where P is the average yield of the ultimate plats and σp their variability, and n is constant throughout the m combination plats." The method of application of this coefficient is illustrated by the use of published records of several investigators, involving experiments with mangolds, wheat, and timothy hay.

"The remarkable thing about the results of these tests is that in every case the coefficient of correlation has the positive sign and that in some instances it is of even more than a medium value. In short, in every one of these experimental series the irregularities of the substratum have been sufficient to influence, and often profoundly, the experimental results."

It is noted that nothing could "emphasize more emphatically the need of a scientific criterion for substratum homogeneity than the facts that correlations between the yields of adjacent plats ranging from r=0.115 to r=0.609 can be deduced from the data of fields which have passed the trained eyes of agricultural experimenters as satisfactorily uniform."

[Field crops] work of the Truckee-Carson reclamation project experiment farm in 1914, F. B. Headley (*U. S. Dept. Agr., Bur. Plant Indus., Work Tuckee-Carson Expt. Farm, 1914, pp. 1–9*).—This reports the progress of work at the experiment farm near Fallon, Nev. (E. S. R., 31, p. 828), and near-by farms. Weather records are given and data as to agricultural conditions, which include acreage, yields, and farm values of the main money-producing crops in 1914 and a comparison of the data with those of 1912 and 1913.

Yields in variety tests with 11 varieties of alfalfa ranged from 72 to 134 lbs. per 100-ft. row, with four varieties of fodder corn, from 13.53 to 19.85 tons per acre of green weight; with six varieties of wheat, from 16.3 to 31.8 bu. per acre; with six varieties of oats, from 16.6 to 24.5 bu. per acre; with 24 varieties of corn, from 554 to 1,390 lbs. per acre; and with 22 varieties of potatoes, from 4 to 61 lbs. of marketable tubers per 100-ft. row.

[Field crops work at the Canadian stations and farms in 1913], J. H. Grisdale et al. (*Canada Expt. Farms Rpts. 1914, pp. 3, 4, 15–19, 22–24, 28, 29, 38–40, 41, 42, 45, 48, 52, 53, 55, 56, 58, 59, 60, 63, 64, 67, 68, 72, 73, 77, 78, 80, 81, 83, 104–109, 119–123, 141–180, 183–291, 510, 511, 557–559, 560, 563–566, 575, 576, 580–582, 587, 588, 608–613, 643–646, 670, 683, 684, 686, 695, 698, 718, 719, 725, 726, 743, 752–828, 881–940, 941–950, 995–1022, pls. 18*).—This reports the continuation of work previously noted (E. S. R., 32, p. 431) and is a detailed account of the work already mentioned (E. S. R., 30, p. 829; 32, pp. 530, 532), with meteorological data and additional data on variety and manurial tests with potatoes, tobacco, and sugar beets.

Experiments with spring grain in 1914, P. R. Fedorov (*Bezenchuk. Selsk. Khoz. Opytn. Stantsīīa, No. 58 (1914), pp. 13*).—In a 4-field rotation system the crops preceding wheat were peas, corn, sunflowers, millet, potatoes, carrots, and wheat. The greatest yields were after potatoes and carrots, the smallest after wheat and sunflowers.

In a depth-of-plowing test for seeding wheat, 4 verchoks (7 in.) gave better results than 2½ or 5½ verchok depths. August proved a better time to plow than July or September. Heavy seeding, 9 poods per dessyatina (120.2 lbs. per acre), gave better results than light seeding.

In fertilizer tests barnyard manure gave the best results. Phosphates seemed to reduce the yield. Native varieties gave the largest yields and Egyptian the smallest.

There were no parasites on oats during the year. A large number of empty grains resulted from the drought. The depth of plowing best suited was found to be 4 verchoks for the crop preceding the oats and 5 verchoks for the oats.

In fertilizer tests barnyard manure, manure combined with Thomas slag, and Thomas slag alone were used. The manure, either alone or in combination, apparently did not increase the yield of oats, though somewhat improving the quality of the grain, while Thomas slag alone increased the yield by 11.4 per cent.

Of oats sown broadcast, 5 to 7 poods per dessyatina, in rows with from 4 to 7 poods per dessyatina, in wide single and double rows with from 3 to 5 poods per dessyatina, and at distances varying from 6 to 8 verchoks, the best method proved to be sowing in wide single rows at a distance of 8 verchoks.

Wild white clover, A. N. M'Alpine (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 238–256*).—This article treats of wild sweet clover (*Trifolium repens sylvestre*), discussing its distinguishing characters, agricultural value, ecology, characteristics of the commercial seed, and its growth and development.

Corn, C. P. Bull (*Minnesota Sta. Bul. 149 (1915), pp. 5–23, figs. 7*).—This bulletin gives a detailed report of work previously noted (E. S. R., 28, p. 233) and additional results on corn cultural experiments.

As the result of different methods of cultivation for three years, it is concluded that "to a certain degree the lack of cultivation is attended with an increased percentage of barren stalks. Though the 'twice-cultivated' plat is an exception, the increase in the number of cultivations seems to have a tendency to lower the percentage of stand. The difference in the plats is, however, not sufficient to warrant a definite conclusion. The height of the stalks and of the ears on the stalk does not appear to be influenced by the cultivations, except that with no cultivation they are considerably lower. The yield per acre of corn is the important item in the results of this experiment. The averages for the plats show conclusively that the number of cultivations materially affects the yield per acre. The yield of stover also increases regularly with the number of cultivations. It is plain that two cultivations are not sufficient to subdue the weeds and give the proper start to the vegetative growth of the plants. It is quite likely that the relative time of cultivation has something to do with the value, but that was not considered in this experiment.

"Another important fact shown is that it is not necessary to practice deep tillage when once the soil has been properly prepared before planting. The average yield of the hoed plat exceeded the highest yield obtained from any other. It exceeded that of the plat cultivated six times by 1.46 bu. per acre.

"The data show that the large profit from cultivation comes from the fourth cultivation and that there is but slight gain from three cultivations over two cultivations, the profit amounting to but 53.2 cts. more than the cost of the operation."

In a study covering five seasons of the relation of the number of stalks per hill to yield, where the hills were spaced 44 by 44 in., the results show that not only the number but also the percentage of barren stalks increased as the number of stalks per hill increased, but that the difference in percentage stand in check rows was not sufficient to be regarded as significant. The percentage stand in the drill row was nearly perfect, thus indicating that the chances of securing a perfect stand are about 5 per cent better by planting in drills. A large number of stalks per hill (6, 7, or 8) impaired the growth, as shown by the short plants and low ears in these hills. The percentage of marketable ears decreased as the number of stalks per hill increased. The maximum yield per acre was reached with four stalks per hill, with three stalks per hill yielding only a fraction of a bushel less, followed by five stalks per hill. Six stalks per hill yielded higher than two stalks.

The percentage of marketable ears harvested from corn planted 2, 3, 4, 5, and 6 stalks per hill were 81.4, 66.37, 54.45, 38.75, and 30.37, respectively, while that of corn planted 18 in. apart in drills 44 in. apart was 82.07.

Single-stalk cotton culture at San Antonio, R. M. MEADE (*U. S. Dept. Agr. Bul. 279* (*1915*), *pp. 20, pls. 6, figs. 3*).—This bulletin gives results of trials in 1914 of the single-stalk cotton culture method (E. S. R., 32, p. 434) in comparison with the usual wide-spacing method. Data show the average number of vegetative branches on plants in wide-spaced and in single-stalk rows, the daily flower census of single-stalk and wide-spaced plants, the number of bolls matured on wide-spaced and single-stalk rows, the ratio of 3, 4, and 5 locked bolls, and the yields by the two methods of culture. "The single-stalk and wide-spaced systems of culture were compared in alternate single rows and alternate 4-row blocks in rows 4 ft. apart and again in alternating rows 3, 4, 5, and 6 ft. apart. In one instance plants were thinned early, late, and very late to 6, 9, 12, 18, and 24 in. apart. The stand was satisfactory in all cases. . . .

"More flowers were produced daily on the single-stalk rows than on the adjoining wide-spaced rows. At the end of 40 days single-stalk rows alternating with wide-spaced rows had produced 84 per cent more flowers than the latter. In alternating blocks single-stalk rows had produced 78 per cent more flowers than wide-spaced rows in the adjoining block.

"Single-stalk rows produced an average of 5.5 bolls per plant and wide-spaced rows 8.6 bolls per plant. The difference in the number of bolls per plant was much more than offset by the greater number of plants in the single-stalk rows, so that the single-stalk rows set from 50 to 150 per cent more bolls in the same row space. A larger percentage of 4-locked bolls was produced in single-stalk rows and in rows close together than in wide-spaced rows where the plants were set either close together or far apart. The bolls in the single-stalk rows were slightly smaller than those in the wide-spaced rows. Nineteen 4-locked bolls from single-stalk rows were required to equal the weight of 18 4-locked bolls from wide-spaced plants. The ratio of weight for 5-locked bolls is 11 : 10 for single-stalk and wide-spaced rows, respectively.

"The plants in single-stalk rows were taller than those in wide-spaced rows. The single-stalk rows were spreading at the top, while the wide-spaced rows were broader near the ground. In all cases single-stalk rows yielded more than the adjoining wide-spaced rows, regardless of the distance between the rows. An examination of the fiber in the field showed that there was no perceptible difference in the quality or quantity of lint produced in single-stalk and in wide-spaced rows.

"Plants thinned to a few inches apart in the row had fewer vegetative branches than plants spaced farther apart, the thinning having been done at the same time in each case. Late-thinned plants had fewer vegetative branches than plants thinned earlier to the same distance. Early thinning and late thinning gave higher yields than very late thinning."

Improvement of cotton in the Bombay Presidency (except Sind), K. D. KULKARNI and G. L. KOTTUR (*Dept. Agr. Bombay Bul. 70* (*1915*), *pp. 43*).—This bulletin gives lists and descriptions of some 300 varieties of native and 300 varieties of introduced cotton and their hybrids grown in various parts of the Bombay Presidency since 1905, with brief notes regarding the performances of some of the selections and hybrids.

Flax culture, R. KUHNERT (*Der Flachsbau. Berlin: Deut. Landw. Gesell., 1915, 3. ed., pp. XV+34*).—A revised and enlarged third edition of a book previously noted (E. S. R., 14, p. 960).

Experiments on the development of oats under the influence of irrigation and root pruning, B. SCHULZE (*Landw. Vers. Stat., 86 (1915), No. 1–2, pp. 63–74*).—Oats grown in a series of six concrete pots and receiving during the growing period, aside from the seasonal precipitation, no water and 1.3, 1.69, 1.91, 2.11, and 2.34 times as much water as the seasonal precipitation, produced, respectively, 132.5, 160.7, 176.1, 191, 178.7, and 187.4 gm. of grain per pot. For each 100 liters of water the amount of dry matter produced per pot was 621, 580, 504, 472, 421, and 377 gm. The ratios of grain to straw were for each pot 1:1.9, 1:1.91, 1:1.99, 1:1.91, 1:2.08, and 1:1.91; and the ratios of tops to roots, 100:14.8, 100:12.4, 100:11.9, 100:9.8, 100:11.7, and 100:12.9, respectively.

For the study of root pruning, oats were grown in concrete pots that permitted of the introduction of an iron plate so as to cut horizontally the contents of the pot at a required depth. Oats planted on March 20 were pruned on May 2 at a depth of 30 cm., and on May 16 and 30, June 15, and July 1 at 40 cm., respectively. The harvest of grain from each of these pots in August was 148, 117.5, 85.9, 67.3, and 158.4 gm., respectively, and 161.9 gm. from the pot not pruned. The ratios by weights of the tops to the roots were 100:10.4, 100:10.1, 100:11.1, 100:10.7, 100:6.8, and 100:9.9.

It is noted that a shortening of the roots during the period of shooting and blossoming of the plant was the most injurious, and that this injury seemed to lie in a reduction of the food supply rather than a cutting off of the water supply.

Oats for North Carolina, C. B. WILLIAMS (*North Carolina Sta. Circ. 30 (1915), pp. 8, figs. 2*).—This circular gives cultural suggestions for the oat crop when grown alone and in combination with crimson clover, vetch, and rape. Rotations, including oats, for the various sections are suggested.

Experiments with potatoes, P. R. FEDOROV (*Bezenchuk. Selsk. Khoz. Opytn. Stantsīia, No. 59 (1914), pp. 9*).—This report shows that deep plowing, 5½ verchoks (9.62 in.), gave better results than shallow depths, and large seed tubers planted whole better results than small, medium, or cut pieces. In a spacing test 12 verchoks (21 in.) square gave the best results. In manurial tests Thomas slag alone gave higher yields than barnyard manure, either alone or with Thomas slag. The potatoes from the unfertilized soil gave the highest percentage of starch, 17.6 per cent, but the lowest yield.

Soy bean growing in North Carolina, C. B. WILLIAMS (*North Carolina Sta. Circ. 31 (1915), pp. 8, figs. 3*).—This circular gives instructions for the production of the soy bean crop in North Carolina. Brief notes discuss the crop as grown for hay, seed, soil improvement, soiling, and pasture.

Experiments with fertilizers and manure on tobacco grown continuously and in rotation with wheat and clover, C. E. THORNE (*Ohio Sta. Bul. 285 (1915), pp. 210–221, figs. 2*).—This reports the continuation of work begun in 1903 and previously noted (E. S. R., 22, p. 23). Data show the yield and increase of tobacco grown continuously and of that grown in rotation with wheat and clover, with various fertilizer treatments of the soil, covering 6, 5, and 4 year periods. In the rotations the fertilizer applications were made to the tobacco crop only.

Yields from soils that received a complete fertilizer consisting of 320 lbs. of acid phosphate, 60 lbs. of muriate of potash, and 320 lbs. of nitrate of soda per acre were much more profitable than those from any form of partial fertilizer. When the amount of potash in the complete fertilizer was increased the yield was not increased and the quality was reduced. The substitution of either nitrate or sulphate of potash for the muriate showed a reduction in yield. When the phosphorus in the rotation experiment was increased there was a marked gain in the yield, a greater total yield, and a greater net profit than with any other in the series. The omission of phosphorus reduced the increase to the lowest point in the series. The next highest total yield and net profit was by the increased amount of nitrogen.

Comparing nitrate of soda with sulphate of ammonia as carriers of nitrogen, and again with lime, there was an apparent loss for the sulphate of ammonia in the absence of lime and a gain when lime was added. Nitrogen and phosphorus were applied as tankage at a disadvantage to both yield and net profit. Barnyard manure used at the rate of 10 tons per acre produced yields to an average value of $5 per ton of manure. Reinforcing the manure with phosphorus (40 lbs. of floats to the ton of manure) materially increased its effectiveness. The data show that lime was apparently not needed on this soil, as the only plat which showed any decided benefit from lime was the one receiving its nitrogen in sulphate of ammonia.

A general comparison of the continuous and rotative cropping of tobacco shows that the annual value of all the crops has been smaller in the rotative than in the continuous cropping, because of the much higher acre-value of tobacco than of wheat or clover. "On the unfertilized land the average annual total yields for the two 6-year periods of the test have been 399 and 319 lbs. for the continuously grown tobacco and 576 and 536 lbs. for that grown in rotation, thus showing that a clover sod has produced 177 and 217 lbs. of tobacco per acre during the two periods in excess of that grown on tobacco stubble."

Tobacco: Influence of fertilizers on composition and quality, J. W. AMES and G. E. BOLTZ (*Ohio Sta. Bul. 285 (1915), pp. 173–209, figs. 6*).—This gives results of experiments conducted at Germantown, Ohio, on light clay loam in which organic and mineral fertilizers were used in varying combinations and quantities to determine their influence on the composition and quality of the tobacco grown. Data show the amounts of fertilizers used and the resulting yields in wrapper, filler, and trash for 1912, the total average annual yields for a period of six years, the percentage content of carbon-free ash, Ca, Mg, Mn, Na, K, P, total N, nitrate N, nicotin, total S, S as sulphates, and Cl of the resulting crop, and the results of smoking tests in regard to fire-holding capacity, flavor, and aroma.

The methods which were used in collecting and preparing the samples and in making the chemical determinations are described.

"The results show that the composition has been modified to a greater or less extent by different fertilizer treatments. The several lots of tobacco have a high ash content. When sodium nitrate is applied there has been, in most instances, a decrease in total ash, phosphorus, sulphur, and chlorin. Of the essential elements present, calcium is found in largest amount, followed by nitrogen, potassium, magnesium sulphur, and phosphorus. The addition of lime to the soil has decreased the calcium and increased the magnesium in the tobacco. A complementary relation is found to exist between the calcium and magnesium, when the one is high and the other is low. Tobacco from limed plats, as a rule, contains less phosphorus, potassium, and sulphur than that from unlimed plats. Relatively small amounts of phosphorus are removed by the crop, as compared with other constituents which are regarded as less essential for plant growth. The highest percentage of nitrogen is found in tobacco from unfertilized soil. Where organic carriers of nitrogen were applied the percentage of nitrogen in tobacco leaves is higher than where inorganic materials supplied the nitrogen. Tobacco from plats to which organic carriers of nitrogen, shed manure, and tankage were applied have a higher nitrate nitrogen and nicotin content.

"While tobaccos from plats treated with potassium salts contain more potassium than where none was applied, the amount present is influenced by the carrier of this element. Tobacco from sulphate or nitrate of potash plats contains larger amounts of potassium than that from muriate of potash treated plats, fertilized with like carriers and quantities of phosphorus and nitrogen. Sodium nitrate has tended to increase the potassium content. The smallest amount of potassium is found in case of untreated land, and the largest amount in tobacco from the manure-treated plat, which is in accord with the large amount of potassium furnished by 20 tons of manure. The carrier of potassium used has decidedly influenced the amounts of chlorin and sulphur in the tobacco leaf, but certain conditions of fertilization have so modified the amounts of potassium and chlorin or sulphate present that no direct relation exists between them. The chlorin content is in close agreement with the excess of chlorin supplied to the soil by muriate of potash, the largest amount being present in tobacco from soil receiving the heaviest application of muriate.

"Tobacco from the manure-treated plat contains more chlorin than any of the other tobaccos not fertilized with muriate of potash. This is in agreement with the amount of chlorin furnished by 20 tons of manure. The amount of chlorin present in this case, 1.32 per cent, has not impaired the quality of the tobacco. Acid phosphate, when used in combination with muriate of potash, tends to increase the chlorin content, while nitrate of soda decreases it. While the sulphur content of tobacco is normally greater than the chlorin, when no excessive amount of chlorin has been furnished, the addition of sulphates in the fertilizing material has modified the sulphur content in a much less degree than has been found with regard to the chlorin following treatment with muriate of potash.

"Smoking tests of cigars from the several lots of tobacco show that the quality of tobacco is impaired where muriate of potash is used in the fertilizer. Tobaccos with a low chlorin content have a good fire-holding capacity in contrast with the tobacco containing excessive amounts of chlorin, due to the fertilizer treatment. All the tobaccos with a high chlorin content had a black, charred ash, which in some instances did not cohere with the ash of the binder and wrapper, with the result that the ash of the binder and wrapper shattered easily. The average length of time the cigars made from tobacco from the muriate-treated plats held fire was approximately half that for tobacco from plats treated with sulphate or nitrate of potash. Muriate of potash was included with varied combinations of phosphorus and nitrogen, so that differences observed in burning quality are due in part to other influences. Although muriate of potash when used with acid phosphate and nitrate of soda increased the yield above that obtained by the use of other forms of potash, any improvement in this respect has been more than offset by poor quality of the tobacco.

"Potassium when used in other combinations than the chlorid improved the quality of the tobacco. The quantity of sulphur as sulphates present in the tobacco exerted very little, if any, influence on the burning quality. Acid phosphate alone improves the quality of the tobacco; when applied in combination with muriate of potash, any favorable effect produced appears to be counteracted. Variations in flavor, aroma, and fire-holding capacity are not due entirely to the presence or absence of any one compound, but are more or less dependent upon the total constituents of the tobacco."

Tobacco growing in Minnesota, C. P. Bull (*Minnesota Sta. Bul. 150* (*1915*), *pp. 7–47, figs. 26*).—This gives a survey of the progress of the tobacco industry for the period from 1909 to 1914, inclusive, together with cultural, harvesting, and curing directions for Minnesota growers. Cost accounts show the total cost to range from $25 to $45 per acre and the yields from 755 to 2,100 lbs. per acre.

Hairy vetch, V. M. Shoesmith (*Michigan Sta. Circ. 27* (*1915*), *pp. 3–8, figs. 2*).—This deals with cultural methods and the uses of vetch as a green manure, forage, or seed crop, and in rotation with wheat.

Spacing and depth of planting for spring wheat, A. D. Bochkova (*Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *14* (*1913*), *No. 2, pp. 43–63*).—In experiments in spacing wheat so as to allow 25, 50, 75, 100, 125, 150, 187, 225, 300, and 400 sq. cm. per plant, it was found that the total yield per plant increased with the increase of area per plant. The closer the spacing the better was the quality of the grain, the greater the weight of 1,000 kernels, and the higher the yield per unit of area.

In tests of depth of planting a difference between 6 and 7 days was observed in the appearance of the seedling when planted at depths of 2, 4, 5, 8, and 10 cm. The germinative ability was noted to decrease with the increase in depth of planting. Tillering and shooting occurred at the same time for all depths, but the degree of tillering decreased with the depth of the seed. After the shooting the higher temperature seemed to hasten the development of the plants from the deep-planted seeds so that the spike matured two or three days earlier than those from the shallow-planted seeds. The length of spike and number of kernels per spike increased with the depth of planting, while the weight of the kernels diminished. The total yield and yield of grain increased with the depth of seed, while the proportion of straw decreased.

Some quantitative data from laboratory investigations of seeds of rye and oats, N. Leontevskiĭ (*Abs. in Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *15* (*1914*), *No. 2, pp. 184, 185*).—This gives results of seed examinations and chemical analyses of rye and oats grown in various parts of the Government of Vologda.

Weediness of fields and influence thereon of various methods of husbandry, P. I. Leshchenko (*Trudy Poltav. Selsk. Khoz. Opytn. Stantsiï, No. 25* (*1914*), *pp. VIII+79, figs. 8*).—At the Poltava Experiment Station the following observations were made:

For each cultivated plant there were one, two, or more weeds, and for each unit of the green weight of grain from one to two units of weeds. Both in winter and spring cereals annual weeds were in greater number than the perennials. The winter cereals had a larger quantity of weeds than the spring, and also, according to the weight of grain, more annual and biennial weeds, while in the spring cereals there were more perennial weeds.

The predominant annuals and biennials in winter cereals were *Viola tricolor*, *Sclerantus annuus*, *Capsella bursa pastoris*, and Tlaspi, which are typical for a 3-course crop rotation with later fertilization. All these developed completely and produced seed. For spring cereals with a 3-course crop rotation the typical weeds were *Setaria glauca*, Stachys, *Polygonum aviculare*, several species of Vicia, and *P. convolvulus*.

Experiments covering a period of 19 years showed that in a 3-course crop rotation of late fertilization caused *Avena fatua* and *Centaurea cyanus* to disappear entirely, while Matricaria and *Triticum repens* occurred very seldom. Where early fertilization had been practiced, annual and biennial weeds characteristic for the same fields with late fertilization were entirely eliminated. Winter cereal fields produced at harvest time young shoots of annual weeds typical for spring cereals.

Early fertilization in the rotation, however, increased the weediness of spring cereals, these being covered with annuals typical for this field with seeds which were large, covered with a hard envelope, and ripened either at the time of harvesting the grain or after it. Early fertilization did not crowd out the seeds of such weeds nor entirely eliminate the number of perennial weeds, although that of thick-stemmed weeds was decreased.

HORTICULTURE.

Report from the division of horticulture for the year ended March 31, 1914, W. T. Macoun et al. (*Canada Expt. Farms Rpts. 1914, pp. 492–510, 512–552, 553–557, 559, 561, 562, 566–574, 577–580, 582–586, 588–602, 603–608, 614–642, 647–669, 670–682, 685, 686–692, 696, 697, 698–718, 719–725, 727–743, 744–748, pls. 9*).—A detailed report on results secured in 1913 in the breeding and cultural experiments with fruits, vegetables, forest and ornamental trees, and herbaceous plants conducted at the Central Farm, Ottawa, and at the various branch experimental farms and stations in Canada. A summary of these results has appeared previously in bulletin form (E. S. R., 32, p. 539).

[Variety tests with vegetables], F. B. Headley (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1914, pp. 9, 10*).—Ripening dates and yields are given for varieties of tomatoes tested on the Truckee-Carson farm in 1914, together with yields of onion varieties grown on a farm at Fallon, Nev., in 1914. The five highest-yielding tomato varieties in the test were the Perfection, Ponderosa, Globe, Acme, and Beauty. Of the onions, Prizetaker, Ohio Yellow Globe, and Red Wethersfield appeared to be the most desirable varieties for commercial purposes.

Insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms Rpts. 1914, pp. 123–126*).—Analyses are reported of arsenate of lead, formaldehyde, pine spray insecticide, worm killer, Velvas lawn sandweed killer and fertilizer, and tobacco decoction.

Orchard spraying, D. E. Lewis (*Kansas Sta. Bul. 203 (1915), pp. 5–44, figs. 15*).—In this bulletin consideration is given to spray materials and machinery, mixing and testing the common orchard spray solutions, the method of applying each, and the acreage which each type of spray machine may be expected to protect. A spraying outline is also given showing the dates and kind of material to use in protecting the fruit crop from the common orchard pests.

Some effects of pruning, root pruning, ringing, and stripping on the formation of fruit buds on dwarf apple trees, A. W. Drinkard, Jr. (*Virginia Sta. Tech. Bul. 5 (1915), pp. 96–120, figs. 9; Rpts. 1913–14, pp. 96–120, figs. 9*).—An account is given of experiments begun in the spring of 1913 for the purpose of determining the effects of root pruning, ringing, and stripping at different seasons on the formation of fruit buds on apple trees. The observations and results here reported cover a period of two years and include only full dwarf apple trees of the English variety King of Pippins. The work has now been extended to include half dwarf and standard apple trees growing under a variety of conditions.

The results thus far secured with dwarf trees show that spring pruning of the branches of the trees at the time of growth resumption had a tendency to discourage the formation of fruit buds, but appeared to stimulate the wood growth. Summer pruning of the branches during the latter part of June, when fruit buds normally begin to show differentiation, checked wood growth for the year and greatly stimulated the formation of fruit buds. Fall pruning of the branches in November did not materially influence the crop of fruit buds, but caused vigorous wood growth the following year.

Severe root pruning in the spring, whether at the time of growth resumption, when the leaves were well developed, or at the beginning of fruit bud differentiation, when accompanied by or preceded by spring pruning of the branches produced some stimulation in fruit bud formation. Root pruning retarded growth in the current and succeeding year, the leaf area of the trees being reduced and the trees showing injury from the treatment. The earlier the root pruning was done the greater was the injury. Root pruning without branch pruning at the resumption of growth did not give as much stimulation to fruit bud formation as the same treatment applied at later dates.

Ringing at different seasons when accompanied by or preceded by spring pruning of the branches produced no noticeable stimulation of fruit buds. Ringing alone early in the season did not stimulate fruit bud formation. Ringing alone at the time the leaves were fully developed gave the best results, although some stimulation to fruit bud development was observed when the ringing was done at the time of differentiation of the fruit buds.

The effects of stripping the trees were offset by spring branch pruning. Stripping at the three seasons already mentioned without branch pruning stimulated fruit bud formation uniformly.

Thus far our knowledge of special practices, such as root pruning, ringing, and stripping, is deemed too meager to formulate rules for their use in orcharding.

Cranberry growing, H. J. Franklin (*Mass. Bd. Agr. Circ. 41 (1915), pp. 31, pl. 1*).—In this paper the author gives a brief discussion of the important essentials for the growing of cranberries, their handling for market, and their preparation for the table, together with an itemized estimate of the present cost of preparing a bog.

Utilization of peat land for cranberry culture, C. L. Shear (*Jour. Canad. Peat Soc., 4 (1915), No. 1, pp. 15–18*).—In this paper the author gives the essentials for successful and profitable cranberry culture, with special reference to the utilization of peat land.

Contribution to the history of the vine and its culture in the Lorraine region, J. Riston (*Contribution a l'Histoire de la Vigne et de sa Culture dans la Région Lorraine. Nancy: Librairie Sidot Frères, 1914, vols. 1, pp. 596; 2, pls. 33*).—In the introductory chapter of this two-volume work the author summarizes the characteristics and delimits the Lorraine region. Part one comprises a historical account of grapes and the grape industry in this region. Part two consists of a study of the cultivated grapes in Lorraine. Part three reviews the knowledge relative to the climate of the region. Part four treats of the culture of the vine, and part five comprises a study of the decadence of the Lorraine grape industry. Volume two comprises photographic illustrations of the foliage of the principal grapes, together with maps of the regions studied.

The results of experiments with citrus stocks.—The first five year average, W. W. Bonns (*Proc. Fruit Growers' Conv. Cal., 45 (1914), pp. 114–118*).—A progress report on a long-continued experiment being conducted at the California Citrus Substation with the view of determining the value of sweet, sour, and trifoliata orange stocks for the navel and Valencia oranges and the Eureka lemon. The Valencia orange and Eureka lemon are also being tested on pomelo stocks. The tests are being conducted on different types of soil.

No definite conclusions are drawn from the results to date. Attention is called to the fact, however, that the reputation of trifoliata stock for dwarfing trees does not hold good for all soils or all varieties. The behavior of the same stock and variety varies on the light and the heavy soils. Trifoliata roots dwarf the lemon to an undesirable degree. In all cases there is a decided increase of the stock above ground when trifoliata has been used.

Improvement of lemon varieties by bud selection, A. D. SHAMEL (*Proc. Fruit Growers' Conv. Cal., 45 (1914), pp. 257–266, figs. 5*).—A progress report on the author's work in bud selection (E. S. R., 32, p. 439).

As to the results secured in improving lemon trees, the author concludes in brief that in the experimental work and in the practical rebudding work carried out by cooperators "we have as yet to find a single exception to the rule that the unproductive and undesirable types of healthy trees can be successfully top-worked and replaced with productive and desirable types of lemon trees by rebudding."

The relation of washing to decay in Washington navel oranges; season of 1914–15, C. W. MANN (*U. S. Dept. Agr., Bur. Plant Indus., Relation of Washing to Decay in Washington Naval Oranges, 1915, pp. 4*).—The results of previous investigations of the Bureau of Plant Industry (E. S. R., 20, p. 43) have shown that washing even under the most favorable conditions is followed by an increase in the decay in the packed fruit. In the present paper the author describes an investigation conducted by the Bureau during the orange shipping season of 1914–15 to determine the relation of handling to the occurrence of decay resulting from the methods used in the washing and subsequent drying of the fruit. A comparison was made between fruit very carefully picked by the Bureau men with the same kind of fruit handled under ordinary commercial conditions. All of the fruit was washed in the ordinary machinery, a part being packed while still moist and wet and an equal amount of fruit thoroughly dried before packing. A part of the same fruit was packed without washing or brushing.

The data secured from these tests show that the percentage of decay in carefully handled fruit was increased from 1.8 per cent in the unwashed fruit to 3.4 per cent in the washed and thoroughly dried fruit and to 3.9 per cent in the washed fruit packed wet. In the ordinary commercially handled lots the average percentage of decay in the unwashed fruit was 8.3 per cent. Washing followed by thorough drying increased the decay to 11.4 per cent, and in the same fruit packed wet the average decay was 13.9 per cent. The difference in the percentages of decay developing in the wet and dry packed fruit was considerably greater during the period of cloudy or wet weather early in the season. The figures given are the averages for the whole season.

The work in general indicates that the losses from decay resulting from packing improperly dried oranges are directly in proportion to the care exercised in the methods of handling.

Experiments were made to determine the time required to dry the fruit under different conditions of temperature and humidity. The most rapid evaporation of the moisture of the fruit took place with dry air at a temperature of 130° F. The time varied approximately 11 minutes with an air blast having a temperature of 55° and a relative humidity of 70 per cent to about one minute with air at a temperature of 130° and a humidity of 14 per cent. In experiments conducted with two types of driers it was found that infection with blue mold may be increased if the dusty air from the packing house is blown on the fruit in the air blast. In an efficient system of drying the cost of heating air to a temperature of 130° should not exceed $1 per car of packed fruit.

Some experiments in pineapple planting, S. M. CAPISTRANO (*Philippine Agr. and Forester, 4 (1915), No. 2, pp. 45–50*).—A number of cultural experiments and a variety test conducted by the author at the College of Agriculture are reported.

[Cacao experiments, 1913–14], J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 3, pp. 74–97, pls. 6*).—A progress report for the year ended August 31, 1914, relative to manurial, shade, pruning, and natural yield experiments being conducted in a number of plantations in Trinidad (E. S. R., 30, p. 444), including also data on manurial experiments with cacao and rubber in Tobago.

The flower garden, T. W. SANDERS (*London: W. H. & L. Collingridge [1915], 2. ed., pp. 472, pls. 56, figs. 40*).—A revised and enlarged edition of the author's work which treats of the designing, formation, planting, and management of flower gardens, including the description and cultivation of all hardy and half hardy plants, trees, and shrubs adapted for outdoor culture in the British Isles.

FORESTRY.

Forest administration in the southern Appalachians, K. W. WOODWARD (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 130–140*).—A discussion of forest conditions in the southern Appalachians with special reference to modifications which will be necessary in order to make the forest policy which has been worked out for western conditions fit in the East.

Present condition of applied forestry in Canada, H. R. MACMILLAN (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 115–129*).—A review of forest activities and conditions in Canada with special reference to the work of administration, protection, reforestation, and other activities leading to forest conservation.

Sand dune reclamation on the coast of northern California and southern Oregon, F. B. KELLOGG (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 41–64, figs. 2*).—An account of methods employed in sand dune reclamation as carried out on an extensive scale for over 15 years near the Oregon line in California, with special reference to the application of the methods in similar sand dune areas situated on the Siuslaw National Forest, Oregon.

Notes on the relation of planting methods to survival, E. E. CARTER (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 9–17*).—The author here presents the results of a study of planting methods started in 1913 on the Harvard Forest, Petersham, Mass. The three methods employed consisted in brief of planting in a mattock hole, planting in a slit with the sod previously removed, and planting in a slit without removing the sod.

The experiment has not been conducted sufficiently long to arrive at any conclusion. The data thus far secured, however, show that the hardier species as a group are less affected by the different methods of planting than the more tender species.

A formula for normal growing stock in selection system forests, T. T. MUNGER (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 18–21, figs. 2*).—The author here presents a formula which is believed to be thoroughly applicable in preparing preliminary working plans for virgin forests where adequate yield tables can not be prepared.

A possible measure of light requirements of trees, W. W. ASHE (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 199, 200*).—The author is of the opinion that the relation between the cambium surface of the stem and the surface of the crown of dominant trees affords a reliable basis for measuring the light requirements of trees. By establishing this ratio between cambium surface and surface of the crown in stands at different ages and on different quality sites, either for the dominant trees or for the crown classes which receive direct light, series are obtained which, it is believed, should express the relative demands on light for a species at different ages.

A table is given showing the variation in this relation with age and quality site for dominant trees of *Pinus tæda*.

The construction of a set of taper curves, W. B. BARROWS (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 32–40, figs. 5*).—A discussion of methods in vogue in preparing tabulations and curves showing the taper of trees for a given species.

Reading and replotting curves by the strip method, W. B. BARROWS (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 65–67, figs. 9*).—A method of reading and replotting curves representing graphically values used in forest measurements is here described.

The clinometer on fire lookouts, D. BRUCE (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 201–206, figs. 4*).—The application of the clinometer to the location of forest fires from lookout points is described.

The invasion of a planted prairie grove, R. J. POOL (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 1–8, pl. 1*).—A discussion of changes in the flora in the prairie region of Nebraska as brought about by the establishment of forest plantations of considerable size.

Investigation into the retarding effect of lime on the growth of conifers, A. D. HOPKINSON and H. D. ELKINGTON (*Agr. Students' Gaz., n. ser., 17 (1915), No. 4, pp. 176–178*).—An investigation was started at the Royal Agricultural College in 1914 to ascertain the effect of varying quantities of calcium carbonate on the growth and development of Douglas fir (*Pseudotsuga douglasii*).

The data thus far secured indicate that Douglas fir grows well in sandy soils with small amounts of calcium carbonate. Increasing quantities of calcium carbonate up to 8 per cent have a distinct retarding effect on its growth. Above 8 per cent of calcium carbonate some counteracting factor, whose influence has not yet been established, dominates this retarding effect of the lime.

A study of Douglas fir seed, C. P. WILLIS and J. V. HOFMANN (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 141–164*).—This comprises a progress report on a study of Douglas fir seed which is being carried out at the Wind River Experiment Station, Carson, Wash., with special reference to securing the best type of seed for artificial reforestation, and to determine what class of seed trees are satisfactory for the natural restocking of timber-sale areas. As a result of the data secured in 1913 and in 1914 from planting tests of seed of varying sizes and secured from various sources, a number of suggestions and rules are given for application to cone collecting and in the selection of seed trees for reforesting cut-over areas.

Douglas fir and fire, C. S. JUDD (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 186–191*).—This paper shows the influence of forest fires in creating favorable conditions for the development of Douglas fir stands. The most favorable effect of forest fires in this respect is the burning off of the humus so that the mineral soil is exposed. In this soil Douglas fir, with its vigorous reproductive capacity, regenerates itself to the almost complete exclusion of other competitive and dominating species.

The management of Engelmann spruce-alpine fir stands, J. W. SPENCER (*Proc. Soc. Amer. Foresters, 10 (1915), No. 2, pp. 192–198*).—An account of the plan of management of mixed stands of Engelmann spruce and alpine fir at the Battlement National Forest, Colorado.

Monterey pine, L. T. LARSEN (*Proc. Soc. Amer. Foresters, 10 (1915), No. 1, pp. 68–74*).—An account of Monterey pine with reference to its range and occurrence; climatic, soil, and moisture requirements; associated species; habit of growth; tolerance; rate of growth and longevity; yield; susceptibility to injury; reproduction; and management.

Eysenhardtia polystachya, the source of the true lignum nephriticum mexicanum, W. E. SAFFORD (*Jour. Wash. Acad. Sci., 5 (1915), No. 14, pp. 503–517, figs. 2*).—In this article, which is based on a paper read before the Botanical Society of Washington, the author establishes the identity of lignum nephriticum mexicanum, a nephritic wood remarkable for the blue fluorescence of its infusion in spring water, and which was celebrated throughout Europe in the sixteenth century as a diuretic. It proves to be the wood of a leguminous tree (*E. polystachya*) occupying an extensive range in the interior of Mexico. The species is described in detail.

DISEASES OF PLANTS.

The investigation of physiological plant diseases, R. E. SMITH (*Phytopathology, 5 (1915), No. 2, pp. 83–93*).—According to the author the term "physiological" or "nonparasitic" disease has come into use to describe troubles due to an autogenous functional disturbance rather than to the presence of a foreign organism. The information regarding a number of these diseases is reviewed and the author concludes that there is no such thing as an established group of physiological or nonparasitic plant diseases for the kind of troubles which have been described. They are all considered more or less obscure diseases of unknown etiology as yet unaccounted for. He claims that the only positively known inciting factors in plant diseases, excluding direct traumatisms, are parasites.

A suggestion of a new phase of the problem of physiological diseases of plants, C. B. LIPMAN (*Phytopathology, 5 (1915), No. 2, pp. 111–116*).—Largely upon the basis of the author's investigations on mottled leaf of citrus trees (E. S. R., 31, p. 450), he proposes as a justified theoretical consideration to connect certain functional troubles in plants known as malnutrition or as physiological diseases with a definite lack of the specific plant food element, nitrogen, in available or usable form.

Bactericidal products in healthy and diseased plants.—I, Healthy plants, R. J. WAGNER (*Centbl. Bakt. [etc.], 2. Abt., 42 (1914), No. 21–22, pp. 613–624, figs. 5*).—This first report deals with the natural immunity of plants, detailing studies made with three different bacteria named.

It is stated that in healthy plants three classes of antibacterial products may be found, namely, agglutinin, tending to limit bacterial movement, lysin, tending to dissolve bacterial membranes, and substances limiting multiplication of spores and of bacteria possessed of resistant membranes. To these may be added as a possible factor a heightened acidity of the cell sap.

[Adaptive specialization of vegetable parasites], F. HESKE (*Centbl. Gesam. Forstw., 40 (1914), Nos. 7–8, pp. 272–278; 9–10, pp. 369–375*).—The author reviews recent developments regarding biochemical phenomena noted in plants, and discusses, in connection with the probable activities of ferments as related to the specialization of certain parasitic organisms, the apparent possibilities as regards the gradual production of ferments adapted to this work.

Disease resistance in plants, O. APPEL (*Science, n. ser., 41 (1915), No. 1065, pp. 773–782*).—In this paper, which was presented as a lecture before a number of agricultural colleges in this country, the author points out various problems in connection with resistance to plant diseases, and states that while the present methods of combating diseases should not be abandoned, efforts should be made to find the causes of immunity, and after solving this question to determine without infection the disease resistant qualities in different varieties and individuals in order to establish the desired resistance and at the same time eliminate undesirable qualities.

It is believed that in working along this line the breeding of disease-resistant varieties can be best accomplished.

Some problems of plant pathology in reference to transportation, F. L. STEVENS (*Phytopathology, 5 (1915), No. 2, pp. 108–110*).—Attention is called to a number of questions relating to the development of diseases in fruits in transportation. Of some of these troubles considerable information is at hand, but it is stated that there is necessity for further investigations on those which rapidly develop on wilting or old products under unsuitable conditions of temperature and humidity.

Report of the division of botany, H. T. GÜSSOW (*Canada Expt. Farms Rpts. 1914, pp. 831–849, pl. 1*).—This report contains an account of administrative work in connection with the destructive insect and pest act and various specific diseases, experimental work in plant-disease control, notes on investigations in economic botany, and a report of St. Catharines field laboratory for 1913 (pp. 845–849), in which notes are given of a number of the more important diseases of apples, pears, quinces, cherries, peaches, and plums observed during the season.

Among the plant diseases investigated, considerable attention was paid to those attacking the potato, and a description is given of a black heart of potatoes, which resembles that described by Bartholomew (E. S. R., 30, p. 149), but which, in the present case, is attributed to frost injury. An account is also given of apple canker and silver leaf of fruit trees.

[Plant diseases in Southern Nigeria], C. O. FARQUHARSON (*Ann. Rpt. Agr. Dept. South. Nigeria, 1913, pp. 41–55*).—A presumably new root disease of Para rubber trees at Calabar was said to be distinct from each of two others due, respectively, to *Polyporus lignosus* (*Fomes semitostus*) and to *Hymenochœte noxia*.

Cocoa trees are affected near the forks by a trouble described as of unknown causation. A pathogenic but undetermined fungus attacks also the maturing pods. *Thyridaria tarda* is a very common saprophyte.

Cotton leaf curl has been studied and the main conclusions therefrom are given. The first-year hybrids of native American cotton were immune, resembling in this the American parents. The disease is suspected to be identical with mosaic disease of tobacco. An enzym may be the cause of the trouble.

Cotton anthracnose (*Colletotrichum gossypii*) attacks most severely the native cotton, American cotton and hybrids being almost entirely immune. A spotting disease of bolls was ascribed to cool nights. A stem blackening disease is mentioned as of obscure origin. *Ramularia areola* and *Uredo gossypii* were very common on American cotton, but neither affected seriously native plants. Spraying for the control of cotton diseases is impracticable, and careful selection of seed from immune plants and government seed control are suggested.

Fungus disease of peanuts (*Cercospora personata*) was somewhat serious. Its severity depended apparently upon the kind of weather prevalent during the given season, possibly being conditioned by another disease of unknown but probably physiological causation, which is described as suggesting cotton leaf curl.

Two rust fungi from the Royal Botanic Garden, Edinburgh, M. WILSON (*Notes Roy. Bot. Gard. Edinb., 8 (1914), No. 38, pp. 219–221, pls. 2*).—The author notes the discovery of *Puccinia prostii* attacking a bed of *Tulipa sylvestris* and doing considerable damage, the plants affected producing but few flowers. The rust was probably present on the plants in 1913 or even earlier.

Uromyces scillarum was found on leaves of *Muscari polyanthum*, which has not hitherto been recorded as attacked by this rust.

Both fungi are briefly discussed in these connections.

Ustilago vaillantii on Chionodoxa luciliæ, R. C. Davie and M. Wilson (*Notes Roy. Bot. Gard. Edinb., 8 (1914), No. 38, pp. 227, 228, fig. 1*).—In March, 1913, *U. vaillantii* was found in the anthers of *C. luciliæ* in the Royal Botanical Garden, Edinburgh. The fungus was studied in this connection, but no information is yet available regarding the method of infection in case of this plant, or whether this may be brought about by use of spores of this fungus from anthers of *Scilla bifolia*, in which it commonly occurs.

The crown gall of alfalfa, O. T. Wilson (*Science, n. ser., 41 (1915), No. 1065, p. 797*).—The author gives a brief account of certain facts observed in the life history of the organism *Urophlyctis alfalfæ*, the cause of crown gall of alfalfa. The presence of a plasmodium as the vegetative stage of the parasite and the entire absence of mycelium at any stage is said to suggest that possibly the organism should be removed from the genus Urophlyctis.

Gummosis of beets, G. Arnaud (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 11, pp. 350-352*).—A gumming disease of beet roots is described.

The causative organism, which is an intercellular bacterium, is said to be closely allied morphologically to *Bacterium mori*. The attack appears to be conditioned or favored by injury to the roots from cold, though several fungi are found on the exterior portions of diseased roots. The financial loss is due largely to the transformation of saccharose and the production of a gum which is difficult to eliminate.

Late blight of celery, H. L. Rees (*Washington Sta., West. Wash. Sta., Mo. Bul., 2 (1915), No. 11, pp. 11-18, figs. 4*).—A description is given of the late blight of celery, due to *Septoria petroselini apii*, and notes are given on its life history.

In an account of spraying experiments it is stated that two applications of Bordeaux mixture completely protected the crop. However, as the season was considered exceptionally unfavorable to the blight, it was not concluded that two sprayings will always control the disease.

The effect of planting in single and double rows and of board *v.* dirt blanching was tested. Single rows and board blanching, by reason of securing greater aeration, reduced the amount of disease.

Eight varieties of celery were tested, and marked differences found in their susceptibility to disease. For the control of this disease the author recommends transplanting of only healthy plants, frequent rotation of crops, spraying with Bordeaux mixture, and planting the least susceptible varieties.

In addition to the above, attention is called to a physiological disease of celery, said to be due to an excess of moisture.

A bacterial disease of lettuce, Nellie A. Brown (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 475-478*).—A preliminary report is given of a bacterial disease of lettuce plants, which was first determined from diseased lettuce plants received in this Department in January, 1915, from Nairn, La. When received the plants were full grown, with some of the outer leaves shriveled and dried, while others were in a soft-rotted condition. The centers of the heads were sound, but between the center and these dead outer leaves were others affected in varying degrees.

A study of the diseased material showed the presence of bacteria in and between the cells. These have been studied and compared with various known organisms, and the author suggests the name *Bacterium viridilividum* n. sp. for this form, owing to its peculiar appearance when grown on steamed potato.

A review is made of the rather brief literature of the bacterial diseases of lettuce, none of which seem to be the same as that here described.

Some diseases of the potato.—IV, Late blight or Irish potato blight, Ethel M. Doidge (*Agr. Jour. Union So. Africa, 8 (1914), No. 2, pp. 205-211, figs. 6*).—

Continuing previous work (E. S. R., 32, p. 342), Bordeaux mixture is found to be protective and to increase the yield of tubers if sprayed on when the plants are 6 in. high and two or more times thereafter at intervals of from 10 to 14 days. This, however, delays the ripening of the tubers.

Protective measures available include careful selection and handling of seed potatoes, burning of haulms, rotation of crops, and isolation from solanaceous crops which are susceptible to *Phytophthora infestans*. If the tops are attacked, fallen spores may be killed by spraying the ground.

Notes on the distribution and prevalence of three important sweet potato diseases, L. L. HARTER (*Phytopathology, 5 (1915), No. 2, pp. 124–126*).—According to the author the stem rot of sweet potatoes, due to *Fusarium hyperoxysporum* and *F. batatatis*, is known to occur in New Jersey, Delaware, Maryland, Virginia, Alabama, Ohio, Illinois, Missouri, Iowa, Kansas, Oklahoma, Arkansas, North Carolina, Georgia, and Mississippi. The black rot, caused by *Sphæronema fimbriatum*, is reported as occurring in New Jersey, Delaware, Maryland, Virginia, Ohio, Illinois, Missouri, Iowa, Kansas, Oklahoma, Texas, Arkansas, North Carolina, Georgia, and Alabama. The foot rot, a comparatively new disease due to *Plenodomus destruens*, is reported from Virginia, Missouri, Iowa, and Ohio.

New light on curly top of the sugar beet, R. E. SMITH and A. BONCQUET (*Phytopathology, 5 (1915), No. 2, pp. 103–107, figs. 3*).—The authors record certain facts which recently came to light in the study of the curly top of the sugar beet. They have confirmed the investigations of Ball (E. S. R., 20, p. 954) and Shaw (E. S. R., 23, p. 557) regarding the relationship between the leaf hopper, *Eutettix tenella*, and the occurrence of the disease. A study of affected plants has shown definite lesions accompanied by an organism which agrees fairly well with *Bacillus dianthi*, previously described as the cause of the carnation disease (E. S. R., 8, p. 235).

The authors have not succeeded in producing the disease by inoculating plants with this organism, and it is not known whether or not it is the inciting factor causing and inhabiting the lesions. Further study on this disease is said to be necessary.

Sugar beet mosaic, C. O. TOWNSEND (*Science, n. ser., 42 (1915), No. 1076, pp. 219, 220*).—The author states that while this disease has been observed for a number of years, it has not hitherto been described. It is known to occur in the middle and western portions of the United States and appears to be increasing from year to year. In some commercial fields it is said to affect from 10 to 20 per cent of the stand and threatens to become a limiting factor in sugar beet culture in some areas.

The leaves of the affected plants are said to be mottled yellow and green. The spots are not always sharply defined, but usually shade into each other, giving the affected leaves a yellowish appearance. Only a part of the leaves on a beet are diseased, at least during the early stages of development. Affected leaves, if numerous, generally occupy only one side of the beet crown, normal leaves occupying the opposite side, giving the beet top a one-sided appearance. The shortened petioles give the leaves a dwarfed appearance, as in the case of curly top. The roots are said to be dwarfed and often hairy, further resembling curly top. While the two diseases are somewhat similar, they are easily distinguished from one another.

Tobacco root rot observations, W. A. BARNET (*Canada Expt. Farms Rpts. 1914, pp. 1022, 1023*).—In connection with investigations of tobacco growing, the author reports plats of Burley tobacco in which certain rows or portions of the field seemed to have their growth completely arrested. This dwarfed appearance of the plants was prevalent in the field, and, it is said, was produced by a disease which had affected previous crops, but had not been definitely recognized. The disease is considered as having been caused by *Thielavia basicola*, and cooperative experiments will be made with the Wisconsin Experiment Station in trying to breed a disease-resistant strain of Burley tobacco.

A serious new wheat rust in this country, M. A. CARLETON (*Science, n. ser., 42 (1915), No. 1071, pp. 58, 59*).—The author reports the discovery of *Puccinia glumarum*, the yellow leaf rust of wheat, in a field of wheat at Sacaton, Ariz., by a party representing the Office of Cereal Investigations of this Department. About the same time the rust was reported on *Hordeum murinum* in southern California, and later was found in considerable abundance in various parts of Oregon and Washington and to some extent in Idaho, and a few specimens were taken at Bozeman, Mont., and Logan, Utah.

Control of stinking smut of winter wheat with formaldehyde, H. C. MÜLLER and E. MOLZ (*Fühling's Landw. Ztg., 63 (1914), No. 24, pp. 742–752*).—Detailed results are given of several series of more recent tests (E. S. R., 32, p. 341) with formaldehyde alone and with copper sulphate in solutions for steeping seed wheat for protection against stinking smut, also regarding the value, in this connection, of paraformaldehyde, which proved to be injurious and not protective.

The rôle of sucking insects in the dissemination of fire-blight bacteria, V. B. STEWART and M. D. LEONARD (*Phytopathology, 5 (1915), No. 2, pp. 117–123*).—In a previous publication (E. S. R., 30, p. 650) the relation of the tarnished plant bug as a carrier of the causal organism of fire blight was pointed out. In the present paper an account is given of experimental work on young apple seedlings under cages, to which the following species of sucking bugs were transferred from near-by weeds: *Adelphocoris rapidus*, *Campylomma verbasci*, *Orthotylus flavosparsus*, and *Pœciloscytus basalis*.

From the results of the experiments it appeared that all of the above-named species are capable of producing fire-blight inoculations when the causal organism is present, and that they are undoubtedly instrumental in spreading the disease.

Three strawberry fungi which cause fruit rots, F. L. STEVENS (*Science, n. ser., 41 (1915), No. 1068, pp. 912, 913*).—In a previous publication (E. S. R., 31, p. 645) the author called attention to the presence of a number of rots on strawberries in shipment.

In the present paper descriptions are given of a fruit rot due to *Patellina* sp., and another rot caused by *Sphæronemella* sp., both of which have been found on market berries. The frequency of their presence is believed to render them of considerable economic significance. In addition, a black rot due to *Sphæropsis* sp. is described.

A nasturtium wilt caused by Bacterium solanacearum, MARY K. BRYAN (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 451–458, pls. 4, figs. 3*).—A description is given of a bacterial wilt disease of nasturtium, first observed in the summer of 1914. The disease prevents blossoming, stunts the plants, and finally kills them. It is caused by *B. solanacearum*, and a cross-inoculation with a virulent strain from tobacco produced typical nasturtium wilt.

Cultivated ageratums and verbenas were also found susceptible to infection by this organism, the author having thus added another family of plants to those already known to be subject to attack.

Oak fungus or Armillaria mellea in connection with nursery stock, W. T. HORNE (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 4, pp. 179–184, figs. 3*).—In continuance of previous contributions (E. S. R., 27, p. 450; 32, p. 241), the author states that Armillaria spots have come to be of exceedingly frequent occurrence throughout the best fruit-growing sections of California, especially in the central and northern valleys, probably averaging at least one such spot for every 10 acres of mature bearing orchard. Small nurseries seem particularly liable to Armillaria trouble.

Young trees may carry the fungus undetected in spite of the utmost vigilance, on account of the detachment of the rhizomorphs, or these may be hidden within the ball of dirt left on the roots. When an infected tree is planted it is thought the fungus will so far resist any hardship as to outlive the tree. It is considered unsafe to use soil or plants not known to be absolutely free from this fungus.

Oak mildew, F. W. Neger (*Naturw. Ztschr. Forst u. Landw., 13 (1915), No. 1, pp. 1–30, figs. 6*).—This is a discussion of oak mildew (*Microsphæra alni quercina*) since its sudden appearance in western Europe in 1907, including its development, systematic position, morphology, physiology, pathology, hosts, winter habits, and means of control, concluding with an extensive bibliography.

Dry rot of telegraph poles, K. Havelík (*Centbl. Gesam. Forstw., 40 (1914), No. 7–8, pp. 278–295, figs. 7*).—Investigation of an extensive and often rapid decay of telegraph poles showed *Merulius lacrymans* to be the chief cause of the injury. This was more frequent and severe in case of double than of single uprights, and more particularly in case of the A form as compared with the H form poles. This is thought to be owing to the looser texture of the soil around the double poles, due to the larger holes necessary and to the greater difficulty and supposedly less need of thoroughly packing the soil around these poles. Compactness and moisture of the soil seems to be unfavorable to rapidity of underground extension in case of *M. lacrymans.*

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A preliminary note on the food habits and distribution of the Texas horned lizards, W. M. Winton (*Science, n. ser., 41 (1915), No. 1065, pp. 797, 798*).—The author reports upon studies conducted with a view to determining the economic status of *Phrynosoma cornutum,* during the course of which 485 stomachs have been examined.

It is pointed out that while the area of distribution of this species extends from Kansas southward far into the Mexican table-land and westward into Arizona its area of greatest abundance is the north and south strip of Texas known as the Black and Grand prairies. It is stated that within this area, where conditions are at all favorable, the average number of horned toads is at least 30 to the acre. The stomach examinations show that the noxious insects consumed overwhelmingly outnumber the beneficial species.

Entomological yearbook.—Calendar for all insect collectors, edited by O. Krancher (*Entomologisches Jahrbuch. Kalender für alle Insekten-Sammler. Leipsic: Frankenstein & Wagner, vols. 19 (1910), pp. 208, pl. 1; 20 (1911), pp. 196, pl. 1; 21 (1912), pp. 200, pl. 1; 22 (1913), pp. 195, pl. 1, figs. 5; 23 (1914), pp. 211, pl. 1, figs. 8; 24 (1915), pp. 224, pl. 1, figs. 8*).—These handbooks contain much information of interest to the entomologist, particularly as relates to the collection of insects during the different months of the year.

Report to the entomologist of the Arizona Commission of Agriculture and Horticulture for the year ending June 30, 1914, A. W. Morrill (*Ariz. Com. Agr. and Hort. Ann. Rpt., 6 (1914), pp. 9–47, figs. 16*).—The first part of this report (pp. 9–26) deals with the inspection of plant, fruit, and seed importations; inspection of orchards and nurseries; insect control and eradication; interstate movement toward the standardization of nursery inspection certificates, entomological investigations, etc.

The second part (pp. 27–47) consists of notes on the important insects of the year. The deciduous fruit and vine pests mentioned are the southwestern green flea-beetle (*Haltica foliacea*) which was the most notable through its injury to apple trees and grapevines; the western rose chafer (*Macrodactylis uniformis*); the flower thrips, which was unusually destructive to late blooming varieties of peas, etc. The citrus pests briefly mentioned are the soft brown scale (*Lecanium hesperidum*), citrus thrips, and a species of cicada. The field crop pests mentioned include the western army cutworm (*Chorizagrotis agrestis*); a species of blister beetle (*Tegrodera erosa*), which appeared in alfalfa fields; the corn flea-beetle (*Chætocnema ectypa*); and a species of bill bug (*Spenophorus callosus*) which attacked corn. Among the pests mentioned as attacking vegetable crops are the melon aphis, grasshoppers, the harlequin cabbage bug, and a small black beetle (*Blapstinus pimalis*), previously unknown as a crop pest. The cotton or melon aphis was the most destructive cotton pest of the year. A species of Goldsmith beetle (*Cotalpa consobrina*) was notably abundant in southern Arizona and did much damage by stripping the leaves from cottonwood trees.

Report from the division of entomology for the fiscal year ending March 31, 1914, C. G. Hewitt (*Canada Expt. Farms Rpts. 1914, pp. 853–876*).—The first part of this report deals with the administration of the Destructive Insect and Pest Act under the headings of the new plant quarantine or fumigation stations, inspection and fumigation of imported nursery stock, field work against the brown-tail moth, 1912–13, importation of parasites of the brown-tail and gipsy moths, collection of parasites, colonization of parasites, Apanteles in Nova Scotia, and parasites of native insects. The parts which follow report upon the occurrence of and work of the year with the insects affecting cereals and field crops, fruit crops, forest and shade trees, domestic animals and man, and the garden and greenhouse, and with apiculture.

Observations on the biology of Nematus erichsonii, Athalia spinarum, and Hylemyia (Anthomyia) antiqua, V. A. Levtejev (*Mat. po Izuch. Vredn. Nasiek. Moskov. Gub., 5 (1914), pp. 94–111; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, pp. 372–374*).—A report of two years' observations of these pests in Petrovo-Razumovskoje, near Moscow.

Insect enemies of Sudan grass, W. Newell (*Texas Sta. Circ. 7, n. ser. (1915), pp. 5–18, figs. 6*).—A number of native insects have found Sudan grass (*Andropogon sorghum sudanensis*), a forage plant introduced into the United States by Piper from Khartum, Sudan, in 1909, to their liking. One class attacks the seeds during their development or after harvest, while another class attacks the growing crop and reduces the yield of forage.

Those belonging to the first-mentioned class are the sorghum midge (*Contarinia* [*Diplosis*] *sorghicola*), which is the most important enemy of the plant, due to its destruction of the seed before maturity, and the Angoumois grain moth. A report of studies of the sorghum midge, a pest which has for many years been familiar to growers of sorghum, milo maize, and all other crops of this family, by Dean, has been previously noted (E. S. R., 23, p. 364). The destruction of Johnson grass, which affords a constant breeding place for the pest, is thought to be the most vital step in the control of this midge. The Angoumois grain moth does not prevent the Sudan grass from making seed, but the adult moths deposit their eggs in the seed heads before the harvest, the seed thus becoming infested with larvæ, and the moths continuing to breed in the stored seed. It can be destroyed by fumigation, experiments having shown that carbon bisulphid used at the rate of 15 lbs. to 1,000 cu. ft. of space with an exposure of 12 hours did not affect the germination of the seed. The author emphasizes the importance of immediately sacking up the seed, preferably in sacks of heavy cloth such as canvas, free from holes, so that moths can not get to the seed to start another infestation.

The insects mentioned as belonging to the second class include the conchuela (*Pentatoma ligata*) and grasshoppers. The conchuela, an account of which by Morrill has been previously noted (E. S. R., 23, p. 461), has become a pest in the area in which the sorghum midge is scarce or absent on account of insufficient moisture. Its sucking of the sap from either the stem or seed head results in a rapid wilting or burning of the infested plants and their heads. As yet large areas of Sudan grass have not been grown in the localities where the conchuela is at present abundant. Where grasshoppers appear in sufficient numbers to cause injury, the weed patches should be sprayed with a sweetened arsenical, care being taken to keep all stock from grazing on these patches until after several hard rains.

The insect enemies of the fig, F. PICARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 35 (1914), No. 36, pp. 279–286, pl. 1; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 1, pp. 10, 11*).—A general account of eight of the more important enemies of the fig illustrated by a colored plate.

Notes on the development of Bacillus pestis in bugs (Cimex lectularius) and their power to convey infection, A. W. BACOT (*Jour. Hyg. [Cambridge] Plague Sup. 4 (1915), pp. 777–792, pls. 2, fig. 1*).—The author's conclusions are "that for a percentage of bugs (*C. lectularius*) and probably all newly hatched ones a meal of septicemic blood from a mouse dying of plague is fatal. Bugs which are not killed by the infecting meal are capable of carrying *B. pestis* and reinfecting mice after a period of 48 days' starvation. The development of *B. pestis* within the crop of bugs differs generally from that which takes place in the stomach of the flea in respect of its slower and looser growth, this limitation of activity being accompanied by and possibly due to the preservation of the structural character of the blood for many days after its ingestion into the crop.

"The absence of any definite valve between the pump and the crop, together with the looser nature of the growth within the bug, preclude the idea of such mechanical blockage as causes regurgitation and mouth infection by fleas. It may be surmised, however, that mouth infection, when not caused by accidental or other injury to the bug while feeding, may be due to interruption followed by a second attempt."

Natural enemies of the sugar beet leafhoppers in California, W. J. HARTUNG and H. H. P. SEVERIN (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 277–279*).—In order to determine the percentage of parasitized leafhoppers (*Eutettix tenella*) 500 specimens, collected at King City on September 2, 1913, by sweeping with an insect net beet leaves showing a severe condition of "curly top," were placed in breeding jars and vials containing beet leaves and stems which served as food material. During the following three weeks twelve puparia of dipterous parasites which represent two new species described by F. Knab as *Pipunculus industrius* and *P. vagabundus* were found at the bottom of the breeding jars and vials, together with twelve dead leafhoppers; four jassids were parasitized by a dryinid.

At least 3.2 per cent of the leafhoppers were parasitized during the season of 1913 by dryinids, which have been determined by Rohrer as *Gonatopus contortulus* and *Labeo* n. sp. Data relating to the parasitism of leafhoppers during 1914 are presented in tabular form. It appears that 33.6 per cent of leafhoppers were parasitized and in addition a fungus disease was observed.

A bibliography of seven titles relating to the subject is included.

Catalogue of recently described Coccidæ, V, E. R. SASSCER (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, pp. 25–38*).—This fifth part of the catalogue previously noted (E. S. R., 28, p. 754) is thought to be fairly complete to November, 1914.

On the occurrence of an intermediate in Aphis pomi, W. F. TURNER and A. C. BAKER (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, pp. 42–52, figs. 18*).—A discussion of aphidid forms.

The authors conclude that "in these intermediates we have to do solely with transitional forms between more primitive conditions on one hand and more advanced conditions on the other. We feel confident also that all these intermediates are of equal value. The very fact that variants have been discovered in so many different species, having such diverse habits, seems to us to preclude the possibility that these arise from different fundamental causes. The only difference is that the forms in *A. pomi* and similar species and the intermediate sexuparæ of various Phylloxera are varying in one characteristic, the elimination of wings, while the virginoparous forms in *Phylloxera vastatrix* and in the Chermesinæ are varying in two characters, the elimination of wings and the elimination of sexes."

Further studies of the embryology of Toxoptera graminum, W. J. PHILLIPS (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 403, 404, pls. 2*).—This paper supplements the general account of the development of the winter eggs of *T. graminum* given in the bulletin by Webster and Phillips, previously noted (E. S. R., 27, p. 859).

A catalogue of Portuguese aphidids, J. S. TAVARES (*Broteria, Ser. Zool., 12 (1914), No. 3, pp. 177–193, figs. 8; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 2, p. 90*).—Eighty-nine species are recorded together with their food plants and the localities in which they have been collected.

Ravages of the forleule (Panolis piniperda) in the Woleschna woods in 1913, NECHLEBA (*Vereinsschr. Forst, Jagd, u. Naturk., Prague, No. 11–12 (1914), pp. 614–633, fig. 1; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 7, pp. 483, 484*).—The author discusses the ravages of the forleule or pine moth in the pine woods of Woleschna, in Bohemia.

Combating Euxoa segetum, ENIKIEV (*Zeml. Ghaz., No. 31 (1914), pp. 1026, 1027; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 12, p. 695*).—This cutworm was the source of great injury to winter-sown crops in the district of Borovitchee in the Government of Novgorod in 1913.

The morphology and biology of Carpocapsa pomonella and C. funebrana (*Trudy Bessarabsk. Obshch. Estest. i Liubit. Estest., 3 (1911–12), pp. 129–134, pl. 1*).—It is shown that the larvæ of these pests may be distinguished by their structure, color, and size. See also a previous note (E. S. R., 33, p. 155).

Descriptions of new North American Microlepidoptera, A. BUSCK (*Proc. Ent. Soc. Wash., 17 (1915), No. 2, pp. 79–94*).—Among the species described that are of economic importance are the following: *Memythrus perlucida* reared from *Populus trichocapa; Psacaphora cambiella* reared from the cambium of Salix at Evaro, Mont.; *Recurvaria alnifructella* feeding on the catkins of alder and hazel at Falls Church, Va.; *Dichomeris vacciniella* from cranberry at Pemberton, N. J.; *Sparganothis albicaudana* reared from leaf tying larvæ on maple at Notch, Pa.; *Tortrix (Cacœcia) lambertiana* on *Pinus lambertiana* at Oakland, Oreg.; *Marmara pomonella* reared from larva mining just under the skin of apple at Corvallis, Oreg.; *M. serotinella* reared from *Prunus serotina* at Falls Church, Va.; *Argyresthia castaneella* reared from the bark of chestnuts infested with *Sesia castaneæ* at Falls Church, Va.; *A. franciscella* from tips of cypress at San Francisco; *Zelleria haimbachi* reared from short needle pine at Wenonah, N. J.; *Bucculatrix ilecella* reared from *Ilex* sp., at Victoria, Tex.; and *Prodoxus barberella* from *Agave palmeri* at Ray, Ariz.

A comparative study on the losses to rural industries from malarial mosquitoes, J. K. THIBAULT, JR. (*Reprint from South. Med. Jour., 8 (1915), No. 3, pp. 195, 196*).—A supplement to the paper previously noted (E. S. R., 33, p. 255), in which the author reports upon studies made at Scott, Ark. It is stated that *Anopheles quadrimaculatus* was taken in every house in which malarial cases were visited and that in every case a breeding place was found within 50 yds. of the dwelling. Anopheles were not found breeding in either foul or very muddy water.

On the occurrence of Aedes calopus (Stegomyia fasciata) in Russia, E. J. MARZINOWSKY (*Bul. Soc. Path. Exot., 7 (1914), No. 7, pp. 590–593; abs. in Rev. Bact., 4 (1914), No. 5, p. 70*).—The yellow fever mosquito is recorded by the author as occurring at Batum, where the winter temperature falls to as low as 6.6° C., and on the Caucasian coast, where it appears at the beginning of the summer and disappears in October. It appears that this mosquito passes the winter in the larval stage, living larvæ having been found in water at a temperature of about 5°.

Notes on two parasitic Diptera, A. B. GAHAN (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, pp. 24, 25*).—The author records the parasitism of a mantid (*Stagmomantis carolina*) by *Sarcophaga* (*Helicobia*) *helicis*, and the army worm (*Heliophila unipuncta*) by a tachinid, *Metachæta helymus*.

Medullary spots and their cause, J. G. GROSSENBACHER (*Bul. Torrey Bot. Club, 42 (1915), No. 4, pp. 227–239, pls. 2*).—This paper reports upon studies of cambium miners carried on in continuation of those previously noted (E. S. R., 24, p. 561).

In comparing the life history and morphology of the Prunus miner with that of *Agromyza carbonaria* recorded by Nielsen [a] and that of *A. pruinosa* as described by Greene (E. S. R., 30, p. 855), the author finds that it represents a different species to which he gives the name *A. pruni* n. sp. "The egg stage of these cambium miners is very short, apparently less than three days, while the larval stage lasts at least eleven months. The pupal stage lasts perhaps about three weeks, and the flies apparently oviposit within two days after emerging from the puparia."

Observations on the length of time that fleas (Ceratophyllus fasciatus) carrying Bacillus pestis in their alimentary canals are able to survive in the absence of a host and retain the power to reinfect with plague, A. W. BACOT (*Jour. Hyg. [Cambridge] Plague Sup. 4 (1915), pp. 770–773*).—"Fleas (*C. fasciatus*) are able to carry *B. pestis* for periods up to 47 days in the absence of any host and subsequently to infect a mouse. Infected fleas, starved for 47 days and then placed upon a mouse, may not infect it for a further period of about 20 days. There is no reason to suppose that the positive results obtained in these few experiments represent the limit of time after which infection may take place, but indicate that plague infection may persist in fleas for one or two months in cool weather and, subsequently, give rise to an epizootic."

The fleas found on rats and other rodents, living in association with man, and trapped in the towns, villages, and Nile boats of Upper Egypt, A. BACOT, G. F. PETRIE, and R. E. TODD (*Jour. Hyg. [Cambridge], 14 (1914), No. 4, pp. 498–508, fig. 1*).—This is a report on collections of fleas made during an investigation of plague conditions in Upper Egypt in 1912 and 1913.

Descriptions of Braconidæ, S. A. ROHWER (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, pp. 55, 56*).—*Allodorus tomoxiæ*, a parasite of *Tomoxia lineella* at Falls Church, Va., and *Macrocentrus ægeriæ*, parasitic on (*Sesia*) *Ægeria castaneæ* at Greenville, S. C., are described as new to science.

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[a] Zool. Anz., 29 (1906), No. 7, pp. 221, 222.

Preliminary note on Bracon sp., a parasite of the cotton bollworm, F. C. WILLCOCKS (*Bul. Soc. Ent. Egypte, 6 (1913), No. 2, pp. 56–67; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 8, pp. 507, 508*).—An undetermined parasite of *Earias insulana* has been found by laboratory experiments to breed equally well on the pink bollworm (*Gelechia gossypiella*).

The white grubs of sugar cane in Queensland, A. A. GIRAULT (*Bur. Sugar Expt. Stas. Queensland, Div. Ent. Bul. 1 (1914), pp. 11*).—A popular account prepared for cane growers, and based upon work during a period of three years at the Sugar Experiment Stations in Queensland. A technical report will follow.

The date stone beetle, F. C. WILLCOCKS (*Bul. Soc. Ent. Egypte, 6 (1913), No. 1, pp. 37–39; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 8, p. 506*).—The author has found a small scolytid beetle, thought to be *Coccotrypes dactyliperda*, in dates from Sharkieh Province.

"An infested stone is perforted by a small circular hole and a quantity of pale-colored dust, composed of excrement and matter excavated from the stone, may be observed inside the date itself. . . . One date stone was found to contain 9 beetles, 6 pupæ, and 24 larvæ of different sizes, besides ova. Of 244 stones from the 'Amry' dates only 3, or 1.2 per cent, harbored the beetle, while of the 398 'Aglawy' date stones examined 47, or 11.8 per cent, were infested."

On parasitic and other nematodes biologically associated with bark beetles, G. FUCHS (*Verhandl. Gesell. Deut. Naturf. u. Aerzte, 85 (1914), II, pt. 1, pp. 688–692; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 6, p. 375*).—This paper deals with nematodes that are found associated with bark beetles, particularly with *Ips typographus* and the weevil *Hylobius abietis*. Some of the nematodes are true parasites.

Two blossom weevils (Anthonomus pomorum and A. rubi), A. TULLGREN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 93 (1914), pp. 12, pl. 1; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 3, pp. 106, 107*).—A popular treatise on *A. pomorum* and *A. rubi*, their biology and remedial measures.

A hymenopteran parasitizing the oothecæ of a blattid, A. ALFIERI (*Bul. Soc. Ent. Egypte, 6 (1913), No. 1, pp. 14, 15; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 8, pp. 504, 505*).—Two species of Evania, *E. lævigata* and *E. abyssinica*, are said to have been reared from *Stylopyga orientalis* that were kept under observation.

The North American fever tick: Notes on life history, E. C. COTTON (*Tennessee Sta. Bul. 113 (1915), pp. 31–77, figs. 15*).—A report of biological studies of the cattle tick conducted at Knoxville, Tenn., earlier reports relating to which have been noted (E. S. R., 20, p. 1054; 26, p. 458). Recent studies of the biology of this tick by other authors, including Newell and Dougherty in Louisiana (E. S. R., 18, p. 987), Hunter and Hooker in Texas (E. S. R., 19, p. 664), Graybill in Alabama (E. S. R., 28, p. 63), and Hooker, Bishopp, and Wood in Texas (E. S. R., 27, p. 865) have been noted. The report is presented under the headings of life history, the engorged adult, preoviposition period, the female reproductive organs, rate of oviposition, fatal temperatures, the egg stage, the incubation period, overwintering eggs, the seed tick, longevity of seed ticks from overwintering eggs, and mortality of seed ticks from extreme cold.

The following is a summary of the more important results of these investigations, which, it should be pointed out, are based upon and apply particularly to conditions in Tennessee, which State lies on the northern border of the tick belt.

"The parasitic stages of ticks are little affected by changes in air temperature. These require, respectively, 7 to 9 days for seed-tick engorgement, 5 to

10 days for nymphal engorgement, and 4 to 14 days for the final, or adult, engorgement. The nonparasitic stages vary greatly with the season and temperature. The preoviposition period may last but 2 days in midsummer or it may be prolonged to 56 days in winter and spring. The oviposition period varies from 9 to 122 days under similar conditions. . . .

"The alimentary system of the tick consists of from 10 to 12 cæca, or blind sacs, which provide large storage capacity. Movement of the food particles within these cæca is accomplished by peristalsis. No waste materials are excreted by the adult tick after final engorgement. Such materials are stored in the renal sac and the Malpighian tubes, mostly in the form of crystals of uric acid, which remain there after death. . . .

"The rate of oviposition varies with temperature. The average daily rate for 26 engorged ticks kept in the incubator at 85° was 285 eggs, the extremes being 156.8 and 407.1 eggs, respectively. The average number of eggs produced by each individual tick was 2,113, varying from 967 to 4,071 eggs. The largest number produced within any 24-hour period by a single tick was 1,006 eggs.

"Engorged adult ticks exposed to temperatures of 24° or lower may be killed by freezing. Those under dry conditions will survive temperatures fatal to those under moist conditions, while partly spent females are more easily killed by cold than those that have not yet begun egg laying. Ticks protected by a covering of dry litter will survive very much more cold than those not so protected, but moist litter offers no protection at all.

"Eggs protected by the viscid secretion from the shell glands retain their moisture very much longer than those without it. Those eggs from which this coating has been washed are liable to absorb sufficient water to destroy the embryos, if they remain submerged.

"The incubation period of the eggs varies from 24 days, the record of a lot of eggs laid by ticks dropping from the host on July 5, to 252 days for eggs laid by ticks maturing September 20. Eggs laid by ticks dropping from the host before August 28 will hatch before winter, while of those laid by ticks dropping after this date a few may hatch the same season, the remainder going over until the following spring. Whether they will hatch then depends upon the effectiveness of the viscid coating of the eggs in preventing excessive loss of moisture. Probably many of the eggs exposed to extreme cold are destroyed. In our experiments all eggs exposed to 2° F. were killed. It is very difficult, however, to dissociate this effect from that of excessive drying during the long dormant season. . . .

"The six-legged seed ticks immediately after emergence are able, if necessary, to fast for several months while awaiting a host animal. Our record of greatest seed-tick longevity is 298 days. . . . Seed ticks hatching from eggs laid by engorged ticks dropping during July live longest, while those from September-maturing ticks are the shortest lived, the longevity in this case being about one-third that of those from July ticks. . . . The average longevity of seed ticks hatching from overwintering eggs is 94 days, while that of seed ticks from eggs hatching before winter is 176 days. This indicates a debilitating effect on the developing embryos, due to cold and drying during the long dormant season. Seed ticks are able to survive the ordinary winter temperature of the tick area, except along the northern border. A temperature of 4° F., however, is fatal to all seed ticks."

A table is appended which gives detailed information concerning the 2,315 engorged female ticks kept under outdoor conditions at Knoxville, on which the facts and conclusions reached in this bulletin are based.

A list of 15 titles of the literature referred to is appended.

FOODS—HUMAN NUTRITION.

Refrigerated meat, E. PERRONCITO (*Ann. R. Accad. Agr. Torino, 57 (1914), pp. 214–217*).—Information is given regarding the extent to which refrigerated meat has been used in Europe, and especially Italy, during the years 1907 to 1912.

Whey in infant feeding, A. W. BOSWORTH, H. I. BOWDITCH and B. H. RAGLE (*Amer. Jour. Diseases Children, 9 (1915), No. 2, pp. 120–125*).—Feeding experiments with an infant are described in which the child received an abundance of fat, sugar, and protein, the whey constituents being the only variable.

The results of these experiments are in agreement with those of other investigators, and indicate that a ration composed of pure materials—fat, carbohydrate, and protein—needs the addition of substances such as whey salts to promote the growth of the young. The work also seems to bear out the theory that creatin excretion is in some way related to growth, and to offer an explanation of the fact that the creatin excretion of growing infants varies from day to day.

The phosphoric oxid content of maize flour, J. MCCRAE (*Jour. Hyg. [Cambridge], 14 (1914), No. 3, pp. 395–398*).—To ascertain the loss of vitamin in the usual milling of maize meal or flour a number of milled samples of different grades of fineness were analyzed. The vitamin loss (assumed to be parallel to that of phosphoric oxid) was found considerable, though not so great as that resulting from the polishing of rice.

For experimental purposes the milling process was so altered that 96 per cent of the original grain (instead of from 84 to 89 per cent) was converted into fine meal passing a 30-mesh sieve. This meal was found to contain nearly as much phosphoric acid as the original grain. Feeding experiments with 6,000 laborers are in progress to determine the relative merits of the flours prepared by the new and old style methods of milling. No intestinal disturbances due to the use of the new type of meal have been observed thus far.

The author concludes that "fine white meal, produced after removal of the husk and a considerable proportion of the germinal portion of maize, is a defective foodstuff which may give rise to some form of deficiency disease; by grinding the maize in such a way that practically the whole of the grain is converted into fine meal this defect is remedied."

Atmospheric conditions in relation to bread making, J. E. WIHLFAHRT (*New York: The Fleischmann Co., 1915, pp. 15, figs. 4*).—This pamphlet, which is intended for commercial bakers, discusses the importance of and gives hints regarding the control of temperature and humidity to secure the best results in baking. An inexpensive moisture generator is described, as well as some measuring instruments.

War bread, E. FLEURENT (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 3, pp. 55, 56*).—The author describes a method for improving the keeping quality of bread, the essential features of which are as follows:

A dough is prepared as usual, but the baking is prolonged to insure sterilization of the loaf. On removal from the oven the bread while still hot is wrapped in two thicknesses of paper and the wrapper sealed. The wrapped bread is then submitted to a second baking at a temperature of 120 to 130° C. for 15 to 20 minutes. It is said that bread thus prepared has been kept for a month and longer in damp cellars without deterioration.

The bread of the Kaingang Indians of Brazil, R. LIESKE (*Jahrb. Wiss. Bot. [Pringsheim], 53 (1914), No. 4, pp. 516–526*).—The author reports a bacteriological and chemical examination of bread prepared by these Indians from matured and unripe corn by an acid fermentation process.

Honey as a food, B. C. Aston (*Jour. Agr. [New Zeal.], 11 (1915), No. 1, pp. 48–52, fig. 1*).—Data are given regarding the composition of honey. Honey is compared with other foods as to its fuel value, the ash it supplies to the diet, and its price per pound.

Note on vinegar, J. S. Jamieson (*Analyst, 40 (1915), No. 468, pp. 106, 107*).—Comparative analyses are given of a vinegar prepared from malted barley and one prepared from malted maize. A vinegar prepared from germinated maize and pasteurized, the same vinegar before pasteurization, and an ordinary barley malt vinegar were also studied. The author concludes that the proteins and phosphates from malted maize are not so readily extracted by an aqueous infusion as in the case of malted barley.

[Food inspection and analysis and other topics], E. F. Ladd and Alma K. Johnson (*North Dakota Sta. Spec. Bul., 3 (1915), No. 19, pp. 305–336*).—This bulletin contains the results of the sanitary inspection of dairies, bakeries, restaurants, and other places where food is prepared or sold; together with popular information regarding various pure-food topics. Data are given regarding the examination of a number of samples of foods, drugs, proprietary medicines, and toilet preparations. A report of the analysis of toilet soaps, by R. Hulbert, is included.

Principles of food preparation, Mary D. Chambers (*Boston: The Boston Cooking-School Magazine Co., 1914, pp. XX+251, pl. 1, figs. 33*).—A text-book of cookery in which the fundamental principles presented are illustrated by a large number of simple experiments as well as by recipes recommended for classroom work.

Analysis and cost of ready-to-serve foods, F. C. Gephart and G. Lusk (*Chicago: Amer. Med. Assoc., 1915, pp. 83*).—This publication reports a study of approximately 350 different portions or "orders" of food as served to patrons in a chain of restaurants operated in several large cities of the country. The bulk of the publication consists of tabulated data regarding each order. The figures given show the cost of each order; the weight of its food constituents; the total number of calories of energy furnished; the actual amounts and proportion of this energy supplied by the protein, carbohydrate, and fat constituents; the number of calories obtained for 5 cts.; and the cost of 2,500 calories of energy furnished by the portion. The tabulated data are discussed, and the introduction by G. Lusk considers somewhat at length the results of the investigations in their relation to some fundamental principles in nutrition.

An educational lunch room (*Housewives League Mag., 6 (1915), No. 3, pp. 13–17, figs. 3*).—A description is given of a lunch room conducted by the Board of Health of New York City, for city employees. Menus and food costs are discussed.

Fitting out the fleet—provisions, S. McGowan (*Navy Dept., Bur. Supplies and Accts., [Leaflet], 1915, June 22, p. 1*).—Estimates are given of the amounts of different foods required to feed for 30 days from 1,000 to 9,000 men. The values for foods are in all cases "practically in agreement with the quantities actually expended during 10 months of the battleship cruise around the world." The leaflet bears the date June 22, 1915.

Mutual service, Carolyn P. Webber (*Bedford, Mass.: Author, 1915, pp. 112, figs. 33*).—This book, which has been prepared for distribution by gas companies to consumers, describes various forms of gas cooking, heating, and lighting apparatus, and gives instructions for their care and operation.

The influence of food on metabolism, G. Lusk (*Jour. Biol. Chem., 20 (1915), No. 4, Proc., pp. VIII+XVII*).—In this address the author reviews the results of a number of his experiments which have been noted from other sources, and coordinates these results with those obtained by a number of experimenters.

On the cholesterol content of the tissues of growing rats when under various diets, P. E. LANDER (*Biochem. Jour., 9 (1915), No. 1, pp. 78–96, figs. 11*).—Feeding experiments with laboratory animals (rats) are described, which were conducted to determine the normal cholesterol content of the tissues of growing rats, and to obtain information as to whether the growing organism can manufacture cholesterol when deprived of that substance in the food. The normal standard quantity of cholesterol contained in the bodies of rats which were just beginning to feed themselves was 0.1467 per cent. From the results obtained the following general conclusions are drawn:

"A pure synthetic dietary is insufficient to enable 'growth processes' to go on in young rats, in other words the rats are starved on such a diet and neither cholesterol, cholesterol esters, nor lecithin appears to supply the deficiency. [A commercial meat extract which was tested], however, appears to have a beneficial effect in some cases, rats fed on a diet with this addition showing no eagerness to nibble their dead comrades.

"There is no evidence that the living organism can manufacture cholesterol, but on the other hand it is a substance which is strictly conserved and readily picked out from a diet in which it is present in only small quantities. When, however, it is present in large quantities in the food then the percentage in the body goes up considerably, but only a small quantity of that ingested is actually stored up."

Contributions to the physiology of the stomach.—XIX, Reflexes from the intestinal mucosa to the stomach, E. H. BRUNEMEIER and A. J. CARLSON (*Amer. Jour. Physiol., 36 (1915), No. 2, pp. 191–195, figs. 2*).—Experiments with dogs having intestinal and gastric fistulae are described, from which the following conclusions are drawn:

"Gastric juice, chyme, acids, alkalis, water, milk, and oil introduced into the small intestine inhibit gastric hunger contractions and gastric tonus for varying periods. This inhibition of these gastric hunger contractions and tonus is due partly to mechanical, partly to chemical stimulations of the intestinal mucosa. The chemical stimulation produces the greatest effect.

Animal calorimetry.—VII, The metabolism of a dwarf, F. H. MCCRUDDER and G. LUSK (*Jour. Biol. Chem., 13 (1913), No. 4, pp. 447–454*).—The results are reported of a metabolism experiment made with a dwarf 17 years old suffering from infantilism:

"The basal metabolism was increased 6.6 per cent as a result of the ingestion of food, and this again was increased by 14.7 per cent when the boy was reading illustrated periodicals in bed. The protein metabolism yielded the normal proportion of 15 per cent of the total calories of heat production. Nothing abnormal could be detected in the metabolic processes of the individual, as determined from these calorimetric observations."

Earlier experiments have been noted (E. S. R., 28, pp. 865–868).

Animal calorimetry.—VIII, The alleged influence of the adrenals on diabetic metabolism, G. LUSK and J. A. RICHE (*Arch. Int. Med., 13 (1914), No. 5, pp. 573–681, fig. 1*).—Experiments with laboratory animals (dogs) are reported in which the total metabolism and the respiratory quotient were determined during the period of absorption of 50 gm. of glucose from the alimentary tract and also between 18 to 21 hours after this was administered.

Administration of epinephrine during these periods did not interfere with the metabolism of carbohydrates, and during the period of its administration the fraction of the total heat output furnished by carbohydrates was increased. From these experiments the conclusion is drawn that "the theory that epinephrine causes a production of sugar from fat, decreases the power of the organism to oxidize glucose through inhibition of pancreatic function, and stimulates the thyroid so that protein metabolism is increased, is untenable in any of its particulars."

Animal calorimetry.—IX, The influence of meat ingestion on the amino acid content of blood and muscle, MARY B. WISHART (*Jour. Biol. Chem., 20* (*1915*), *No. 4, pp. 535–537*).—A large number of feeding experiments with laboratory animals (dogs) are reported which substantiate the conclusions of the author that amino acids do not accumulate in the muscular tissues, but are either immediately destroyed or else synthesized into new (body) protein.

Animal calorimetry.—X, The rate at which ingested glycocoll and alanin are metabolized, F. A. CSONKA (*Jour. Biol. Chem., 20* (*1915*), *No. 4, pp. 539–554, figs. 3*).—This paper reports the results of further feeding experiments with phlorizinized dogs. Using the amount of extra sugar eliminated in phlorizin glycosuria as an index to the rate of metabolism of amino acids, the results obtained indicate that the rates of absorption of iso-glycogenic quantities of glycocoll and alanin are practically identical with the rate of absorption and elimination of ingested glucose.

Animal calorimetry.—XI, An investigation into the causes of the specific dynamic action of the foodstuffs, G. LUSK and J. A. RICHE (*Jour. Biol. Chem., 20* (*1915*), *No. 4, pp. 555–617, pls. 15*).—Previous experiments by the authors are reviewed somewhat at length and a large amount of additional experimental data are included, which may be briefly summarized as follows:

"A dog, after undergoing prolonged confinement in a cage without loss of body weight, manifested a marked reduction in basal metabolism, recovery from this condition being brought about by exercise. After the ingestion of a cold solution of 70 gm. of glucose in 210 cc. of water a discrepancy was noted between the heat production as measured by the direct and indirect methods, this discrepancy extending over 3 or 4 hours after ingesting the material. The same phenomenon was noted when cold water was ingested, although to a lesser extent.

"After prolonged confinement in a cage without loss of body weight, a dog may manifest a marked reduction in basal metabolism. Recovery from this condition is achieved through exercise.

"Ingestion of a cold solution of 70 gm. of glucose in 210 cc. of water causes a discrepancy between the measurement of heat by the direct and indirect methods which may extend over 3 or 4 hours after taking the material. The heat production is increased in order to replace the heat abstracted by the cold solution. To a lesser extent the same phenomenon occurs when cold water is ingested. This explains the disparity between heat found and calculated after meat ingestion noticed in the second paper [E. S. R., 28, p. 866].

"Glycocoll 5.5 gm. increased metabolism 7.3 per cent at a time when alanin 5.5 gm. increased it 7 per cent, and when the two mixed together increased it 18 per cent. Therefore, when two amino acids are given together there is a summation of effect. Eleven gm. of the mixed acids caused the same increase in metabolism as did 50 gm. of glucose.

"Glycocoll 20 gm., containing 42 nutritional calories, increased the metabolism by 33.75 calories, or 33.7 per cent above the basal level; while 10 gm., containing 21 nutritional calories, increased metabolism by 16.7 calories, or 16.7 per cent. The increase is therefore proportional to the quantity ingested. The extra heat production after giving glycocoll is nearly equal to the energy content of the glycocoll administered.

"After giving 20 and 30 gm. of alanin the heat production rose in proportion to the quantity ingested. Extra heat was produced to an extent of 53 per cent of the energy content of the ingested alanin.

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"When the action of glycocoll and alanin is compared, the quantity of extra heat produced is not found to be proportional to the quantity of sugar formed, but there is some evidence to indicate that one molecule of glycolic acid liberated from glycocoll has the same power to increase heat production as one molecule of lactic acid derived from alanin.

"When carbohydrate is transformed into fat there is a small exothermic elimination of heat, for which due allowance may be made by calculation.

"After giving glucose 50 gm. with glycocoll 20 gm., the increase in the metabolism was almost as great as the sum of the increases induced when each substance was given alone. Alanin 20 gm. followed the same law when given with glucose 50 gm. (This nullifies the authors' former opinion.)

"The influence upon heat production of 50 gm. of glucose, sucrose, and fructose increases in the order named, which accords with [other investigators]. . . . The increases in single hours may be over 30 per cent above the basal level.

"After giving 50 gm. of lactose to the dog there was no increase in metabolism or in the respiratory quotient.

"After giving 50 gm. of galactose there was little increase in metabolism or in the respiratory quotient.

"Ethyl glycolate is a poison.

"Ethyl alcohol in small amounts (5.8 and 9.4 gm.) increases the level of the basal metabolism and does not merely replace an isodynamic quantity of fat.

"The resultant of the effect on heat production of ingesting glucose and alcohol together is nearly equal to the sum of the effects which each would have produced alone. The carbohydrate respiratory quotient is greatly reduced.

"After giving ethyl lactate it is probable, though not certain, that lactic acid acts as a stimulus to higher metabolism.

"Administration of phlorizin to a fasting dog may cause an increase in metabolism of as high as 70 per cent above the basal value.

"Glucose 10 gm. or 70 gm. and fructose 10 gm. have no influence upon the level of heat production in phlorizin glycosuria.

"Glycocoll 12.5 gm. and alanin 20 gm. increase metabolism when they are given to a phlorizinized dog, though they are not oxidized and their energy content is eliminated in the form of sugar and urea in the urine. Since the maximal effect upon heat production coincides with the period of their maximal metabolism, and since evidence exists to show that amino acids themselves do not stimulate metabolism (nullifies former opinion) one may conclude that intermediary products such as glycolic acid or lactic acid provide the stimulus. These experiments afford conclusive proof of a true chemical stimulation of protoplasm within the mammalian organism, and offer a logical explanation of the specific dynamic action of protein."

Calorimetric observations on man, J. S. Macdonald, F. A. Duffield, and K. Lucas (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 238–241*).—The experimental work done by the committee in continuation of that previously reported (E. S. R., 32, p. 257) is reviewed briefly. Employing the respiration calorimeter, the authors have studied the heat production and respiratory exchange of a man performing different amounts of work upon a bicycle ergometer.

The energy metabolism of 10 hospital children, J. R. Murlin and B. R. Hoobler (*Amer. Jour. Diseases Children, 9 (1915), No. 2, pp. 81–119, figs. 10*).—Using the respiration incubator previously described (E. S. R., 32, p. 860), the authors conducted a series of experiments to study the energy metabolism of 10 hospital children of from 2 to 12 months of age, of which the nutritive condition varied from that of the last stage of marasmus to one of considerable overweight. The heat production was calculated both on the basis of weight and of surface area, and the approximate specific gravity was determined in an attempt to secure a measure of the proportion of fat to active tissue. Full experimental data are reported from which the authors draw in part the following conclusions:

"The specific gravity, even if accurately measured, can not serve as a measure of the proportion of fat to active tissue. . . .

"The heat production for the sleeping period averages for the 10 children 2.7 calories per kilogram and hour. It is highest on this basis for the atrophic and underweight children and lowest for the fattest child. On the basis of a square meter of surface the heat production of normal children shows a decided increase from the early months (2 to 4) to the later months (6 to 12) of the first year. The average of all the 10 children is 39.7 calories. The average deviation from the mean heat production in all sleeping periods is about $\pm$10 per cent for each of the several formulas expressing the relation of surface area to weight."

Practically the same average heat production per unit of weight and per unit of surface was obtained when all the infants between 2 months and 12 months in this series and in the experiments of others (61 in all) were compared, i. e., 2.7 calories per kilogram and hour, 39.3 calories per square meter and hour.

"On the unit of weight all but 3 of the atrophic and underweight children (48 in all) lie above the line represented by 2.5 calories per kilogram and hour; all the normals (18) lie near this line; and all but 1 of the overweight infants (5) lie below the line. Two and one-half calories per kilogram and hour or 60 calories per kilogram and 24 hours may therefore be called tentatively the 'normal heat production' of recently fed, sleeping infants between 2 months and 1 year of age. Included in this figure is whatever dynamic action the foods themselves may have; otherwise the figure is minimal. Hard crying may increase the metabolism as much as 40 per cent; the requirement for growth and allowance for nonabsorption must be added. . . .

"There seems to be no sufficient reason . . . for estimating the food requirements of infants on the basis of surface area rather than on the basis of weight."

A calorimetric calibration of the Krogh bicycle ergometer, F. G. Benedict and L. E. Emmes (*Amer. Jour. Physiol., 38 (1915), No. 1, pp. 52–61, figs. 2*).—A report of the calibration of an electric brake bicycle ergometer, which has previously been described by Krogh (E. S. R., 30, p. 767).

The ergometer, placed in a calorimeter, was rotated from the outside by a motor. The heat developed, as measured by the calorimeter, was compared with the computed work done in sustaining various loads on a suspended balance pan. Tests were made at different rates of speed and with different weights on the balance pan. "These experiments showed that friction and other extraneous factors may be entirely neglected in using the Krogh bicycle ergometer and that the results obtained by calibration were within 0.5 per cent of theory."

ANIMAL PRODUCTION.

Further experiments on the inheritance of coat color in rabbits, R. C. Punnett (*Jour. Genetics, 5 (1915), No 1, pp. 37–50*).—Continuing work previously noted (E. S. R., 28, p. 768), the author reports further experiments with rabbits showing the unexpected appearance of agoutis in litters from black parents. He also gives results of experiments showing that chocolate in the rabbit, as in the mouse, behaves as a simple recessive to black and that the chocolate series of colors runs strictly parallel with the black series. These data are interpreted on both the "presence and absence" and the "multiple allelomorph" hypotheses, but reasoning is advanced to show that it would appear premature to reject the former hypothesis for the latter until the possession of facts compels.

A bibliography of the literature cited is appended.

Studies on inbreeding.—VI, Some further considerations regarding cousin and related kinds of mating, R. PEARL (*Amer. Nat., 49 (1915), No. 585, pp. 570–575, fig. 1*).—Continuing this series of studies (E. S. R., 32, p. 665), the author gives coefficients of inbreeding for continued single and double cousin mating and uncle and niece mating, with hypothetical pedigree tables illustrating these kinds of breeding. Illustrating graphically these coefficients of inbreeding, together with those from the continued inbreeding of brother×sister and parent×offspring, it is seen that the curves fall into two pairs alike for brother×sister and the double cousins, and for parent×offspring and single cousin, except that the cousin curves lag one generation behind the others. The uncle×niece curve is the same as the single cousin curve. From data presented in this and former papers, it is seen that inbreeding of any type when continuously followed for about 10 generations results in within 1 or 2 per cent of complete "concentration of blood."

The author extends the table of general equations given by Jennings (E. S. R., 32, p. 665) for coefficients of inbreeding after *n* generations of each particular type of mating.

An attempt to produce mutations through hybridization, F. N. DUNCAN (*Amer. Nat., 49 (1915), No. 585, pp. 575–582, fig. 1*).—Crosses were made with mutant stocks of Drosophila with wild stock from many localities in the United States, from the West Indies, France, and Australia in order to discover, if possible, whether hybridization is an essential factor in the formation of mutant races. From 16,637 flies of the F_2 generation, 7 flies arose which varied from the normal type and bred true. Four of these seven cases arose from wild stock just received from Illinois, so it is thought that the characters found to be inherited were recessive in the wild stock and not due solely to the cross. This narrows the results to one mutant to every 5,545 flies, a ratio too wide to attribute hybridization as its cause.

In the light of these results, the author considers that mutations arise only through chance.

The nitrogenous metabolism products and their value in determining the digestibility of the proteins of feed stuffs, A. MORGEN, C. BEGER, and F. WESTHAUSSER (*Landw. Vers. Stat., 85 (1914), No. 1–2, pp. 1–104*).—From their studies with sheep and swine to determine the magnitude of the error occasioned by the excretion into the alimentary tract and the voiding with the undigested food of certain nitrogenous products of metabolism consisting of the secretions of the gastroenteric canal (including the bile), together with epithelial cells with some proteins and some other nitrogenous compounds of a nonproteid nature, the authors conclude that a correction previously made, which amounted to 0.4 gm. of nitrogen per 100 gm. of digested organic matter, was not sufficient and that the figure should be increased to 0.85 gm. per 100 gm. of digested organic matter.

Importance of calcium and phosphoric acid in the animal organism.—III, Value of the principal phosphorus compounds to the ruminant, G. FINGERLING (*Landw. Vers. Stat., 86 (1915), No. 1–2, pp. 75–114*).—Results of experiments in the feeding of casein, phytin, lecithin, nuclein, sodium nucleinate, and disodium phosphate in rations to lambs indicated that an average of 89.2, 90.83, 92.72, 90.92, 93.62, and 90.53 per cent of the P_2O_5 in the respective phosphorus-containing materials was retained by the animal body, while with goats the percentages were 89.46, 96.81, 84.64, 88.54, 90.18, and 90.23.

Previous work has been noted (E. S. R., 31, p. 71).

Feeding of potato foliage, L. MEYER (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 32, pp. 472–474*).—An account of the use of potato foliage hay for cattle and sheep feeding in Germany. It is said to compare favorably with meadow hay, having a composition as follows: Dry matter 85.7 per cent, protein 11.8, fat 2.8, nitrogen-free extract 35.1, crude fiber 23, and ash 13. The starch value of meadow hay is given as 34.3 and of potato foliage hay as 34.2.

[Analyses of feeding stuffs], F. T. SHUTT (*Canada Expt. Farms Rpts. 1914, pp. 109–119*).—Analyses are given of the following feeding stuffs: Cottonseed meal, distillery and brewers' grains, dried distillery slop, oil cake, gluten meal, barley germ meal, veiny pea hay, vetch hay, cacao bean husks, wheat middlings, golden flax, bran, hull-less oats, molasses, molasses feed, molassine meal, corn fodder, and corn silage, and of mangels and carrots of various varieties.

[Animal husbandry work], E. S. ARCHIBALD ET AL. (*Canada Expt. Farms Rpts. 1914, pp. 297–328, 400–408, 410, 411, 416–454, 457–472, pls 16*).—Steers of various breeds and types were fed from 80 to 151 days, it being found that steers fed quickly gave a good margin of profit, that the dairy type of feeder may be profitably finished in from three to five months according to age, and that many steers slaughtered in November and December would pay profitable returns if fed a few months longer. In steer-feeding experiments to determine the effect of heavy and light feeding it was found that while the daily rate of gain was greater in the heavy-fed lots, yet their average cost per pound of gain was considerably higher and the greater profit was realized from the light-fed lots. Grain was profitably replaced by molasses when used in only a limited amount. Molasses appeared to have a more beneficial effect when fed to good stocker than to good butcher cattle getting the same amount of grain. Molasses showed a profit over a full-grain ration.

Eight steers fed 140 days and given freedom in box stalls made a gain of $56.17 as compared with $3.23 from eight steers tied. In a comparison of corn silage and dry corn fodder as roughage for fattening steers fed five months, the former made an average daily gain per steer of 1.86 lbs., the latter of 1.5 lbs. Four lots of steers fed 140 days, lot 1 receiving oat straw, mixed hay, oats, and barley, fed outside; lot 2 the same as lot 1, but fed inside; lot 3 the same as lot 1 with the addition of silage, and fed inside and tied; and lot 4 fed mixed hay, silage, roots, and grain (bran, peas, oats, and barley), fed inside, made average daily gains per head of 1.95, 1.93, 2.47, and 2.82 lbs., respectively.

In feeding steers outside during the winter it was found that 77.31 lbs. of dry matter was required to produce 1 lb. of gain, the steers making 0.29 lb. of gain per head per day. Three lots of steers fed 85 days, lot 1 outdoors with free run, lot 2 in a corral, and lot 3 in box stalls, made daily gains per head of 1.73, 1.55, and 2.67 lbs. at a cost of 9.47, 10.48, and 6.15 cts. per pound of gain for the respective lots. In another experiment it was found that corral steer feeding, even in spite of severe weather, may be profitable. Steers of good beef type made rapid and economical gains and good profits, but steers of dairy type made slower gains, costing more to produce, and were fed at a loss.

Three lots of steers fed 135 days, lot 1 receiving alfalfa, roots, and grain, and lots 2 and 3, green oat fodder in addition, made average daily gains per head of 1.6, 1.5, and 1.6 lbs. for the respective lots.

Methods of feeding the work horse, brood mare, and young colt are reported. In an experiment to determine the most economical means of handling and feeding the work horse in winter, four lots were fed as follows: Lot 1, oat straw, oat fodder, oats, and bran; lot 2, oat straw, mixed hay, oats, and ground flaxseed; lot 3, oat straw, mixed hay, oats, and bran; and lot 4, oat straw, alfalfa hay, oats, and bran. The cost per horse per day was 16, 18, 15, and 17 cts. for the respective lots. The cost of growing a horse from weaning at five months to two years of age was $33.17 and that of wintering an idle horse, $9.17.

Four lots of 9 lambs each were fed 97 days as follows: Lot 1, clover hay and alfalfa; lot 2, mixed hay and corn stover; lot 3, timothy hay and roots; and lot 4, mixed hay, roots, and extra grain. They made average daily gains per head of 0.085, 0.065, 0.037, and 0.106 lb., costing 22.7, 29.6, 47.7, and 16.6 cts. to produce a pound of grain. Three lots of 31 lambs each fed 92 days, lot 1 receiving alfalfa hay; lot 2, mixed hay and corn stover; and lot 3, timothy hay and roots, made average daily gains per head of 0.2, 0.054, and 0.068 lb., costing per pound of gain 14⅔, 28, and 22 cts., respectively.

In two years' lamb-feeding experiments four lots of lambs were fed 118 days as follows: Lot 1, clover hay, roots, and grain; lot 2, clover hay and grain; lot 3, timothy hay, roots, and grain; and lot 4. timothy hay and grain. They made average daily gains per head of 0.24, 0.21, 0.24, and 0.2 lb., costing per pound of gain 11.4, 11.15, 11.7, and 11.82 cts. for the respective lots. Clover hay surpassed timothy hay in economy of production. When roots are used a better daily gain is obtained, but not quite sufficient to produce any appreciable profit by using them.

In an experiment in wintering a breeding flock, three lots of ewes were fed as follows: Lot 1, alfalfa in an open shed; lot 2, alfalfa in the sheep barn; and lot 3, hay in the sheep barn. They made average total gains per ewe during the 81-day period of 26.88, 27.42, and 22.06 lbs., respectively. Four lots of 25 lambs each were fed 112 days as follows: Lot 1, oat straw and grain (oats and barley 1:1); lot 2, oat straw, mixed hay, and grain; lot 3, oat straw, mixed hay, grain, and turnips; and lot 4, oat straw, alfalfa, hay, grain, and turnips. They made average daily gains per head of 0.19, 0.26, 0.25, and 0.27 lb., costing per pound of gain 8.3, 6.75, 7.4, and 6.9 cts., respectively.

In a three years' experiment six lots of about 50 lambs each were fed as follows: Lots 1 and 2, alfalfa, grain, and roots; lot 3, alfalfa and roots; lot 4, alfalfa and grain; lot 5, alfalfa and screenings; and lot 6, alfalfa alone, lot 1 being composed of yearlings and the remaining five lots of lambs. They made average daily gains per head of 0.23, 0.29, 0.19, 0.24, 0.23, and 0.17 lb., costing per pound of gain 10.71, 7.58, 9.34, 8.32, 6.11, and 9.8 cts., respectively.

Two lots of eight sows each were fed during the winter season, lot 1 receiving a mixture of wheat bran and shorts and lot 2 the same, with th eexception that one-third of this mixture was replaced by tankage. The tankage-fed sows did not consume as much grain as where no tankage was fed. The weights of the sows at the beginning of the experiment and after farrowing were approximately the same. The average weights of litters at farrowing, at four weeks of age and at eight weeks of age, were 2.44 and 2.42, 11.4 and 13.5, and 19.7 and 25.3 lbs. for the respective lots. It is concluded that, although tankage when fed in these proportions is an expensive feed, yet this difference in cost is counterbalanced by greater ruggedness of litters, lower percentage of mortality, and the increased weight of litters at eight weeks of age.

Two lots of seven pigs each were fed four months as follows: Lot 1 ground oats, feed flour, and mangels, and lot 2 ground barley, feed flour, and mangels. They made average daily gains of 0.6 and 0.67 lb. per pig, costing per pound of gain 4.66 and 4.03 cts., respectively. Two lots of four pigs each fed three months, lot 1 twice a day and lot 2 three times a day, made average daily gains per head of 1.13 and 1.1 lbs., costing 3.35 and 3.45 cts. per pound of gain, respectively.

From records kept of two sows and litters during two years it was found that it cost a total of $15.50 per sow and litter to feed the sow and 10 pigs during the winter.

The results of an experiment to determine the effect of feeding rice meal to fattening hogs are given in the following table:

Summary of experiments in feeding rice meal to fattening hogs.

Lots.	Feed.	Cost per pound of gain.	Average weight per pig.			
			Average daily gain per pig.	Viscera.	Liver.	Heart and lungs.
		Cts.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	Rice meal, skim milk, and mangels	6.30	0.75	22.31	2.54	2.09
2	Wheat shorts, skim milk, and mangels	4.30	1.09	23.44	3.41	2.44
3	Rice meal, wheat shorts, skim milk, and mangels	4.70	.92	19.70	2.88	2.11
4	Grain, wheat shorts, skim milk, and mangels.	4.66	1.05	22.55	3.75	2.50
5	Rice meal, ground alfalfa, and mangels	8.18	.59	20.01	2.38	2.00
6	Wheat shorts, grain, ground alfalfa, and mangels	7.00	.91	24.17	2.54	2.38
7	Rice meal, dried blood, and mangels	7.92	.58	20.75	2.10	2.08
8	Wheat shorts, grain, dried blood, and mangels.	6.03	.91	22.03	2.65	2.00
9	Rice meal, ground alfalfa, dried blood, and mangels	7.76	.68	23.15	2.67	1.55
10	Wheat shorts, ground alfalfa, dried blood, and mangels	6.12	1.00	25.55	3.22	2.37
11	Wheat shorts, boiled potatoes, skim milk, and mangels	5.18	1.03	27.90	3.17	1.55
12	Rice meal, boiled potatoes, skim milk, and mangels	6.75	.58	18.65	2.30	1.55
13	Rice meal, skim milk, and mangels	5.78	.75	....	....	....
14	Grain, skim milk, and mangels	4.47	1.22	21.45	2.60	1.85

Phosphorus metabolism of lambs fed a ration of alfalfa hay, corn, and linseed meal, E. L. Ross, M. H. Keith, and H. S. Grindley (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 459–473*).—In connection with studies conducted at the Illinois Experiment Station to determine the influence of different quantities of protein upon the nutrition of young growing lambs, data relating to the phosphorus metabolism of the lambs when weighing, on the average, 115 lbs. were reported. Differences in the quantities of protein fed were necessarily accompanied by corresponding differences in the quantities of phosphorus ingested by the lambs.

Two 9-month-old lambs were chosen from each of three lots which had been fed rations consisting of alfalfa hay, shelled corn, and linseed meal. At the time of this experiment the concentrates of the ration for the low-protein lot consisted of 95 per cent of shelled corn and 5 per cent of linseed meal; for the medium-protein lot, 75 per cent of corn and 25 per cent of linseed meal; and for the high-protein lot, equal parts of corn and linseed meal. The lambs were put in metabolism cages and analyses made of all the feed consumed and of the excreta.

In analyses of the feeds it was found that there were marked differences in the percentages of the different forms of phosphorus occurring in alfalfa hay, corn, and linseed meal, and in the ratio of phosphorus to protein in these feeds. A large part of the phosphorus of alfalfa hay consisted of the acid-soluble inorganic form; that of corn was equally divided between acid-insoluble and acid-soluble, the soluble being largely organic; and that of linseed meal was largely in the acid-insoluble form, the soluble being about equally divided between inorganic and organic phosphorus.

It was found that upon the ration used the lambs excreted in the urine only from 0.2 to 0.5 per cent of the total phosphorus ingested. The forms of phosphorus excreted in the feces showed that marked qualitative and quantitative changes had taken place during the processes of digestion and metabolism. A large proportion of the acid-insoluble phosphorus of the feeds was converted into acid-soluble phosphorus, and a large part of the soluble organic phosphorus was also changed into acid-soluble inorganic phosphorus.

The results of this metabolism experiment, together with those of the main feeding experiment of 217 days' duration, indicated that the phosphorus requirement for the normal growth and fattening of lambs does not exceed 3 gm. per day per 100 lbs. of live weight. There was no evidence of correlation between the amounts of phosphorus retained in the body, on the one hand, and the amounts of phosphorus ingested, the amounts of protein ingested, or the body weights of lambs, on the other. Variations in the quantity of digestible protein consumed from 1.56 to 3.19 lbs. per 1,000 lbs. of live weight per day did not influence significantly the forms of phosphorus in the feces, the total phosphorus in the urine, or the total phosphorus stored in the animal body, expressed in percentage of the total phosphorus ingested.

Tensile strength and elasticity of wool, R. F. Miller and W. D. Tallman (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 379–390, pl. 1, figs. 4*).—The apparatus and methods used in determining the tensile strength and elasticity of wool at the Montana Experiment Station are described.

Feeding the sow and the suckling pigs, D. T. Gray (*North Carolina Sta. Circ. 25 (1915), pp. 5*).—A general discussion of methods of feeding and care of the sow and the suckling pigs under southern conditions, including data showing the cost of feed in raising four litters of pigs to the weaning age to have ranged from $11.12 to $13.78.

Soy bean pastures for hogs, D. T, Gray (*North Carolina Sta. Circ. 24 (1915), pp. 6*).—This is a general discussion, based mainly on work previously reported (E. S. R., 20, p. 1031; 25, p. 374).

Feeding skim milk, buttermilk, and whey to hogs, D. T. Gray (*North Carolina Sta. Circ. 29 (1915), pp. 5*).—This is a general discussion, based mainly on results of experiments conducted at several of the experiment stations and previously reported.

Report from the poultry division, F. C. Elford et al. (*Canada Expt. Farms Rpts. 1914, pp. 955–991, pls. 7*).—The maximum and minimum, also the range and average, temperatures in poultry houses having various proportions of cotton and glass are given. Results of experiments indicate that for an 8 by 4 ft. colony house in the Canadian climate a suitable proportion of wood, glass, and cotton would be, estimating from the floor up, 15 in. of wood, 2 ft. of glass, and 3.5 ft. of cotton.

In an experiment to determine the number of eggs that would be fertilized with one mating only, five fertilized eggs appeared to be the maximum. In a fertility test following 12 hours' mating it was apparent that this method was more conducive to results than the one mating only proved to be. In trials to determine the increase of pen fertility after the introduction of the male, maximum fertility, 100 per cent, was reached in a pullet pen six days after mating. and occurred three times in a period of 21 days. The same fertility was reached in a pen of old hens on the eleventh day after introducing the male, but the fertility increased more rapidly and continued a great deal stronger in the pullet pen than in the pen of old hens. One male was also kept with 44 White Leghorn hens. Though the percentage of fertility was highest when only 56.8 per cent of the hens were laying, the total hatch was only 33.3 per cent. When

86.4 per cent of the pen were laying, the total hatch was 48.1 per cent and the fertility 87.7 per cent. In other tests without mating again fertility could not be traced in eggs laid after hens had been broody for any length of time.

In an experiment to determine the best method of cooling eggs in an incubator, the eggs in an incubator containing eight trays were cooled for a mere turning 5, 10, 15, and 20 minute periods. The tray that gave the best results was cooled as follows: First week, five minutes in the afternoon; second week, 10 minutes in the afternoon; and third week, 15 minutes in the afternoon. Cooling one tray for several hours proved detrimental.

In an experiment to determine the profit on ducks hatched in incubators, reared in brooders, and sold on the local market at from 10 to 12 weeks old, 3.18 lbs. of feed per pound of gain were required, the average weight at the end of 10 weeks being 4 lbs. 11.2 oz. per duck.

Shipping eggs for hatching by parcel post proved to be quite as safe as by express.

The value for poultry feeding of screenings, scalpings (chiefly broken and shrunken wheat and the larger weed seeds), wild buckwheat, "black seeds" (lamb's quarter, wild mustard, and tumbling mustard), and each of these three separately, was tested. The presence of the black weed seeds in the ration made it not only unpalatable, but unprofitable as well. Wild buckwheat, however, made a very desirable feed. The mustards and lamb's quarter proved unpalatable and unprofitable. Some birds died, but in no case did death result from "poison," but rather from malnutrition. In the birds that suffered most severely, as in the case of the mustards, upon return to a normal ration the rebound was very rapid. The mustards rather than being poisonous seemed to have a stimulating effect on the digestive organs.

Data on the cost and amount of feed, cost of producing 1 doz. of eggs, and fertility and hatchability of eggs set with White Leghorn hens and pullets and Barred Plymouth Rocks are given, also data on the temperature, amount of oil used, and average cost per chick hatched by four types of incubators. Some rations for various classes of poultry which have been found satisfactory are included.

The limitations of cotton-seed meal feeding in poultry, B. F. Kaupp (*North Carolina Sta. Circ. 27* (*1915*), *pp. 14*).—This is a report of preliminary experiments to determine the point of limitation of the feeding of cotton-seed meal for the different purposes for which birds are fed. The results are summarized as follows:

"Cotton-seed meal in dry mash, constituting 10 per cent of the mixtures for laying and breeding stock for a space of 90 days, in 19 flocks of birds has shown no noticeable physical effect. They apparently eat it with relish. This mash is given along with a morning and evening scratch feed and acts only as an adjunct. Cotton-seed meal constituting 20 per cent of a fattening ration in seven tests proved unpalatable, and the birds having a tendency to become sick of it did not eat sufficient to make satisfactory gains, and in some cases actually lost weight when kept on it for a period of 18 days. In cram feeding of 12 birds, four, or 33⅓ per cent, were thrown completely off digestion, as evidenced by the food remaining in the crop. Three died and one later digested her food again. Twenty per cent cotton-seed meal in one cram test did not produce satisfactory gains, due to its ill effect, in this quantity, upon digestion. In two tests upon three Leghorns gossypol (E. S. R., 33, p. 311) apparently produced the same results as were noted in the cram feeding and other lots.

"In the trough feeding, which proved unsatisfactory, the maximum amount of cotton-seed meal consumed was slightly less than 1 oz. a day. In the cramming work the maximum amount of cotton-seed meal was slightly in excess of 2 oz. a day. It was noted that birds of weak constitution and delicate appetite are the first to become affected.

"All through this set of preliminary tests it was noted that as soon as the quantity of cotton-seed meal consumed reached about 1 oz. or more per day they may become sick. A bird sick of cotton-seed meal will usually eat grain such as corn, wheat, or oats unless the effect be so aggravated that the food remains in the crop."

Bacterial infection of fresh eggs, DOROTHY W. CALDWELL (*Abs. in Science, n. ser., 42* (*1915*), *No. 1079, p. 322*).—The results of a bacteriological study of fresh eggs conducted at the Rhode Island Experiment Station are given as follows:

"Of 2,510 fresh eggs from 65 hens, examined by the indirect method, 8.8 per cent showed infection in the yolk. None of 111 whites examined showed infection, while the yolks of the same eggs gave a percentage of infection (4.5) less than the average for the series (8.8). The percentages of infection obtained for individual hens per year varied between 2.8 and 15, the average being 8 per cent per year. No hen laid sterile eggs during a whole year. No correlation was observed between the percentage of infection for any individual and the degree of fecundity of that individual. Approximately the same amount of infection was found among fertile eggs (6.9 per cent infected out of 422 eggs examined) as among infertile (8.9 per cent infected out of 315 eggs). The infection of eggs in the degree made apparent by the present studies seemed to have no unfavorable effect upon their hatchability. Practically no difference between the percentages of infection of eggs from pullets and from hens in their second laying year was found. No definite seasonal variation was observed in the bacterial content of the eggs examined.

"No definite conclusions can be drawn from these studies regarding the influence of temperature upon the detection of infection in fresh eggs. From 57 infected eggs out of 737 examined in one of the series, 37 bacterial types were isolated, among which were 7 cocci, 11 motile rods, 18 nonmotile rods, and 1 spirillum. Control plates exposed under the hood in which the examinations were made yielded a variety of organisms, largely chromogens. This series, as a whole, did not resemble the series of egg organisms."

The study "indicated that the penetration of the shell after the egg had been laid, or infections during the passage of the egg through the cloaca, or during fertilization or while the albumin or the shell were being deposited, are uncommon. It seems more likely that infection of fresh eggs is largely due to occasional chance infections with harmless organisms taking place within the ovary of the fowl."

Bacteria in preserved eggs, MAUD M. OBST (*Abs. in Science, n. ser., 42* (*1915*), *No. 1079, p. 320*).—Commercial and strictly fresh June eggs packed in solutions of 1:5, 1:10, 1:15, and 1:20 parts of commercial waterglass, and in saturated lime solutions were stored in the laboratory, barn, cellar, and at 34° F.

The temperature of 80° in the laboratory permitted rapid multiplication of bacteria in eggs. Of the eggs frozen in solutions some later thawed without breaking and at the end of the experiment showed no effects attributable to freezing. The bacterial content was uniform and fairly low.

The bacterial increase in commercial eggs in 1:10 waterglass was rapid, especially in the albumin, during the first two months of storage. The eggs stored in the cellar held a uniformly low bacterial content throughout the experiment. At 34° the eggs showed exceptionally low counts. Waterglass solutions contained practically no bacteria after five months of storage. The average bacterial content of the eggs in nearly every lime solution increased more rapidly than in waterglass.

The bacterial content of the albumin in most cases remained lower or equal to that of the yolks for 150 or 250 days of storage, then increased markedly and generally far exceeded that of the yolk.

From apparently good eggs were isolated *Micrococcus aurantiacus*, *Bacillus prodigiosus*, *B. subtilis*, *B. pyocyaneus*, *B. fluorescens liquefaciens*, *B. termo*, and *B. zopfi*. One decomposed egg contained *B. proteus* in large numbers.

DAIRY FARMING—DAIRYING.

[Dairy husbandry], E. S. Archibald et al. (*Canada Expt. Farms Rpts. 1914, pp. 329–365, 369–375, 380–399, pls. 8*).—Comparisons were made of the feeding value for dairy cows of molasses and molasses meal. It is concluded that molasses meals tend to increase the cost of milk production. The cost of production is lower with molasses, and this is more palatable and appears to be a better milk producer.

From tests with a mechanical milker it is concluded that even when the best methods possible were adopted, certified milk was an impossibility. Good pure milk was possible if special precautions were taken in the washing and sterilizing of the milker after each milking period. The machine apparently had no ill effect upon the cattle. It is estimated to have reduced the labor of milking 50 per cent, but, on the other hand, largely increased the labor of washing and sterilizing the utensils. The installation of the machine is deemed warranted in a herd of 15 cows or more. The machine appears to exert some influence in hastening the end of the lactation period.

It is concluded from records kept of a number of cows that the biggest profit-making cows are in general the largest producers, which consume the most feed at the highest cost. Three cows which received 1 lb. of grain for 2.25 lbs. of milk gave, during the period of the experiment (128 days), an average profit of $15.50 each; three which received 1 lb. of meal per 4 lbs. of milk gave an average profit of $10.67; while three which received 1 lb. of meal per 8 lbs. of milk gave an average profit of $9.26.

From records kept of representative cows it was found that the cost of feed to produce 100 lbs. of milk ranged from 59 cts. to $1.25 and that the annual profit on milk over the cost of feed ranged from $8.28 to $73.05 per cow. The total cost of feed for a mature bull for one year was $57.01. The cost of raising heifers from birth to six months is given as $35.47, the cost from three months to 15½ months $52.99, and the cost from 16½ months to 28½ months $22.02. In another test the total cost of raising a heifer to one year was $34.45, the average daily gain 1.5 lbs., and the cost per pound of gain 6.3 cts.

Three lots of calves fed 48, 35, and 34 days, respectively, for veal, made average daily gains of 2, 2.1, and 1.5 lbs. per head, consuming 7.86, 7.3, and 6.16 lbs. of milk per pound of gain.

In bacteriological tests milk taken directly from the teat contained 1,587 bacteria per cubic centimeter: milk taken from the pail, 5,154 per cubic centimeter; and milk from the cooler, 10,987. It was further found that the number of bacteria in the air of the barn appears to correspond to a great extent with the number in the milk. It is concluded from these tests that quickness and simplicity in methods of handling milk reduce the risk of contamination, that air-borne organisms play a great part in milk contamination, and that special care should be taken to have the air in barns as free from dust as possible.

In making a ripened soft cheese of the Coulommier type, experiments to determine the proportions and renneting temperature most suitable show the best results with fresh morning's milk, rennet at the rate of 3.6 cc. to 30 lbs. of milk, a starter (acidity 0.7 to 0.8) at the rate of 9 to 10 cc. to 30 lbs, of milk, a renneting temperature of the milk of 86° F., and a room temperature of 65 to 68°. Some cheeses were tried without starter but were unreliable. The cheeses stand heat better when the percentage of moisture in the atmosphere is low. In those which are set with starter the room temperature may be somewhat raised or lowered without injuring the products, though this variation is not desirable. Cheeses invaded by liquefying organisms may frequently be saved by exaggerated salting, but this depreciates the product considerably.

Prickly pears as a feed for dairy cows, T. E. WOODWARD, W. F. TURNER, and D. GRIFFITHS (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 5, pp. 405-450, pls. 3, fig. 1*).—In these experiments, conducted by the Dairy Division in cooperation with the Office of Farm Management of this Deparement at the South Texas Gardens, Brownsville, Tex., prickly pear was compared in feeding value with sorghum hay, sorghum silage, and cotton-seed hulls.

The grain mixture consisted of equal parts by weight of corn chop, wheat bran, and cotton-seed meal; the hay was sorghum hay of average quality, and the prickly pear was a very spiny two-years' growth. The prickly pear was singed in the field with a gasoline torch, then cut off near the ground, and hauled to the cow lot. After being placed in the mangers, the heavier stems were chopped into small pieces with a sharp spade or hoe. The average analysis of the prickly pear fed in these experiments was as follows: Water 91.3 per cent, protein 0.58, albuminoid protein 0.29, ether extract 0.12, nitrogen-free extract 4.67, crude fiber 1.16, and ash 1.76.

Prickly pear was found to be a very palatable feed for dairy cows, even when it formed the major part of the roughage ration, and 100 to 150 lbs. were consumed per cow per day. The prickly pear ration caused an increase in the quantity of milk produced, a decrease in the percentage of fat in the milk, and a decrease in the total production of fat. The reduction in the percentage of fat became more pronounced as the quantity of prickly pears in the ration increased.

Assuming prickly pear to have 10 per cent, sorghum hay 80, sorghum silage 25, and cotton-seed hulls 90 per cent of dry matter, and considering the nutritive values to vary in direct proportion to the content of dry matter, 1 lb. of sorghum hay was equal to 15.9 lbs, of prickly pear when that plant was fed in large quantities, and to 10.1 lbs. of prickly pear when it was fed in moderate amounts. One lb. of sorghum silage was equal to 2.6 lbs. of prickly pear, and 1 lb. of cotton-seed hulls was equal to 5.8 lbs. of prickly pear. When prickly pear in moderate amounts was substituted for a part of the dry roughage, it appeared to have little effect on the digestion of the other ingredients of the ration; when substituted in large amounts it depressed the coefficient of digestion, although not to any great extent.

As the result of maintenance trials conducted during these experiments, it is believed that mature Jersey cows can be maintained on a daily ration of 3.5 to 6 lbs. of sorghum hay, 60 to 100 lbs. of prickly pear, and 1 lb. of cotton-seed meal a day; or, with prickly pear as the sole roughage, about 110 lbs. of that plant and 2 lbs. of cotton-seed meal. Prickly pear alone did not make a satisfactory maintenance ration, but sustained life for a long time. One cow that was fed prickly pear alone for a period of 70 days lost 30.2 lbs. live weight.

The average coefficients of digestion in two trials with prickly pear as the sole ration was as follows: Dry matter 61.58, organic matter 67.21, protein 71.56, ether extract 65.88, nitrogen-free extract 71.55, crude fiber 42.98 and ash 38.37.

Palatability was apparently an important factor in feeding prickly pears as the sole roughage. One cow that ate prickly pear with relish did as well on the ration when that plant was the sole roughage as when some dry roughage was included. Another that ate prickly pear reluctantly lost in weight. In one case feeding prickly pear alone caused the formation of an obstruction in the intestine and the death of the animal. The feeding of prickly pear produced a highly colored butter, but had no appreciable effect upon the flavor or keeping quality of the milk. Prickly pear had a decidedly laxative effect on the cows, although there seemed to be no permanent ill effects even after long-continued feeding. The addition of 4 to 6 oz. a day to each cow of common salt had no appreciable effect upon the laxative property of the plant.

During an experimental period of 10 days cows receiving a heavy ration of prickly pear drank no water, those receiving a medium ration drank an average of 44.3 lbs. of water per day, while those on a roughage ration of sorghum hay drank a daily average of 95 lbs. As measured by milk production, cows fed prickly pear were more sensitive to sudden drops in temperature than those which received a dry roughage. The greater the quantity of the plant consumed the more sensitive the animal became. The prickly pear ration appeared to have no great influence upon the size and vigor of the offspring or upon the condition of the cow after parturition.

The cost of harvesting prickly pear depends largely upon local conditions. During these experiments it was found that the spines could be singed at a cost of about 50 cts. per ton.

There was no great difference between the spineless and the spiny varieties of prickly pear in composition, palatability, or feeding value. While the cost of harvesting the spineless was less than that of the spiny varieties, the latter yielded a greater tonnage to the acre and were not so subject to injury from insects.

It is concluded that prickly pear is a good and palatable feed for dairy cows. It is best to feed the plant in medium quantities, 60 to 75 lbs. a day to each cow. When fed in large amounts, 120 to 150 lbs. a day, it causes an excessive scouring and a very insanitary condition of the stable. On account of the high content of mineral matter, it is thought that prickly pear may be of special value as a supplementary feed for use with other roughages of a low mineral-matter content, such as cotton-seed hulls.

Standards for determining the purity of milk.—The limit of error in bacteriological milk analyses, H. W. Conn (*Pub. Health Rpts.* [*U. S.*], *30* (*1915*), *No. 33, pp. 2349–2395*).—The importance of a revision of the standard methods of milk analysis as published by the American Public Health Association is pointed out. This paper gives the results of tests conducted cooperatively by four of the large bacteriological laboratories in New York City, the tests covering a period of seven months and involving nearly 20,000 separate analyses by a variety of methods.

It was found that individual analyses under the best conditions are subject to considerable variation, so that no single individual count can be properly relied upon. The question of the exact composition of the media to be used is deemed of far less significance than that of the methods used in the manipulation.

The need of unifying laboratory methods was demonstrated. There were found to be wide differences in the analyses of duplicate samples, due chiefly to differences in laboratory technique, the more important being the following: (1) Shaking of the samples. Wide variations were found in the vigor and the extent of the shaking to which the samples of milk and the dilutions are subjected by the different laboratories. (2) Amount of dilution. The counts from highly seeded plates are uniformly lower than the counts of the same milk from low-seeded plates. The best results are obtained only when the plates contain somewhere between 40 and 200 colonies. (3) Methods of counting. This has seemed to be the cause of the widest amount of irregularity. The greatest difference was associated with the use or nonuse of a counting lens, or with differences in magnifying power of the lens used. Further results show that the personal equation in counting is still a factor of very large importance. When the same plate is counted by two different laboratories the results are not infrequently 100 per cent apart, and occasionally more. Another factor modifying the counting is the method adopted by each laboratory of estimating numbers rather than actual counting. (4) Irregularities in samples from the same bottle of milk. Two samples taken from the same bottle of milk, even after thorough shaking, are by no means identical. This is due to the clumping of bacteria and to the fact that inasmuch as bacteria are not in solution, but are solid objects, they can not be expected to be uniformly distributed through the liquid. (5) In low counts variation between duplicate samples is sometimes considerable, due to the irregularity of the distribution of bacteria. In high counts variation in reports is also sometimes very great, due to excessive crowding and to methods adopted in estimating the number of colonies.

The extent of variation in the results obtained from the analysis of duplicate samples varies widely with the care that is taken in the laboratory technique. At first the causes of irregularity were sufficient to give results disagreeing as much as tenfold in the number of bacteria that would be reported from any sample of milk. After the laboratories had adopted methods of bringing about uniformity in technique so far as possible, the variations were very greatly reduced, the last tests showing that when sufficient care is given the variations need not be more than twofold. It is not possible to rely upon a greater accuracy than 100 per cent even when an average of more than one analysis is obtained, although most of the results fall considerably below this limit.

There is no essential difference in the results whether the milk dilution is directly inoculated into the Petri dish and the agar poured upon it or whether the milk dilution is inoculated into the melted tube of agar and subsequently poured into the Petri dish. When examinations of cream are made the plate inoculation is unreliable, and the inoculation must be made in the agar tube followed by thorough agitation.

Five days' incubation (48 hours at 37° C. and 72 hours at 20°) gives a very slightly greater count than a two-day incubation. A 24-hour count gives on the average about one-half as high numbers as a 48-hour count.

The results of the tests seem to warrant three broad grades, essentially the three grades that have been adopted by the commission on milk standards, but they are not as yet accurate enough to warrant a closer grading than the commission's grades.

The series of tests has proved that if a sample of milk can be put into iced water, containing floating ice, it may be kept for 20 hours with very little change in bacteria count. This makes it possible to keep samples sent to a laboratory for analysis for a number of hours without any fear of change in bacterial content, provided the samples are immersed in water containing floating ice.

It is said that in making a comparison of the bacteriological analysis by the plate count and the microscopic count, the latter should be a count of groups rather than individuals, plate colonies representing groups only. Considerable experience by the person making the count is needed to distinguish between bacteria and dirt particles, particularly when the milk contains minute micrococci. When the microscopic count is made by one who has had sufficient experience, the group count agrees somewhat closely with the plate count—agreeing, indeed, about as closely as the plate counts of different laboratories agree with each other. Raw, fresh milk does not contain any appreciable number of dead bacteria which might disclose themselves to the microscope, but fail to grow in plates.

The direct microscopical examination of milk smears by the Breed method (E. S. R., 31, p. 372) will classify raw milk into grades A, B, and C with about the same accuracy and much more quickly than will the plate method of bacteriological analysis. It can not be used in the study of pasteurized milk, however, since it discloses dead as well as living bacteria, except as indicating when such milk has become old before it is pasteurized by showing large numbers of dead bacteria with small numbers by the plate method. The direct method might be of exceptional value applied at the dairy to guide the dairyman as to the general grade of the milk he is marketing. It may also be of great aid to the large dealer to enable him to determine promptly whether he is purchasing milk of A, B, or C grade. The possibility of quick results and ease of making the smears at the dairy or shipping station, subsequently sending them to the laboratory for microscopic examination, renders the method especially applicable at the dairy end of the line.

Smoothness and keeping qualities in ice cream as affected by solids, W. K. Brainerd (*Virginia Sta. Tech. Bul. 7 (1915), pp. 154–159, figs. 9; Rpts. 1913–14, pp. 154–159, figs. 9*).—From a micro-photographic study of ice cream the author concludes that smoothness and keeping quality or stability of texture of ice cream are closely associated. Smoothness depends upon the amount and fineness of division of solids present other than those in true solution, within limits; that is, the smoothness depends upon the size and distribution of ice crystals, which in turn depend upon the number and nearness together of minute solid particles which interfere with crystallization and reduce the size of the ice crystal.

Colloidal solutions of solids other than fat are deemed best adapted to ice-cream making, and the finer their division and the more complete the emulsion of the fats the better. The homogenizer has its application in this respect.

The keeping qualities of ice cream apparently depend upon the stability of the "mix." The keeping qualities of ice cream made from a given mixture will depend upon the disposition of the solids in that mixture to separate from the liquid, which in turn depends upon the fineness of division of the solids. The finer the division the better the keeping qualities up to the point at which the solid merges into a true solution.

VETERINARY MEDICINE.

Studies in acid-fast bacteria, I–X, A. I. Kendall, A. A. Day, and A. W. Walker (*Jour. Infect. Diseases, 15 (1914), No. 3, pp. 417–471*).—The first of these studies is on the metabolism of saprophytic human tubercle bacilli in plain, dextrose, mannit, and glycerin broths. "Young, rapidly-growing tubercle bacilli appear to be, in part at least, nonacid-fast. The strain of avirulent tubercle bacilli studied here exhibit the Theobald Smith reaction characteristic of the growth of human tubercle bacilli in glycerin broth. Neither dextrose, mannit, nor glycerin appears to exert any marked sparing action for the protein constituents of ordinary media. Ammonia accumulates rather rapidly during the first, second, and third weeks of growth of tubercle bacilli in plain, dextrose, mannit, and glycerin broths, followed by a definite well-marked recession, during which this ammonia detectable in the media gradually diminishes in amount. The cause of this recession is unknown."

The second study deals with the metabolism of certain rapidly-growing human tubercle bacilli in broth free from lipoids and fatty substances. "In order to determine what part, if any, these lipoidal substances in the amounts in which they occur in ordinary media might play in the metabolism of tubercle bacilli, media were made up from ingredients in which these substances were definitely and quantitatively eliminated. . . . In glycerin broth, after a slight initial increase in ammonia amounting to about 2 per cent of the total nitrogen of the medium, the ammonia appears to decrease in amount, so that at the end of the experiments it is less than that contained in the uninoculated media. At the end of the second week the glycerin broth cultures of both strains of the tubercle bacillus were found to be slightly viscid, and by the end of the fourth week this viscosity was very marked. The reaction of the medium to phenolphthalein becomes progressively alkaline in spite of this decrease in ammonia. . . . It is conceivable that at least some of this ammonia is tied up in the bodies of the bacteria, and inasmuch as the organisms studied in this connection form firm tenacious pellicles, leaving the medium beneath them perfectly clear and free from bacteria, it was a comparatively simple matter to make a determination of the total nitrogen of the clear underlying broth. . . . The results show that a very considerable proportion of the total nitrogen in the medium is, apparently, tied up in the bodies of the bacteria. . . . While these experiments do not by any means prove that the substance or substances conferring acid-fastness on these organisms are derived from protein derivatives alone, yet it would seem that an experiment of this sort carried out under similar conditions, with especial emphasis on the fat and wax content of the organisms, would throw some definite light on the physiology of the formation of fats and waxes from protein."

The purpose of the study on the metabolism of the bacilli in a modified Uschinsky medium was to determine the cause of the recession of ammonia by the old cultures of avirulent tubercle bacilli employed in the second study with media of very simple composition. "For the purpose of this investigation a medium was made consisting of 4 gm. of asparagin, 2 gm. of disodium hydrogen phosphate, and 5 gm. of NaCl to the liter of distilled water as a basis. This medium was divided into three parts, to one of which was added 1 per cent of dextrose, to a second 1 per cent of mannit, and to a third 3 per cent of glycerin, as additional sources of carbon. They were then sterilized under parallel conditions in 100 cc. amounts. . . . An attempt was made to grow the organisms in the asparagin solution without any additional source of carbon, but this was unsuccessful. . . . The determinations were made in duplicate at weekly intervals for six weeks, and, with the exception of glycerin, the same recession of ammonia appears as was noted in the previous experiments. The glycerin does not show this recession. The extent of the recession was somewhat less marked than in peptone-containing media, but the growth, it should be noted parenthetically, was much less luxuriant. . . . Inasmuch as these organisms undoubtedly derive their nitrogen from the nitrogen of the asparagin, it might be assumed that the acid formed was due to the removal of the basic group of the asparagin. There is a certain amount of evidence in favor of this supposition, for the organism in question would not develop in this asparagin solution without an additional source of carbon. . . . At the same time the breakdown of asparagin, as measured by the increase in ammonia, was so great that it would be unjustifiable to assert that these substances exert a sparing action for the nitrogen. The extent of the breakdown of asparagin was, roughly, the same in each of these media. Although the maximum degree of nitrogen metabolism was apparently not reached even at the end of six weeks in the glycerin medium, at the end of four weeks, generally speaking, the maximum growth was reached in the other media." The tubercle bacilli during the last three weeks of growth were completely acid-fast.

"One of the noteworthy changes produced in the media by the growth of the organisms in the asparagin medium was the development of a mucinous-like substance which was apparent even at the end of the first week. By the end of the second week it had apparently reached its maximum, although it persisted throughout the course of the experiment. It was possible to draw out the medium in long and viscid strings by touching it with a platinum needle. Although the medium underlying the pellicle of the tubercle bacillus exhibited this mucinous change most strongly, the organisms themselves were also somewhat mucinous in character. This viscosity was most marked in mannit, considerable in dextrose, and relatively slight in glycerin. . . . It is conceivable that the three phenomena, the decrease in weight of the tubercle bacillus pellicle, the decrease in antigen content, and the decrease in vegetative activity, as shown by the ammonia curve, are parallel phenomena, and the cause of the decrease in each instance is closely associated with the recession of this vegetative activity."

The metabolism of the bacilli in media with inorganic salts as sources of nitrogen, was taken up in the fourth study. It was found that by growing a strain of human type tubercle bacilli in "a medium of known and very simple composition, consisting essentially of diammonium-hydrogen-phosphate, as a combined source of nitrogen and phosphorus, and dextrose, mannit, and glycerin, respectively, as sources of carbon, at the end of two weeks, 4.2 mg. of nitrogen, that is to say, 10 per cent of the total nitrogen of the uninoculated medium, has been so changed by the growth of this organism that it can not be recovered as ammonia. This loss of ammonia is most plausibly explained on the assumption that it has been built up into the bodies of the newly developed bacteria. At the end of four weeks, between 40 and 50 per cent of this 'lost' nitrogen has reappeared in the clear medium underlying the pellicle of the tubercle bacilli in such a form that it can again be determined as ammonia. The period during which the disappearance of nitrogen from the culture fluid is the greatest corresponds with the period of maximum vegetative activity in the culture. Coincidently with the reappearance of this nitrogen, which can be detected as ammonia in solution, there are evidences of a cessation of vegetative activity. This strongly suggests that the reappearance of this ammonia is associated with a certain amount of autolysis of the bodies of the bacteria."

In the fifth study, the metabolism of "lepra bacillus," grass bacillus, and smegma bacillus in plain, dextrose, mannit, and glycerin broths was considered. It was found that "the metabolism of the smegma and grass bacilli resembles that of the rapidly growing human tubercle bacilli, described previously, in two important particulars; neither dextrose, mannit, nor glycerin exhibits any appreciable sparing action for the protein constituents of the broth, the amounts of ammonia produced being practically the same in these media as in plain broth; and their cultures present a gradual increase in proteolysis to a maximum which is followed by a clearly defined recession of the metabolism indicated by a gradual decrease in the ammonia content. The 'lepra bacillus' does not present this metabolic phenomenon. This would suggest that this bacillus was entirely distinct in its cultural relationships from the grass and smegma bacilli, which follow more closely the metabolism of the tubercle bacillus."

As a result of the sixth study on the occurrence of a soluble lipase in broth cultures of tubercle bacilli and other acid-fast bacteria, it was determined that "a variety of acid-fast bacteria, including various strains of the human tubercle bacillus, the bovine, and avian tubercle bacilli, as well as the leprosy, smegma, and grass bacilli, form lipase during their growth in glycerin broth. The lipase is present in the medium free from the bacteria. The lipase resists an exposure of 15 minutes to 100° C. in the moist state without appreciable diminution in its activity. The lipase formed by these organisms appears to be non-diffusable, at least in an active state, through either agar or a collodion membrane."

In the seventh study on the relative activity of the soluble lipase and lipase liberated during autolysis of certain rapidly-growing tubercle bacilli, it is stated that "the observations appear to justify the conclusion that certain acid-fast bacteria grown in nutrient broth, with dextrose, mannit, and glycerin as additional sources of carbon, produce an active lipase which appears in solution in the various culture media. The bodies of the bacteria, freed from adherent culture media and soluble lipase by thorough washing, also contain an active lipase, probably liberated as the bacteria underwent autolysis. The lipase in solution appears to be either greater in amount or more active than that contained in the bacteria freed from the culture medium. It can not be stated whether the lipase free in the culture media is freed as the result of autolysis of the bacterial cells (endolipase), or whether it is secreted by the bacteria as an exolipase."

In the eighth study on the specificity and thermostability of the lipase developed during the growth of a rapidly-growing tubercle bacillus in media of varied composition it was concluded that "a rapidly-growing strain of the human tubercle bacillus produces a lipase which appears to be qualitatively the same when it is grown in media varying in composition from one consisting essentially of ammonium chlorid, ethyl alcohol, Na_2HPO_4, and NaCl to the extremely complex nutrient meat-juice-peptone broth ordinarily used for bacterial cultures. The lipase observed in the simplest media acts on various esters, irrespective of the nature of the carbon compound of the medium in which it is developed. For example, the lipase developed in the $(NH_4)_2HPO_4$ mannit medium acts on triacetin and castor oil as energetically as on ethyl butyrate or other simple esters. That is to say, the lipase developed in the simplest medium acts even on a complex glycerid. This lipase appears to be thermostabile whether it is tested in the simplest media or in the most complex. The activity of the lipase appears to be roughly proportionate to the relative luxuriance of the growth of the tubercle bacillus."

By the ninth study, a comparison of the curves of lipolytic activity and proteolysis of certain rapidly-growing human tubercle bacilli in media of varied composition, it is shown that "the period of maximum vegetative activity of broth cultures of certain avirulent, rapidly-growing tubercle bacilli, as measured by ammonia formation (proteolysis), appears to coincide with the period of maximum lipolytic content of these cultures, as measured by their action on ethyl butyrate. Both ammonia production and lipolytic activity are extremely slight during the first day's growth of these organisms, and increase, roughly, proportionately to their respective maxima. There is a noteworthy recession of both factors after this maximum is reached. These experiments appear to warrant the assumption that the organisms studied excrete a soluble, active lipase during the period of active development; for if autolysis alone were responsible for the lipolytic activity observed in these cultures, it should increase as autolysis proceeds."

The tenth study was a comparison of the curves of lipolytic activity and proteolysis of certain acid-fast bacilli in nutrient broths. It showed that "in general, with the exception of the 'lepra bacillus,' the acid-fast bacteria discussed show a parallelism in their curves of lipolytic activity, as measured by the liberation of acid from ethyl butyrate and their curves of proteolysis. This parallelism is discernible in cultures in plain, dextrose, mannit, and glycerin broths."

The antigenic properties of glycoproteins, C. H. Elliott (*Jour. Infect. Diseases, 15 (1914), No. 3, pp. 501–517*).—The results of anaphylaxis, precipitation and complement fixation tests of glycoproteins (ox tendon mucin, ox submaxillary mucin, and swine stomach mucin) show that the glycoproteins are capable of acting as antigens but are not so powerful as simple proteins. This is in accordance with the findings of other investigators with other compound proteins, as well as with simple proteins modified by the addition of various substances.

"Each mucin gives rise to an antiserum that reacts with itself in comparatively high dilutions; with the blood serum of the same species to a less degree; and with the other mucins almost as well as with the blood serum. The reaction with the other mucins is independent of species and the antiserum does not react with the blood serum of the different species.

"The present study does not throw any light on the nature of the union of the protein and carbohydrate components of the glycoproteins, excepting that it demonstrates that the antigenic properties of this class of compound proteins are different from the antigenic properties of another common class of compound proteins, the 'nucleoproteins' which as such are said to produce specific antibodies for themselves. While the antibodies produced by the mucins do react with the blood serum of the same species, still there are very marked quantitative differences in favor of the homologous mucin. In so far as the antibodies produced by one mucin react with other mucins from a different species as well as from the same species, support is given to the theory that specificity depends on the chemical nature of the antigenic protein rather than its biological origin."

Some new distomes from the intestinal tract of domestic animals and of pelicans for which fish serve as the source of infection, J. Ciurea (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 6, pp. 445–458, pl. 1, figs. 3*).—Three species of the new genus Loossia are described as new to science, namely, *L. romanica* from the dog, *L. parva* from the cat, and *L. dobrogiensis* from the pelican (*Pelecanus onocrotalus*). Feeding experiments show *L. romanica* to occur in *Esox lucius* and different fresh water fish of the subfamily Cyprininæ, with the exception of *Tinca tinca*, and *L. parva* was once found in a cat after it had been fed on *E. lucius*.

The discovery of the anthrax bacillus, O. Malm (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 3–4, pp. 195–208*).—This is a historical review.

Remarks on the work of W. Pfeiler and G. Weber on the action of mallein on sound horses and the significance of the conglutination reaction for the diagnosis of glanders, J. Schnürer (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 4, pp. 305–308*).—It is stated that the conditions under which Pfeiler and Weber conducted the experiments (E. S. R., 33, p. 479) are not those which obtain in practice, consequently the data can not be directly applied to practical conditions.

A reply to the remarks of Prof. J. Schnürer on the work of W. Pfeiler and G. Weber about the action of mallein with sound horses and the significance of the conglutination reaction for the diagnosis of glanders, W. Pfeiler (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 5, pp. 383, 384*).—A discussion of the objects of the work previously reported (E. S. R., 33, p. 479).

The serological diagnosis of glanders in asses, hinnies, mules, and horses with the so-called nonspecific inhibition of complement fixation deviation, W. Pfeiler and G. Weber (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 5, pp. 311–323*).—The object of this investigation was to determine whether it is possible by a modified complement fixation or another serological method to distinguish between specific and nonspecific antibodies in the sera of animals. See also notes by Schütz and Waldemann (E. S. R., 33, p. 479).

It is concluded that this can be accomplished with the conglutination reaction (E. S. R., 33, p. 479). In the investigation 6,500 sera were examined, among which there were 5 which did not give a specific deviation of complement. The agglutination values of these animals were in no case more than 500, but they could be regarded as suspects, whereas with the conglutination method only 1 of the 5 horses could be so regarded. This animal, on autopsy, was found glandered.

With the sera of 14 asses it was not possible to say whether glanders was present from either the complement fixation or agglutination test, but in one case it was noted with the conglutination test.

Necrobacillosis, A. T. Kinsley (*Amer. Jour. Vet. Med., 10 (1915), No. 9, pp. 609, 610, 655, 656*).—It is pointed out that necrobacillosis is a name given to a group of pathologic conditions caused by *Bacillus necrophorus* and characterized by inflammation and necrosis. This includes lip-and-leg ulceration and foot rot in sheep; stomatitis, enteritis, pneumonitis, hepatitis, splenitis, and dermatitis in swine; necrotic dermatitis in the horse; stomatitis in calves; ano-vulvitis in cattle, etc. An outbreak of ano-vulvitis in a feed lot of 115 head of heifers in Missouri in March, 1915, is reported upon.

The effect of quinin on rabies, C. Krumwiede, Jr., and Alice G. Mann (*Jour. Infect. Diseases, 16 (1915), No. 1, pp. 24, 25*).—"Of four dogs treated with quinin, one showed a prolonged period of incubation and another showed a remission in the course of the disease, in either case, however, not beyond variations in the natural course of the disease. The fact that these variations occurred in the two of four dogs receiving the largest amounts of quinin is probably only a coincidence. No influence was observed on the period of incubation in rabbits."

The bovine hemoglobinuria of Chile, a disease due to spirochetiform parasites, J. Blier (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 24, pp. 815–817*).—A brief report upon a disease of cattle occurring in the region of Santiago, Chile, and known as "Meada de Sangre," which has often been confused with anthrax. The death of the affected animal nearly always takes place within 48 hours.

Agglutination studies of milk from cows affected with contagious abortion, L. H. Cooledge (*Abs. in Science, n. ser., 42 (1915), No. 1080, p. 352*).—The author's investigations were carried on with milk from a herd having a record of frequent abortion and in which a high percentage of the animals had repeatedly given positive complement fixation and agglutination tests. The milk of 18 out of 61 cows, each quarter of which had been examined at intervals during a period of six months, gave a positive agglutination test with *Bacillus abortus* in one or more quarters at some time or during this period.

"The power of the milk of one quarter to agglutinate the abortion bacterium has been observed to spread to another quarter and finally to all four. It has also been observed to gradually die out. Milk drawn at about the middle of the milking has the strongest agglutinating reaction."

In an attempt to demonstrate the presence of *B. abortus* in milk that agglutinates the organism, the milk of 14 of 18 quarters produced lesions in guinea pigs typical of the pure culture of this organism. "In the seven cows whose milk has gradually acquired the power of agglutinating the abortion bacterium during this experiment one or both of the rear quarters have been the first to show agglutination. This suggests contamination of the rear quarters by genital discharges."

Warble flies, S. HADWEN (*Canada Dept. Agr., Health Anim. Branch Bul. 16 (1912), pp. 20, figs. 15*).—The first part of this bulletin, relating to the economic aspect of warble flies, is based upon a questionnaire in which 36 replies have been abstracted and tabulated. This is followed by a brief account of the biology of *Hypoderma bovis* (pp. 7–20), a report on the occurrence of which in Canada has been previously noted (E. S. R., 29, p. 357).

It is concluded that the annual loss to hides through warbles in Canada amounts to between 25 and 30 per cent. The egg is laid close to the skin at the base of the hair on the legs and is cemented on by the ovipositor. The first larvæ, which were found in the esophagus on August 15, were under 5 mm. in length and were provided with minute spines on all segments. The author recommends that cattle be housed during the heat of the day, and that the grubs be squeezed out early in the season.

A list of 21 references to the subject is included.

A disease simulating beri-beri in pigs fed on rice meal, S. HADWEN (*Canada Expt. Farms Rpts. 1914, pp. 473–475*).—The author reports upon a noncontagious disease in pigs resembling beri-beri in man which developed during the course of feeding experiments with rice meal. It is pointed out that there was a variation in the toxic properties in different shipments of rice meal. The author is inclined to the opinion that the disease was caused by a toxin, since the pigs improved as soon as the meal was taken from the diet.

What is hog cholera? K. SCHERN and C. STANGE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 4, p. 309*).—A polemic. In this connection, see work previously noted by Hutyra and Joest (E. S. R., 33, p. 285).

Two new cestode parasites of domestic fowl, K. J. SKRJABIN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 3–4, pp. 249–260, figs. 9*).—A new tapeworm parasite from the hen in Brazil is described as *Davainea vigintivasus*, the eighth of the genus recorded from this host, and one from the duck (*Anus boschas domestica*) in Italy as *D. microcotyle*, the second species of this genus recorded from the duck. Lists are also given of the tapeworms recorded up to the present time from the hen, turkey, pigeon, duck, goose, and swan.

RURAL ENGINEERING.

Computing run-off from rainfall and other physical data, A. F. MEYER (*Proc. Amer. Soc. Civ. Engin., 41 (1915), No. 3, pp. 549–648, figs. 36*).—This paper points out the necessity of basing conclusions with respect to run-off or stream flow on extended physical data.

On the basis that run-off consists of the residual rainfall after all losses have been deducted, methods of computing these losses are treated in detail, taking up in their order losses due to evaporation from water surfaces, snow and ice, evaporation from land areas, and transpiration of plants. In this connection a number of curves and other data based largely on observations are given. A summary statement of the author's method of computing run-off is made and the method applied to 15 widely different watersheds. The main features of this method are as follows:

"I. Collection of physical data.—(A) Rainfall and temperature data for stations on and near the given watersheds from which monthly rainfall and temperature for the watershed are estimated. Rates of excessive rainfall at different reasons of the year as indicated by Weather Bureau observations at the nearest regular station. In case rainfall and temperature data are meager, charts showing isotherms and isohyetals for the portion of the State in which the watershed is situated are of asssistance. (B) Data relating to wind velocity, relative humidity, and any other prominent weather characteristics. (C) Data relating to topography, vegetal cover, soil, and subsoil as affecting evaporation. (D) Data relating to character and density of vegetation and length of growing season with reference to temperature and hours of sunshine. (E) Data relating to area of open-water surfaces, swamps, and marshes.

"II. Determination of losses.—(A) Evaporation from water area: (1) Monthly evaporation corresponding to given temperature and season, and multiplied by percentage of water surface, based on data under I–E, and coefficient based on data under I–B. (B) Evaporation from land area: (1) Determination of coefficient for given watershed, based principally on physical data under I–C and I–B. (2) Determination of evaporation, in inches depth per month, corresponding to given monthly temperature and rainfall for given season of year, from curve of evaporation from land areas, and multiplication of the same by percentage of land area and coefficient determined under II–B–1. (C) Transpiration from land area: (1) Determination of normal seasonal transpiration, based on physical data under I–D. (2) Determination of transpiration coefficient by finding ratio between seasonal transpiration determined from base curve of transpiration for the normal monthly temperatures for the given watershed, and the normal seasonal transpiration determined under II–C–1. (3) Determination of monthly transpiration by applying transpiration coefficient to monthly values taken off transpiration curve for given monthly temperatures, and modification of these monthly values on basis of rainfall, percolation, and storage.

"III. Determination of total loss by summation of monthly losses from land and water areas, the deduction of these monthly losses from the monthly precipitation, and summation of these monthly residuals to give the annual yield of the given watershed, with or without correction of this annual total for fall surface run-off or changes in ground and surface storage.

"IV. Where the annual yield and its distribution throughout the year are both desired, additional curves . . . and computations for the same watershed must be made. When the more detailed computations, as here indicated, are carried out, it is possible to make more accurate estimates of transpiration during months of deficient rainfall, because more accurate values of soil and subsoil storage are available."

Other special applications of the author's method are discussed in detail with data from observations.

Snow survey provides basis for close forecast of watershed's yield, J. E. CHURCH, JR. (*Engin. Rec.*, *71* (*1915*), *No. 16*, *pp. 494*, *495*, *figs. 3*).—Rapid and economical methods of measuring large areas of snow at high altitudes are described which have proved useful at Lake Tahoe, Nev.

"The general method pursued was to determine the water content of the snow on typical slopes and under characteristic forest covers, making each topographic unit as large as possible. Measurements were made in sufficient sections of the basin to determine the local difference in snowfall, and enough courses at high levels were measured to determine the relation of the snowfall on the higher slopes of the watershed to that on the floor of the basin. The courses did not always follow contour lines but were frequently diagonal and sometimes vertical to them, being so laid as to determine the water content of the slope in question."

It is stated that the method of snow surveying is a practical substitute for the expensive method of contour line surveying.

A method of correcting river discharge for a changing stage, B. E. JONES (*U. S. Geol. Survey, Water-Supply Paper 375–E (1915), pp. 117–130, figs. 6*).—It is pointed out in this paper that "when a river is rising fast it has a greater velocity and a greater discharge than it has at the same height when its stage is constant. Likewise, when it is falling fast it has a lesser velocity and a lesser discharge. For this reason the relation of gage height to discharge which applies under conditions of constant stage will not apply during times of changing stage, . . . especially . . . if the slope of the river is small. . . . The increased discharge at a given gage height during a rising stage is due to the increase in slope, and the opposite is true for a falling stage. Therefore, the smaller the natural slope of the stream the greater is the proportional change in slope for any given rate of change in the stage."

For the purpose of correcting the discharge for a changing stage so that proper relations between gage height and discharge may be established for certain conditions the following formula, based on Chezy's formula for flow of water in open channels, is mathematically derived:

$$\frac{Q_1}{Q_2}=\frac{\sqrt{S_1}}{\sqrt{S_1+\frac{K}{\frac{V}{N}}}}=\frac{\sqrt{S_1}}{\sqrt{S_1+\frac{NK}{V}}}$$

In this formula Q_1=the discharge at constant stage, Q_2=the discharge for changing stage, S_1=slope at constant stage, K=rate of change of stage per second, V=the mean velocity of the measurement made during the changing stage, and N=the coefficient "for obtaining mean velocity from surface velocity." It is assumed that the flood travels very nearly at the rate of the surface velocity. "Therefore, to obtain the velocity of the flood, that is, the surface velocity—the mean velocity of the measurement should be divided by 0.9 for large streams and by 0.85 for smaller ones. . . . In order to compute the actual discharge from gage heights observed during a changing stage it is necessary to have the cross section at the gage and a slope curve in addition to the discharge curve and mean velocity curve for constant stage. Then the discharge may be assumed to be equal to that at the same gage height at a constant stage, and the approximate mean velocity, surface velocity, and corrected discharge may be obtained. The corrected discharge may then be used in obtaining a new surface velocity and a second correction obtained. This can be repeated until the error is negligible, but once will usually be sufficient."

Data from actual applications of this method are also given.

Conditions requiring the use of automatic gages in obtaining records of stream flow, C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Paper 375–F (1915), pp. 131–139, figs. 6*).—The conditions which require the use of automatic gages are summarized as follows: (1) Regulation of the stream by power developments, (2) operation of canals and ditches delivering water for irrigation, (3) fluctuations due to variation in run-off under natural conditions (*a*) caused by rain and (*b*) caused by melting ice and snow, (4) inaccessibility of gaging station or lack of reliable observer, (5) continuous record needed for legal purposes, and (6) human fallibility of most gage observers. These conditions are briefly discussed.

Small automobile opens up new opportunities in Government stream gaging work, E. A. PORTER (*Engin. Rec., 71 (1915), No. 16, pp. 490, 491, figs. 3*).—Data collected by the U. S. Geological Survey indicate that in a number of the Western States the small automobile is more efficient in stream measurement work than a team.

Ground water in Big Smoky Valley, Nevada, O. E. MEINZER. (*U. S. Geol. Survey, Water-Supply Paper 375–D (1915), pp. 85–116, pls. 2, figs. 2*).—This paper describes the geography and physiography and reports an investigation of the underground water resources, with reference to their development for irrigation, of an area of 3,250 square miles, extending from about the geographic center of Nevada to a point less than 20 miles from the California line.

"The drainage basin of Big Smoky Valley is divided by a low, gentle, alluvial swell west of Manhattan into a north basin, which contains the upper valley, and a south basin, which contains the lower valley. Each of these basins at present contains an alkali flat. Ione Valley, which lies west of Big Smoky Valley proper and has a drainage basin of about 500 square miles, discharges into the lower valley from the northwest and hence forms a part of the south basin." The climate is arid and exhibits the characteristic features of aridity.

It is concluded from the investigation that "several tens of thousands of acre-feet of ground water is probably annually available for irrigation in Big Smoky Valley. Most of this supply is in the upper valley, but a part is in the vicinity of Millers in the lower valley. The water is in general of satisfactory quality for irrigation. Nearly all of the poor water is in the southwestern part of the lower valley, where there is practically no prospect for irrigation. A small part of the ground-water supply can be recovered by means of flowing wells, but full use of the supply can be obtained only by pumping. Throughout the extensive areas in which the depth to the water table does not exceed 10 ft. the soil contains injurious amounts of alkali. In the areas in which the depth to the water table ranges between 10 and 50 ft. there is enough good soil to utilize all the ground-water supply. These areas, however, also contain considerable gravelly, sandy, and alkaline soil. There are some prospects of obtaining flowing wells wherever the water table is near the surface, but the prospects are best on the west side of the upper valley. The flowing-well areas will be found to lie chiefly within the areas of alkali soil, but they may extend into adjacent areas of good soil.

"Full development of the ground-water supply for irrigation will not be economically practicable until cheaper power or more valuable crops can be introduced than are now in sight. Developments believed to be practicable at present are (1) the sinking of flowing wells of moderate depths in the restricted areas where fairly copious flows can be obtained and the soil is not irreclaimably alkaline, and (2) the sinking of nonflowing wells and the installation of pumping plants for raising high-priced crops and for raising ordinary crops in localities where the conditions are exceptionally favorable or where the well water can be used to supplement surface-water supplies. The raising of high-priced crops is practicable to only a small extent. Vegetables and small fruits could, it is believed, be profitably raised in the vicinity of Millers to supply Tonopah, Goldfield, and other local markets.

"The principal favorable conditions that are necessary in order to make pumping profitable for raising ordinary crops, such as alfalfa, are soil that is not injuriously alkaline, sandy, or gravelly; small depths to the water table (not much more than 10 ft.); and water-bearing beds at moderate depths that will yield freely.

"Existing conditions do not warrant the influx of a large number of settlers nor of any without means to sink wells and make other necessary improvements."

A contribution to the study of the actions of various waters upon lead, H. HEAP (*Jour. Soc. Chem. Indus., 32 (1913), Nos. 15, pp. 771–775; 16, pp. 811–815; 17, pp. 847–856*).—A historical review of work bearing on the subject is given, and experiments are reported to determine the effect of various waters and solutions on more or less impure lead pipes and on pure lead.

It was found that pure distilled water, free from dissolved gases, exerts but a very slight action upon lead. The action is greatly modified when certain gases, especially hydrogen, carbon dioxid, oxygen, and air are dissolved in the water. The phosphates of calcium and sodium when dissolved in water seemed to prevent entirely the dissolving of lead. The carbonates and bicarbonates of the alkaline metals and earths ranked next in preventive action.

Along with a number of other results, it was found that "the purer natural waters, such as rain water and the waters from streams (before they have had the opportunity of dissolving much mineral or organic matter or received material amounts of spring waters), exert actions which are comparable with the action of ordinary distilled water. Rain waters containing large quantities of acids react like distilled water containing acids. Moorland waters are generally very free from dissolved mineral matter, but contain varying amounts of organic matter and are usually very soft. [They] may have alkaline, neutral, or acid reactions; they generally attack lead rather vigorously, but seldom more actively than distilled water. The waters gathered from peaty moorlands exhibit at certain seasons an increased acidity, but this can not account for the amount of lead with which they become contaminated. . . . Distilled water and rain water showed diminished actions upon lead after contact with peat, but the reverse was the case with a soft upland lake water and with a hard spring water. . . . Lake waters, which are naturally very pure and contain only small amounts of saline matter, exert a much weaker action than either rain water or distilled water. Their action, though generally of a low degree, is liable to variation during different seasons."

The water supply of farm homesteads, F. T. SHUTT (*Canada Expt. Farms Rpts. 1914, pp. 90, 129–135*).—Analyses of 168 samples of farm water supplies are reported, which show that 62 were pure, 44 were of doubtful quality and probably dangerous, and 25 were seriously contaminated. Thirty-four samples were too saline for potable use.

For the isolated farmhouse the bored or drilled well, tapping a deep-seated source of water, is strongly advocated. It is also suggested "that the area around the well, say for a radius of at least 50 yds., be kept free from manure and all filth. It may preferably be kept in sod. Another precaution of considerable value toward the protection of the well water from organic filth is to line the well to a depth of say 10 to 12 ft. and to a thickness of say 6 in. with concrete or puddled clay. This lining should project some 6 to 12 in. above the mouth of the well."

The application of water to citrus orchards and the maintenance of the proper moisture content of the soil, W. M. MERTZ (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 3, pp. 140–145*).—In this paper the points which are considered of prime importance in the irrigation of citrus orchards are summarized as follows:

"Lay off the land so that the furrows will not be . . . longer than 400 or 500 ft. or with a fall of more than 6 in. to the 100 ft. If the land is comparatively level use pipe line and standpipes as a distributing system, otherwise use the cement flume. Furrow . . . at least 6 in. deep. When starting the water run it as rapidly from the flume to the lower end of the furrow as the grade will permit without washing, then cut the head down to prevent waste from the end. Run the water long enough to have the soil soaked to the 4-ft. level at the lower end of the furrow, then turn it off. Harrow to fill the furrows as soon after irrigation as the soil will work without puddling the soil on which the team walks. As soon as the deeper soil is dry enough to work mellow, cultivate deeply. Duplicate every two weeks until the next irrigation."

Irrigation practice in the Sacramento Valley, W. S. GUILFORD (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 3, pp. 123–128*).—In this article the author discusses briefly the choice of the land, the object of the irrigation, the preparation of the land, and the water delivery system as points which he considers have been the cause of success or failure on the part of irrigators in the valley.

Report of the proceedings of the eighth annual convention of the Western Canada Irrigation Association, 1914 (*Rpt. Proc. Ann. Conv. West. Canada Irrig. Assoc., 8 (1914), pp. 216, figs. 36*).—The text of the proceedings is given.

Biennial report of the state geologist, 1913–14, J. H. PRATT (*N. C. Geol. and Econ. Survey, Bien. Rpt. State Geol., 1913–14, pp. 176, pls. 4*).—This report includes among other things sections dealing with road-building materials, highways, drainage, and soil maps.

The St. John Levee and Drainage District of Missouri, R. M. STROHL (*Proc. Amer. Soc. Civ. Engin., 41 (1915), No. 3, pp. 523–547, pls. 5, figs. 2*).—This paper treats of some of the drainage problems of southeastern Missouri and gives in detail the data necessary to be considered in designing a system for the complete and economical reclamation of large tracts of overflow land. Levees, floodways, drainage ditches, floodgates, storage basins, and siphons are considered and discussed in detail as they are found necessary. The assessment of benefits as provided for under the Missouri laws is also outlined and applied to the case and an effort has been made to show a just and equitable distribution of the cost of the proposed work.

The experiment-farm drainage system, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1914, pp. 10–12, fig. 1*).—The results of experimental drainage work on the project during 1914 are reported (E. S. R., 31, p. 889), certain data being summarized as follows:

Quantity and salt content of water pumped from the tile-drainage system on the Truckee-Carson Experiment Farm in 1914.

Month.	Electricity used.	Water pumped.		Salt content.	
				Average.	Total.
	Kilowatts.	*Cubic feet.*	*Pounds.*	*Per cent.*	*Pounds.*
January	29	35,960	2,247,500	0.249	5,598
February	38	47,120	2,945,000	.278	8,187
March	76	94,240	5,890,000	.322	18,966
April	92	114,080	7,130,000	.305	21,747
May	95	117,700	7,356,250	.313	23,025
June	74	91,760	5,728,750	.276	15,811
July	148	183,520	11,470,000	.290	33,263
August	146	181,040	11,315,000	.351	39,716
September	63	78,120	4,882,500	.360	17,577
October	48	59,520	3,721,100	.364	13,544
November	72	89,280	5,580,000	.304	16,963
December	40	49,600	3,099,700	.447	13,856
Total	921	1,141,940	71,365,800	.3216	228,253

Methods and cost of levee enlargement with a tower dragline excavator (*Engin. and Contract., 43 (1915), No. 19, pp. 417–420, figs. 11*).—This article describes the organization and methods employed in operating a newly developed type of excavator on a 240,000-cu. yd. contract for levee enlargement on the Mississippi River. The excavator used consists of two traveling towers between which a bucket controlled by a slackline cable is dragged back and forth, the propelling power being supplied by a dragline and operated from the main tower.

Wearing tests for sand and gravel, F. L. ROMAN (*Good Roads, n. ser., 9 (1915), No. 18, pp. 185, 187*).—This article describes two tests of the wearing qualities of aggregates which have been used in the laboratory of the Illinois highway department.

The wearing test for sand consists essentially of submitting a given weight of sand to the wearing effect of an ordinary Deval abrasion machine, the cast-iron cylinders of which contain a certain weight of small steel shots. After 1,000 revolutions at 30 to 33 per minute the material passing a 100-mesh sieve is considered as the wear. Data from a number of such tests show practically no wear in the case of Ottawa sand and very little wear in the case of sands composed mainly of quartz. The mixed sands show average wearing qualities while the limestone sands give the poorest wear.

The wearing test for gravel is also performed in the Deval abrasion machine. No shots are used, the wear being caused by the grinding of the stones against each other and the sides of the cast-iron cylinders.

Effect of fineness of sand and of clay and loam on the strength of mortar, F. L. ROMAN (*Engin. and Contract., 43 (1915), No. 18, pp. 403–406, figs. 10*).—Tests made by the Illinois highway department on the effect of various percentages of fine sand below 50-mesh on the strength of mortar, with particular reference to highway structures, brought out the following conclusions:

"In a well-graded sand the presence of fine material passing the No. 50 sieve causes a decrease in the strength of its 1:3 mortar, the strength of the 1:3 mortar obtained from the portion of the same sand retained on the No. 50 sieve being taken as the basis of comparison. In a badly graded sand the presence of a small proportion of clean sand passing the No. 50 sieve might probably, under certain conditions, cause a slight increase in the strength of the mortar, but the presence of a large proportion of the material passing a 50-mesh sieve will cause a decrease in strength. . . .

"Small amounts of clay in sand seem to cause a small increase in the strength of the mortar. The tensile strength curve of 1:3 mortar briquettes in which the sand contains increasing percentages of clay rises at first with small quantities of clay. With larger quantities of clay, however, the strength begins to drop. . . .

"Organic loam in sand, even in very small quantities, will cause a decrease in the strength of the mortar. In the tests 1½ per cent of organic matter in sand caused a decrease in the tensile strength of 1:3 mortar of 15 to 20 per cent. Often 1 per cent and sometimes 2 or 3 per cent of organic matter in sand can not be detected in the general appearance of the sand, and whenever the sand appears dark and loamy it is a sure sign that it should be tested before using in concrete work."

Concrete road with a single crack in 4¼ miles, the result of careful construction (*Engin. Rec., 71 (1915), No. 16, pp. 480–482, figs. 11*).—A description of the construction of 4¼ miles of concrete road which has stood for one year with only one crack is given. Features in the construction were thorough rolling of the subgrade, adequate provision for drainage, minimum time for mixing each batch of concrete, careful grading of sand, accurate measurement of concrete materials in boxes, and use of wire-mesh reinforcement.

The concrete road is single course, 18 ft. wide, 8 in. thick at the center, and 6 in. thick at the sides. The foundation is an old macadam road and the maximum grade 5.8 per cent. The contract cost was $15,914 per mile.

Brick highways in King County, Washington, F. W. ALLEN (*Municipal Jour., 37 (1914), No. 23, pp. 795–799, figs. 8*).—This article gives data regarding the cost, methods of construction, and methods and results of tests of materials for brick-surfaced country roads to withstand a heavy rural traffic.

There have been constructed 21.74 miles, aggregating 246,150 sq. yds., of brick roads at a cost per yard of \$2.37, or a cost per mile of \$27,297. A 5-in. concrete base of 1:3:6 was used and a concrete curb was poured at the same time as the base. The brick surface was laid on a 1½-in. sand cushion and rolled by a 2½ to 3½ ton roller. Expansion joints were placed along the curb line and every 100 ft. transversely.

In tests of brick for the modulus of rupture, in which the brick were broken between supports 6 and 7 in. apart, the average modulus in one set of tests was 2,512 lbs. per square inch. Tests were also made of sections of brick pavement, constructed as beams, 12 in. wide of 42-in. span and loaded at the center, in order to study the efficiency of differently mixed cement joints. With a 1:1 grout the plane of failure cut across one brick and for the rest of the way was through the bond. In one instance a lug was sheared off. With the 1:1½ grout the failure in one case was across two bricks and the rest of the way through the bond and in the second case was through the bond all the way. With the 1:2 grout the failure was entirely through the bond in each instance. In no instance was the failure through the grout.

The author is of the opinion that these results indicate the advantage of using a 1:1 grout rather than a leaner mixture or paving pitches, and concludes that the brick surface is dependable to distribute the load over a larger area on the foundation.

Methods and cost of constructing a mountain road system in Wise County, Virginia, W. F. Cocke (*Engin. and Contract., 43 (1915), No. 15, pp. 341–344, figs. 6*).—This article gives a complete history of a system of roads in a county in Virginia, describes methods and cost of excavation, and gives a table of solid cuttings on sidehill excavation.

Proceedings of the first annual good roads week at Cornell University (*Cornell Civ. Engin., 23 (1915), No. 6–7, pp. 217–478, pl. 1, figs. 19*).—These proceedings include the following special articles:

Survey and Plans for Road Work, by M. W. Nelson; Road Drainage, by M. J. Adams; Town Roads, by W. F. Wilson; Road Materials Available in New York State and Their Adaptability for Different Types of Construction, by H. S. Mattimore; Highway Culverts and Bridges, by O. L. Grover; Public Borrowing for Road Building, by A. A. Young; Gravel Roads, Road Economics, and Sand-Clay Roads, by L. I. Hewes; Surface Treatments and Bituminous Construction, by H. E. Smith; The Mining and Refining of Lake Asphalts and the Physical and Chemical Characteristics of Asphalts for Paving Purposes, by J. S. Miller; Asphalt Block Pavement, by G. P. Hemstreet; Cost and Economy of Cement Concrete Pavements and Standard Recommended Practices for Construction of Concrete Roads, by H. E. Hilts; Organization of a Highway Department, by G. A. Ricker; Masonry and Foundations, by H. S. Jacoby; Inspection of Highway Bridges, by C. L. Crandall; Manufacture and Inspection of Paving Brick and Construction of Brick Pavements, by W. P. Blair; Proper Construction of Brick Pavements, by W. C. Perkins; Cost Keeping and Management, by F. A. Barnes; and Prospecting for Road Material, by H. Ries.

Wheel tire width and weight of load for conveyances with animal draft, J. Duhm (*Ztschr. Transportw. u. Strassenbau, 32 (1915), No. 1, pp. 16–19*).—This article discusses the conditions affecting the relations between the tire width, the load on the wagon, and the condition of the road surface, with particular reference to conditions and practice in districts of Austria.

In the Tyrol the following relations between tire width and load are proposed:

Tire width for different loads on different wagons.

Road surface condition.	Kind of wagon.	Gross weight of load.	Tire width.
			Inches.
Dry	4-wheeled	Less than 4,400 pounds	2.3
Do	do	Less than 7,700 pounds	3.1
Do	do	Less than 11,000 pounds	3.9
Do	do	Less than 14,300 pounds	4.7
Do	do	Less than 17,600 pounds	5.5
Wet and muddy	do	Less than 3,080 pounds	2.3
Do	do	Less than 5,280 pounds	3.1
Do	do	Less than 7,480 pounds	3.9
Do	do	Less than 9,680 pounds	4.7
Do	do	Less than 11,880 pounds	5.5
Dry	2-wheeled	Less than 3,300 pounds	2.3
Do	do	Less than 6,600 pounds	3.1
Do	do	Less than 9,900 pounds	3.9
Do	do	Less than 13,200 pounds	4.7
Wet and muddy	do	Less than 2,200 pounds	2.3
Do	do	Less than 4,400 pounds	3.1
Do	do	Less than 6,600 pounds	3.9
Do	do	Less than 8,800 pounds	4.7

It is proposed to limit the rounding of the tire on both sides to 0.197 in., and to use at least a 2.3-in. tire on light spring vehicles for personal transport the total weight of which will not exceed 6,600 lbs. For 4-wheeled wagons the minimum wheel diameter is given at 31.5 in., and for 2-wheeled 51 in. Each wagon owner is to be required to label his wagon, showing his name and location, the tire width of the wheels, and the corresponding maximum load.

A good commercial dairy barn, J. Begin (*Canada Expt. Farms Rpt. 1914, pp. 376–379, pls. 4*).—Plans and specifications for a modern commercial dairy barn erected at the substation at Ste. Anne De La Pocatière, Quebec, are given. This is considered to be an example of capacity, strength, lightness of structure, convenience, light, and ventilation in a dairy barn.

Cow barns, W. W. Hubbard (*Canada Expt. Farms Rpts. 1914, pp. 366–368, pls. 2*).—Plans and statements regarding the general points of construction of the new cow barns recently erected at the substation at Fredericton, New Brunswick, are given.

Horse barn, W. W. Hubbard (*Canada Expt. Farms Rpts. 1914, pp. 408, 409, pl. 1*).—Plans and statements regarding the general points of construction of a new horse barn for 15 horses recently erected at the substation at Fredericton, New Brunswick, are given.

Horse barn, J. Begin (*Canada Expt. Farms Rpts. 1914, pp. 413, 414, pls. 2*).—Plans and brief specifications of a new horse barn for 15 horses recently erected at the substation at Ste. Anne De La Pocatière, Quebec, are given.

Horse barn, W. C. McKillican (*Canada Expt. Farms Rpts. 1914, p. 415, pls. 5*).—Plans and photographic views, with a brief description, are given of a new horse barn recently constructed at the substation at Brandon, Manitoba.

Piggery, W. C. McKillican (*Canada Expt. Farms Rpts. 1914, pp. 454–456, pls. 3*).—Plans and brief specifications of a piggery recently erected at the substation at Brandon, Manitoba, are given.

Poultry houses and appliances for allotment holders, cottagers, and others (*Bd. Agr. and Fisheries [London], Spec. Leaflet 11 (1915), pp. 8, figs. 4*).—This pamphlet points out briefly the essential features of poultry houses from the English viewpoint, and gives specifications and bills of material for apex portable and stationary poultry houses, scratching sheds, and coops.

A cheap root cellar, W. H. Fairfield (*Canada Expt. Farms Rpts. 1914, p. 940, pls. 2*).—It has been found that a convenient way to build a root cellar at small expense is to make an excavation about 6 ft. deep and cover it with

7 or 8 ft. split cedar fence posts laid 5 to 7 in. apart. Over these is put a foot or more of straw and then 2 ft. of soil. It is stated that little trouble is ever experienced with the sides giving way, provided rain water is not allowed to substation at Brandon, Manitoba, are given.

Cotton warehouse construction, R. L. NIXON (*U. S. Dept. Agr. Bul. 277 (1915), pp. 38, figs. 13*).—The purpose of this bulletin is to outline in a general way some of the essential features of a warehouse for the storage of cotton. A general discussion of the importance of storage houses and the principles of storage, particularly as applied to cotton, is followed by a statement of the functions of a warehouse, which are as follows:

(1) It offers temporary storage facilities when the owner is not in a position to store it himself. (2) It should furnish the owner of the stored product a negotiable receipt. (3) It provides a reservoir for surplus during years of overproduction or when market conditions are very unsatisfactory.

The geneal features of construction of types of standard warehouses, including the closed detached cotton warehouse with compartments limited to 600 bales capacity, the detached cotton warehouse of frame construction, the closed cotton warehouse limited to 1,000 bales capacity, the cotton warehouse with open court, the open court warehouse of fire resistive construction, the single or compartment warehouse of fire resistive construction, open shed compresses with platforms and yards attached, and emergency sheds, are described and illustrated. Miscellaneous fire insurance schedules, insurance standards for warehouse construction, and general considerations relative to cotton storage and fire insurance are also given.

It is considered very important to have a cotton warehouse conveniently located on a sidetrack and to provide ample platform space.

A system of automatic sprinklers is considered to be a desirable installation for a cotton warehouse. Special warning is given against the placing of a wire fence around yards or sheds inasmuch as it will interfere with the handling of the cotton during a fire and consequently increase insurance rates.

The importance of having warehouses conform to the standards of the underwriters' association is urged. It is finally stated that the diagrams in this bulletin should not be treated as plans for building, and the importance of employing a competent architect to draw up specifications for any warehouse is emphasized.

Farm sanitation with special reference to water supply and sewage disposal, P. HANSEN (*Trans. Amer. Soc. Agr. Engin., 7 (1913), pp. 62–96, figs. 15*).—The substance of this article has been noted from another source (E. S. R., 32, p. 87).

Sanitary apparatus for the disposal of excreta and sewage from private residences and isolated houses, F. C. SNOW (*Mont. Bd. Health Spec. Bul. 2, pp. 31, figs. 17*).—This pamphlet deals with the disposal of farm and residential sewage.

With reference to conditions where water under pressure is not available the so-called dry system, wet system, sanitary pail, and several modifications of the L. R. S. sanitary privy (E. S. R., 25, p. 891) are described. With reference to conditions where water under pressure is available, cesspools and the well-known septic tank and filtration system are described. Cost data to suit Montana conditions are given for the different types and arrangements of equipment.

The purification of dairy wastes, G. B. KERSHAW (*Surveyor, 46 (1914), No. 1197, pp. 736, 737*).—The author states that the uniform attainment of standards for dairy sewage having limiting figures of 3 to 4 parts per 100,000 of suspended matter and similar figures for dissolved oxygen taken up from water in five days at 80° F. is desirable.

He prefers the use of a precipitant as a preliminary treatment rather than a septic tank. The best filter is considered to be the deep percolating filter. "Distribution should be good in order to obtain the best results. In many districts peat is obtainable, and may be used as a distributer for certain types of filter. It requires, however, frequent attention and renewal if satisfactory results are looked for. The used peat possesses good manurial properties.

"With regard to the treatment of dairy wastes upon land, it is desirable that there be some form of preliminary treatment before the liquid is treated on the land, in order to remove solids which would otherwise tend to choke the pores of the soil. . . . Concerning the rate of treatment of dairy wastes upon land, much will depend upon the quality of the soil and subsoil, but with land of medium quality from 3,000 to 4,000 gal. per acre per twenty-four hours of settled or strained liquid is probably a safe dose. Much, however, depends upon the nature of the intermittency of the irrigation. Grass land is especially benefited by the careful application of dairy wastes."

Report summarizing the work of the public commission for the testing of processes for the purification of sewage from sugar refineries from 1899 to 1913, C. Günther and A. Herzfeld (*Mitt. K. Landesanst. Wasserhyg. Berlin-Dahlem, No. 18 (1914), pp. 1–32*).—It is concluded from the results of this work that there are numerous points in the process of purification of sewage from sugar refineries which need further systematic investigation. The work so far has shown that there is no single process which may be considered adaptable to all cases. Surface irrigation, while successful in many cases, is generally unsuccessful owing to the land area required. The combination of land irrigation and lime treatment processes is generally unsuccessful for the same reason and on account of the bad effect on the physical condition of the soil. Since no universal process is available it is considered necessary to base the selection of the process to be used entirely on local conditions.

The operation of sewage disposal plants, F. E. Daniels (*New York: Municipal Journal, 1914, pp. [VIII]+136, figs. 40*).—This book presents a series of articles on the practical management and operation of sewage disposal plants, the main purpose being "to assist the plant attendant by pointing out to him many things he should do and some he should leave undone, in order that he may be able to keep his plant up to its highest state of efficiency at a minimum expenditure of cost and energy. Likewise it has been endeavored to show that poor designs are troublesome, costly, and inefficient."

The following chapters are included: Grit chambers and screens, tanks, filters, disinfection, chemical precipitation and electrolytic treatment, trade wastes, testing stations, making tests, and records of plant operation.

It is stated that a much larger area is required for the treatment of sewage by sewage farming than is required for the process of intermittent sand filtration. "Usually only about 10,000 gal. per acre per day can be successfully treated upon a broad irrigation area, while ten times that amount can be taken care of upon a good sand bed. Unless carefully managed, the process is likely to be objectionable if near built-up communities on account of odors, flies, and unsightliness. . . . In some localities good crops have been raised, notably in California, but take it all in all, sewage farming is not a paying operation. . . .

"A low or marshy area should never be selected to receive sewage, because under such conditions there is danger of a nuisance without a purification of the sewage. Light, sandy or loamy soils with free drainage are the most suitable, while stiff clay is almost worthless. . . . The attendant must know just how much water each crop can stand, and to preserve the proper balance between the raising of crops and the disposal of the water often requires considerable skill and experience. Usually in wet weather, when the crops need the least added water, the sewage flow is the greatest, hence its disposal at such seasons is more difficult. . . .

"Corn and forage crops are raised and sometimes fruit and vegetables. . . . Berries, salad greens, celery, and low-growing fruits and vegetables, which are eaten raw, should not be raised. . . .

"Extended sewage areas often have a direct effect upon neighboring wells. Such wells should be frequently examined, and in the location of new works the wells in the vicinity should be considered."

Treat Illinois sewage with activated sludge (*Engin. Rec., 71 (1915), No. 14, pp. 421, 422, figs. 4*).—Experiments on the treatment of sewage by the activated sludge principle showed a marked reduction in the time required for complete nitrification as compared with the time required when simple aeration was employed. With straight aeration this time varied from 15 to 33 days, while when the sludge was added complete nitrification was affected in only four days and the reduction in the amount of air used was from 4,830 to 1,270 cu. ft.

Analyses of the sludge showed that the dried material contained 6.3 per cent nitrogen, 1.44 per cent phosphorus, and 75 per cent volatile matter. It is considered valuable as a fertilizer. Pot culture experiments using the sludge and dried blood showed better growths for the sludge at the end of 18 days than for the dried blood and far better growth than on the unfertilized pot.

See also previous note by Ardern and Lockett (E. S. R., 32, p. 387).

RURAL ECONOMICS.

Early economic conditions and the development of agriculture in Minnesota, E. V. Robinson (*Univ. Minn., Studies Soc. Sci., No. 3 (1915), pp. V+306, figs. 221*).—This study outlines in great detail the agricultural development of Minnesota. After describing the physical features, climate, early travel, trade, and transportation, and the development of pioneer agriculture prior to 1860, the author traces the changes in agricultural conditions by ten-year periods from 1860 to the present time. The transition from the specialized wheat farming to diversified farming, with its accompanying causes and effects, is given.

The text is accompanied by a large number of maps and diagrams and statistical tables. The appendix contains an extensive bibliography.

Social and economic survey of a community in northeastern Minnesota, G. P. Warber (*Univ. Minn. Current Problems No. 5 (1915), pp. VI+115, figs. 35*).—This report is based upon a study of the town of Braham, Minn., and the surrounding territory. Among other things, the author concludes that "a good producers' association would help to get much larger returns, even if the marketing were left to the present competing jobbing concerns.

"The farmers of the community should discuss regularly in club meetings methods of improving farming and marketing conditions. There is plenty of local talent to conduct these meetings with programs of the proper kind."

He points out that the "county ditches" have done much to drain this country, and have accomplished the first thing necessary in the construction of good roads, but it is necessary to go slowly in improving the roads because the kind and amount of traffic the farmers have to do does not warrant inordinate expenses, such as is entailed in the construction of macadam and concrete roads.

"Owing to the gradual change wrought by newcomers of different nationalities, and the dissemination of socialistic doctrines with their usual agnostic accompaniments, the church is losing control over the ethical and moral standards and aspirations of the community. The evident remedy is that ministers of the gospel should be men not only thoroughly imbued with Christian ideals, but should also have a practical appreciation of American standards and practices in business and social life."

Rural morality, P. L. Vogt (*Soc. Hyg., 1 (1915), No. 2, pp. 207–219*).—The author in attempting to get a picture of the moral life of rural and village communities collected data in two counties in one of the middle Western States. The data relate to the number of cases of venereal disease treated during the past year, the evidence of forced marriages as shown by comparison of marriage dates with records of birth of the first child, extent of illegitimacy, records of juvenile courts, records of criminal cases in the county and before mayors and justices of the peace, and divorce records. The value and the limitations of each type of data are discussed and important factors influencing the morality of rural communities are pointed out.

Deficiencies in Italian agriculture (*Staz. Sper. Agr. Ital., 47 (1914), No. 4, pp. 241–281*).—The author notes that Italy imports a large quantity of grain in various forms, which he believes should be produced within the country. He points out the causes for this situation, and outlines means that may be employed to counteract it, among which are agricultural schools, experiment stations, and the establishment of better systems of crop rotation.

Cooperation in Spanish agriculture (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Econ. and Soc. Intel., 6 (1915), Nos. 3, pp. 10–27; 5, pp. 14–25*).—This article describes legislation concerning cooperative societies, and the organizations for cooperative credit and for the purchase and sale of agricultural produce and supplies. A number of statistical tables are given showing the progress of the various types of organization.

Agricultural credit, Edna D. Bullock (*New York: H. W. Wilson Co., 1915 pp. XIV+177*).—This book is intended as a source of information on agricultural credit for students and others, and contains an extensive bibliography and a number of selected reprints.

Middlemen in English business, particularly between 1660 and 1760, R. B. Westerfield (*Trans. Conn. Acad. Arts and Sci., 19 (1915), pp. 113–445, pls. 7*).—This book describes the function of the middlemen in English trade between 1660 and 1760, and outlines the laws and regulations that were promulgated to control their activities. Two chapters are devoted to the middlemen's function in the corn and corn products trades and in the animal and animal products trades.

Report of the trade and commerce of Chicago, 1914 (*Ann. Rpt. Bd. Trade Chicago, 57 (1914), pp. XLII+196+139, figs. 2*).—This report gives statistical data showing prices and movement of agricultural produce and provisions in Chicago. It also contains the rules and by-laws of the Chicago Board of Trade.

Farm-machinery trade associations (*U. S. Dept. Com., Bur. Corporations, Farm-Machinery Trade Assoc., 1915, pp. XVI+368*).—This report describes the activities of the associations connected with the farm machinery trade in their attempts to fix wholesale prices, establish uniformity in production and in cost accounting, influence legislation, restrict retail trade to retail dealers, and prevent price cutting. The report points out that many of these activities have been proper for the protection of legitimate interests, but claims there are others of doubtful legality which have had a tendency to limit competition and enhance prices.

Efforts of communities in the United States toward the control of the high cost of living, G. Nestler-Tricoche (*Ann. Rég. Directe* [*Switzerland*], *6 (1913–14), No. 55–57, pp. 96)*.—The author has summarized in this article the various means that are being employed by the national, state, and municipal authorities to solve the problem of the high cost of living.

The question of food supply during the war, E. THÉRY (*Jour. Soc. Statis. Paris, 56 (1915), No. 6, pp. 230–244*).—This article gives data as to the foreign trade in, and the quantity available for consumption of, grain and meat for France, the United Kingdom, Germany, and Austria-Hungary, for 1914, with comparisons for 1913.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 1 (1915), No. 4, pp. 29–40, fig. 1*).—This number gives the usual monthly estimates of the acreage, condition, and yield of the more important agricultural crops, the farm prices of important products, and the range of prices at important markets, with miscellaneous data.

The estimated percentage of the 1914 cotton crop sold monthly by producers was as follows: August 1.2 per cent, September 6.8, October 14.8, November 18.0, December 16.1, January 11.0, February 8.3, March 7.7, April 6.1, May 2.5, leaving 7.5 unsold on June 1.

The exports of durum wheat for the year ended June 30, 1915, amounted to 15,231,000 bu., as compared with 11,785,000 for the previous year. The receipts at five leading primary markets were 21,356,000 and 20,625,000 bu., respectively.

Statistical information is given concerning the production of grain and potatoes in Germany for 1912–1914, the percentage of the winter wheat crop thrashed by August 1, the commercial bean production, and the per capita value of the exports and imports of the United States from 1855–1859 to 1910–1914.

Moisture determinations made by the Office of Grain Standardization of 678 samples of hard and soft red winter wheats show an average of 14.2 per cent, 10 per cent of the samples exceeding 16 per cent. This is attributed to the frequent rains, and the need of careful handling is pointed out.

Statistical report of the California State Board of Agriculture, 1914 (*Statis. Rpt. Cal. Bd. Agr., 1914, pp. XXIV+365, pl. 1*).—This report contains a number of statistical tables showing, for a series of years and by counties, the area and production of the principal agricultural crops and facts concerning irrigation enterprises.

The agriculture of Pike County, Illinois, J. MAIN (*Ithaca, N. Y.: Author, 1915, pp. 25, figs. 4*).—This pamphlet describes the climate, topography, soil, market facilities, population, and types of farms and farming, and indicates how the agricultural conditions of the county may be improved.

Studies in the industrial resources of Texas, edited by L. H. HANEY (*Bul. Univ. Tex., No. 3 (1915), pp. 105, figs. 21*).—This bulletin contains the following articles concerning the industrial resources of Texas: Economic Comparison of Texas Soil Belts, by L. H. Haney; The Climate of Texas in Relation to its Crops, by A. Deussen; Maps Showing Seasonal Distribution of Temperature and Rainfall, by W. T. Donaldson; The Population of Texas and Its Potentialities as a Labor Force, by W. E. Leonard; The Principal Crops of Texas, by A. B. Cox; Cotton Seed Products, by W. D. Wright; The Lumber Industry of Texas, by C. Lohman; Irrigation in Texas, by B. L. Parten; The Railway Service in Texas, by R. Randolph; A Summary of the Banks of Texas, by F. L. Vaughan; and The Wealth of Texas, by R. Myers.

Agriculture in Argentina—national wealth prostituted, G. T. HOLM (*Buenos Aires: G. Krieger, 1914, pp. 30, fig. 1*).—The author believes that the introduction into Argentina of grain elevators would bring about more economical methods of handling their grain, provide the farmer with better credit, and improve the quality of the grain. This publication is written as an argument in favor of their introduction.

Acreage and live stock returns of England and Wales (*Bd. Agr. and Fisheries* [*London*], *Agr. Statis.*, *49* (*1914*), *No. 1*, *pp. 115*).—This report points out the changes in the number of farms by sizes and the areas devoted to specific crops, and gives detailed statistics by counties for 1913 and 1914 for the total acreage under crops and grass, arable land, and permanent grass, and the number of live stock. Comparative data are given for earlier years for the major subdivisions.

Statistical yearbook of the Union of South Africa, 1912–13 (*Statis. Year Book Union So. Africa*, *No. 1* (*1913*), *pp. XI+383*).—Among the data included in this yearbook are those relating to the population of the urban and rural districts, number of persons employed in agricultural pursuits, extent of land under cultivation, yield of the principal crops, number of live stock, and number of agricultural implements and machines, according to the census of 1911.

Agricultural statistics of India, 1912–13 (*Agr. Statis. India*, *29* (*1912–13*), *I*, *pp. IX+415*, *pls. 4*).—This report contains the same items as previously noted (E. S. R., 31, p. 191), and adds data for the 1912–13 crop year.

AGRICULTURAL EDUCATION.

Agricultural education and agricultural prosperity, A. C. TRUE (*Ann. Amer. Acad. Polit. and Soc. Sci.*, *59* (*1915*), *No. 148*, *pp. 51–64*).—The author discusses the economic and social conditions of farm life in this country, points out as the fundamental need for their improvement a better system of education, including industrial and vocational instruction, and briefly surveys the history and present status of agricultural education in this country. At this present stage of development he recommends that special stress be laid on "the provision of suitable means for the scientific and practical training of teachers of agriculture and home economics for the elementary and secondary schools and of the county agents and other extension workers; adequate supervision of the teaching of agriculture and home economics in the rural elementary and secondary schools by trained experts connected with the state departments of education who thoroughly understand the problems of country life; the encouragement of the consolidation and grading of rural elementary schools with a view to the more efficient organization and equipment of practical instruction in agriculture and home economics, as well as their general improvement as educational agencies . . . and the use of state funds to aid in the establishment of high schools in rural regions, in which agriculture and home economics shall be taught by teachers trained along these lines, or the introduction of efficient courses in these subjects in general high schools frequented by country boys and girls." In his opinion this system of agricultural education will do much toward making farming more profitable and will also greatly increase agricultural production.

Requirements for standardized elementary schools (*Columbus, Ohio: State Supt. Pub. Instr.*, *1914*, *pp. 14*).—This bulletin, which has been prepared by the supervisors of agricultural education of Ohio, contains the recent law on the standardization of elementary schools in Ohio which includes requirements for agricultural apparatus to the value of at least $15 for one-room rural schools of the first grade; at least 2 acres of land for play and agricultural experiment, one teacher employed for 10 months a year, giving a part of his time to the teaching of agriculture or domestic science, or both, and to the supervision of agricultural and domestic art work during part of the vacation, and agricultural apparatus to the value of at least $25, for consolidated elementary schools of the second grade; buildings hereafter constructed to have at least one acre of land for agricultural and school gardening purposes, a course in domestic science, two teachers employed for 10 months each, teaching, respectively, agriculture and domestic science during the term and supervising it during part of the vacation, and agricultural and domestic science apparatus to the value of at least $100, for consolidated elementary schools of the first grade. Price lists of agricultural apparatus are included.

The nature-study situation in the elementary schools of Illinois for 1914-1915, Florence G. Billig (*Nature-Study Rev., 11 (1915), No. 5, pp. 255–259*).—Data received from 99 schools are summarized and show that 83 of the schools reporting are teaching nature study. Of these 49 pursue organized courses, 10 have nature study supervisors, 49 teach nature study throughout the year, 43 teach it in grades 1–8, 9 in grades 1–6, and 14 in grades 1–4, the average time devoted to the subject being 50 minutes a week. Twenty-six schools include physiology in the nature study course. The author concludes, in so far as these schools are representative of the work done in Illinois, that nature study has a definite place in the curricula of the elementary schools of Illinois, that there is uniformity in the courses of study, and that physiology is considered a part of the nature-study course.

Sectional report of commissioner regarding agricultural schools and their place in a coordinated system of education in Great Britain, the Continent of Europe, etc., A. C. Carmichael (*Sydney, N. S. W.: Min. Pub. Instr., 1915, pp. 19*).—This is a report by the minister of public instruction of New South Wales on the agricultural schools and their place in a coordinated system of education, based upon personal observations, in Switzerland, Germany, France, and Great Britain; on features of agricultural instruction in Denmark, Ireland, Canada, and the United States; and on the agricultural education requirements of New South Wales comprising (1) nature study and school gardening in the elementary schools for children up to their thirteenth year; (2) the rural consolidated day schools with an agricultural "top," for pupils from 14 to 17 years of age, and possessing about 5 acres of land, to serve as the elementary school and the social center for the district and to give instruction in home economics and the elements of agricultural science with a certain amount of practical work, each pupil working a portion of his father's farm; (3) the agricultural high school, outside of town areas, with from 80 to 100 acres of land, mainly for residential pupils from 14 to 17 years of age, offering a 2-year course in agriculture leading to the agricultural college, one-third of the time being devoted to science with special reference to farm needs and one-third to field work; (4) the agricultural college; and (5) the university school of agriculture.

Fourteenth annual general report of the Department of Agriculture and Technical Instruction for Ireland (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 14 (1913–14), pp. VI+182+348*).—This is a report on the department's administration and funds and on details of its work during 1913–14, including agricultural and technical instruction.

Agricultural education and research (*Rpt. Bd. Agr. Scot., 3 (1914), pp. XXIV–XXXII*).—This is a report on progress in 1914 in agricultural education and research work under the control of the Board of Agriculture of Scotland.

A list of agricultural and horticultural officials, institutions, and associations (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb. No. 2 (1915), pp. 125*).—This list contains the organization and personnel of the Direction of Agriculture of the Department of Agriculture, Industry, and Commerce, including agricultural education and research institutions, agricultural and horticultural winter schools, itinerant instructors, and associations in The Netherlands.

Instruction in moor culture at the agricultural and technical high schools and universities in Prussia, H. WOLFF (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 33 (1915), No. 9, pp. 243–246*).—The author briefly reviews the lectures and exercises given in rural engineering, including moor culture, together with the number of hours devoted to it in the high schools and universities of Prussia. Only the agricultural high school of Berlin and the University of Halle offer special lectures in moor culture, the other institutions giving only a brief survey of it as a branch of rural engineering.

The essentials of agriculture, H. J. WATERS (*Boston: Ginn and Co., 1915, pp. X+455+XXXVI, pls. 3, figs. 226*).—This text presents the principles underlying successful farm practice in all sections of the United States, the arrangement of the subject matter being based on experience in teaching agriculture in secondary schools and the courses of study adopted by various state departments of education. The author has been assisted by experts in each branch of the subject, which comprises a study of plant production in general and of individual farm crops, care and management of soils, live-stock production, business aspects of farming, and mechanical power for the farm. Each chapter concludes with a list of review questions and problems, practical exercises, and references to literature. Appendixes include score cards, data as to quantity of seed to sow per acre, and similar useful information.

Correlating agriculture with the public school subjects in the Northern States, C. H. LANE and F. E. HEALD (*U. S. Dept. Agr. Bul. 281 (1915), pp. 42, figs. 6*).—This bulletin gives detailed suggestions to public school teachers on utilizing home projects in correlating agriculture and farm problems with the regular school work, the material being arranged according to a monthly sequence plan. Directions for organizing a club, awarding prizes, and conducting a school-exhibit day are included.

Agronomy, II, Field crops for New Hampshire, G. H. WHITCHER (*N. H. Dept. Pub. Instr., Inst. Circ. 21 (1914–15), pp. 22, figs. 4*).—Directions are given for conducting a 7-year practical crop rotation, suited to the needs of a large majority of New Hampshire farmers, as a high-school project. The material is so arranged that each crop in the series may be taken up by itself apart from its relation to the rotation as a whole.

Soil bacteriology laboratory manual, P. S. BURGESS (*Easton, Pa.: Chemical Publishing Co., 1914, pp. VIII+123, figs. 3*).—This series of exercises, as used in the College of Agriculture of the University of California, is designed to cover one semester's work of 9 to 10 hours a week, references being appended to each exercise. Appendixes contain general information on subsidiary methods in connection with the exercises.

How can the teacher make bee culture a school subject, training in habits of investigation and arousing an interest in the insect world, E. F. PHILLIPS (*Better Schools, 1 (1915), No. 6, pp. 96–98*).—The author discusses the availability of bees for school purposes and the value of the subject of bee keeping as an introduction to entomology.

Productive swine husbandry, G. E. DAY (*Philadelphia and London: J. B. Lippincott Co., 1915, pp. XIII+363, pl. 1, figs. 95*).—This text which has been previously noted (E. S. R., 29, p. 872), has been brought up to date and widened in scope to adapt it also to Southern conditions.

Pig club manual, J. D. MCVEAN (*North Carolina Sta. Circ. 26 (1915), pp. 31, figs. 10*).—This manual for pig club members contains a brief history of the pig club movement, the aims and duties of pig club members, rules and regulations for club contests, instruction in raising pigs, a pattern and directions for making a bulletin case, and duplicate record blanks which are to be filled in and the completed records sent to the state agent at the close of the year. After the records have been inspected, graded, recorded, and corrected they are returned to the club members submitting them.

Farm shop work, G. M. Brace and D. D. Mayne (*New York: American Book Co., 1915, pp. XII+291, figs. 251*).—Projects in woodworking, blacksmithing, cement and concrete work, and harness making, including the care and use of tools, are outlined for pupils in practical art classes in rural elementary and secondary schools. The work deals in a very practical way with the repair and construction of things used in actual farm work.

Home economics in the public schools of Louisiana, R. Myrtelle Billings (*Univ. Bul. La. State Univ., n. ser., 5 (1914), No. 9, pt. 1, pp. 60, pls. 2, figs. 7*).—This bulletin contains a statement of the practical value of home economics; rules governing approved departments of home economics receiving $400 state aid; requirements as to qualifications and duties of teachers; a course of study, outlined by months, for approved departments of home economics for grades 8 to 11, inclusive, and equipment; a suggestive course of study for the sixth and seventh grades of rural schools, together with equipment at a minimum cost of $100; and lists of publications for reference and supplementary reading and of educational exhibits furnished free by commercial firms.

Practical application of cooking lessons given in the running of a regular cafeteria with report of social work in connection with continuation school work in Kenosha, Laura E. Hahn (*Bul. Wis. Bd. Indus. Ed., No. 9 (1914), pp. 17, figs. 6*).—An account is given of the preparation and serving of the noonday lunch by the cooking class of the Kenosha continuation school and of the social work in connection with the school.

Outline of home economics for club study (*Agr. Col. Ext. Bul. [Ohio State Univ.], 10 (1915), No. 9, pp. 44*).—This outline consists of four parts, viz, food, shelter, clothing, and management, including suggestive topics and references to literature.

Material supplied to boys' and girls' clubs and rural schools (*Agr. Gaz. Canada, 2 (1915), No. 7, pp. 669–677*).—This is a series of summarized statements of material supplied this season to the rural schools, to boys' and girls' clubs, to junior farmers' institutes, etc., by various agencies in Nova Scotia, Ontario, Manitoba, Saskatchewan, and British Columbia.

Twelve projects for Michigan clubs and a short primer on club work, E. C. Lindemann (*Mich. Agr. Col., Ext. Div. Club Bul. 1 (1915), pp. 7, fig. 1*).—General information is given to club leaders on methods of conducting corn, potato, apple, live stock, poultry, and market gardening projects for boys' clubs, and housekeeping, garment making, canning and marketing, gardening and canning, poultry, and market gardening projects for girls for 1915.

How to carry out the bean-growing project, J. F. Cox (*Mich. Agr. Col., Ext. Div. Club Bul. 3 (1915), pp. 7, fig. 1*).—This bulletin contains the requirements for the bean-growing project, instructions for the growing and care of beans, and a brief discussion of bean diseases, field selection of seed beans, and varieties.

Girls' club work in Georgia, 1915, Lois Dowdle (*Bul. Ga. State Col. Agr., No. 86 (1915), pp. 16, figs. 6*).—This bulletin contains information concerning the organization and rules for conducting girls' club work, some results of the work in 1914, and suggestions for making booklets.

Proceedings of the eighteenth annual meeting of the American Association of Farmers' Institute Workers, edited by L. R. Taft (*Proc. Amer. Assoc. Farmers' Inst. Workers, 18 (1913), pp. 99*).—A detailed report of the proceedinsg of the meeting held at Washington, D. C., November 10–12, 1913.

Among the papers presented are the following: The Organization of the Institute by the Federal Government in Cooperation With the States for

Demonstration of Improved Methods, by T. A. Hoverstad (pp. 40–42); The Local Unit for Institute Organization, by E. C. Johnson (pp. 44–48); The Obligation of the Farmers' Institute to the Country Woman, the Country Boy, and the Country Girl, by W. J. Kennedy (pp. 49–52); The Obligation of the Farmers' Institute to the Farm Laborer and Tenant Farmer, by E. Van Alstyne (pp. 55–57); The Proportion of State Institute Funds That Should Go to the Support of Institutes for Women, by Mrs. W. N. Hutt (pp. 61–63); Model Equipment for a Local Institute for Women, with a Model Program, by Helen L. Johnson (pp. 63–68); How the Organizing of Local Institutes for Women Can Best Be Effected, by Mrs. H. M. Dunlap (pp. 71–74); The Advisability of the Organization of a Section for Women in the American Association of Farmers' Institute Workers, by Ida S. Harrington (pp. 75–78); and How Can Greater Local Self-Dependence be Secured in Institute Work? by W. D. Hurd, pp. 83–85).

Proceedings of the nineteenth annual meeting of the American Association of Farmers' Institute Workers, edited by L. R. Taft (*Proc. Amer. Assoc. Farmers' Inst. Workers, 19 (1914), pp. 123*).—A detailed report of the proceedings of the meeting held at Washington, D. C., November 9–11, 1914, and previously noted (E. S. R., 32, pp. 14, 97).

MISCELLANEOUS.

Annual Reports of Virginia Station, 1913 and 1914 (*Virginia Sta. Rpts. 1913–14, pp. 169, figs. 34*).—This contains the organization list, a report of the acting director as to the organization, publications, finances, work, and other data pertaining to the station, financial statements for the fiscal years ended June 30, 1913, and June 30, 1914, departmeneal reports, and reprints of Technical Bulletins 1–4, previously noted, and of Technical Bulletins 5–8, abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 2 (1915), No. 11, pp. 20, figs. 9*).—This number contains brief articles on the following subjects: Celery Culture in Western Washington, by J. L. Stahl; Late Blight of Celery, by H. L. Rees (see p. 742); and Concerning Abnormal Eggs, The Development of an Egg, and The Feed Requirements of a Laying Hen, by V. R. McBride.

Experiment station research as seen from within and without, H. J. Wheeler (*Proc. Soc. Prom. Agr. Sci., 35 (1914), pp. 38–46*).—This article has been previously noted (E. S. R., 32, p. 97).

The small field laboratory and its atmosphere of research, D. Fairchild (*Proc. Soc. Prom. Agr. Sci., 35 (1914), pp. 62–71*).—This article has been previously noted (E. S. R., 32, p. 306).

Agricultural encyclopedia, compiled by K. zu Putlitz and L. Meyer (*Landlexikon. Stuttgart: Deut. Verlags Anst., 1911, vols. 1, pp. VIII+800; 2, pp. 800; 1912, vol. 3, pp. 800; 1913, vols. 4, pp. 800; 5, pp. 800; 1914, vol. 6, pp. 918, pls. 232, figs. 1221*).—This is a general reference work, with special prominence given to subjects pertaining to agriculture, forestry, horticulture, agricultural industries, agricultural laws and their administration, etc.

NOTES.

California University and Station.—Construction is being begun on the laboratory building to cost $100,000 which is to be erected on the new 465-acre tract at Riverside for the use of the Citrus Substation and Graduate School of Agriculture.

Donald Bruce, formerly supervisor of the Flathead National Forest of Montana, has been appointed assistant professor of forestry and assistant forester in the station. Walter C. Dean, a 1915 graduate of the college of agriculture, has been appointed assistant in the department of soil technology of the station, vice Robert Pendleton, resigned September 1.

Delaware College.—The college has recently received $500,000 from a donor who wishes his name withheld. Of this sum $225,000 will be used for a building to house the entire activities of the departments of agriculture, general chemistry, and biology; $75,000 to remodel the old main building, which will house the social activities of the college; and the remainder will be invested as an endowment fund. The men's college opened in September with 232 students in attendance, 75 of whom are in agriculture. The women's college, which has just received its second class, has 90 students in attendance.

Kansas College and Station.—Edward C. Johnson, superintendent of institutes and demonstrations, has been appointed dean of the division of college extension. M. G. Burton has succeeded J. C. Werner, resigned, as director of correspondence work. Theodore Macklin has succeeded E. D. Baker, resigned, as instructor in rural economics. W. A. Etherton, specialist in rural architecture in this Department, has been appointed professor of rural architecture, and Miss Nola Treat assistant professor of domestic science.

Other appointments include M. F. Ahearn as professor of landscape gardening; David Gray, assistant animal husbandman; Helen Hahn, assistant professor of home economics and education; Carl S. Hoar, instructor in botany; A. E. McClymonds, assistant instructor in agronomy and superintendent of the agronomy farm; Frank E. Mussehl, assistant in poultry husbandry; N. E. Olson, assistant in dairy husbandry; Kurt Peiser, assistant in bacteriology; Dr. C. A. Pyle and Carl Thompson, lecturers in animal husbandry extension; M. C. Tanquary, instructor and assistant in entomology; J. W. Zahnley, assistant in agronomy; and L. C. Williams, assistant to the superintendent of institutes and demonstrations.

Maryland College.—The total enrollment is 310, with a Freshman class of 91. The college has established a correspondence study department with courses in farm soils, fertilizers and fertility, corn, soy beans and cowpeas, horses and mules, dairy farming, farm poultry, the apple, vegetable gardening, farm bee keeping, food principles and food values, grounds of the farm home, farm sanitation, rural economics, farm accounts, farm dwelling construction, gas, oil, and hot-air engines, and pipe and pipe fittings.

Minnesota University and Station.—John D. Schofield, one of the committee of three members of the Pomona Grange of Hennepin County largely responsible for the establishment of the school of agriculture, died September 18 at the age of 87 years. Recent appointments include the following: Alice M. Bilster as assistant professor of nutrition; Philip S. Jordan as instructor in animal husbandry at Morris; J. T. E. Dinwoodie, as assistant veterinarian; L. V. France as instructor in bee keeping; D. O. Spriestersbach, as research assistant in agricultural chemistry; D. D. Valleau as research assistant in horticulture; Frank J. Piemeisel as research assistant in cereal rust studies; Roswell P. Ingram as seed inspector; and Anna S. Olsen as assistant in home economics at Crookston. W. P. Kirkwood, editor in the station, has also been appointed associate professor of journalism.

Nebraska University.—Contracts have been awarded for the new biology building, which will house the departments of botany and zoology and will bear the name of Bessey Hall. The structure will consist of a 3-story and basement main building, 235 by 75 feet, with a short wing at each end and attached greenhouse and vivaria, and will cost approximately $200,000.

The new agricultural engineering building is to be a two-story and basement structure, 180 by 70 feet, with a one-story annex 140 by 90 feet.

C. L. Burlingham, extension specialist in dairying has resigned to accept a position with the Dairy Division of this Department, and has been succeeded by D. H. Propps as extension assistant professor of dairy husbandry. L. M. Gates has resigned as field expert in entomology to engage in farming. Other appointments include the following: M. E. Dickson as assistant professor of poultry husbandry, beginning November 1; P. L. Gaddis as assistant professor in agronomy; R. E. Holland, assistant in instructional agronomy; K. F. Warner as extension specialist in animal husbandry; Miss Emma Ort as extension specialist in home economics; and E. G. Maxwell as extension instructor in dairy manufactures.

Nevada University and Station.—The state hygienic laboratory has been separated from the department of bacteriology and veterinary science of the station and now occupies quarters in another building. Sheds and a corral have been erected on the waste land at the north end of the station farm for the study of the possibility of developing an anthrax serum. Plans are being drawn for a field hospital for the study of animal diseases, to be constructed on the station farm. G. G. Schweis, assistant in entomology, resigned August 1, and August Holmes, assistant in chemistry, about September 15, the latter to complete post-graduate work at Johns Hopkins University.

New Mexico College and Station.—Fred C. Werkenthin has been appointed professor of botany and station botanist, vice J. M. Mann, resigned. Dr. Louis Allen Higley has been appointed station chemist and professor of chemistry, vice Dr. R. F. Hare, whose resignation has been previously noted. L. R. McNeely, assistant agronomist, resigned July 1 and was succeeded August 20 by James T. Barlow. R. L. Stewart, assistant animal husbandman in the station, has been transferred entirely to instruction work. George W. Kable, assistant irrigation engineer, resigned July 1.

Cornell University.—The registration in the college of agriculture is over 1,600, an increase of more than 50 over the previous year. Arrangements have been completed whereby five members of the 1916 class may obtain experience in teaching agriculture by serving for one term as assistants to teachers of agriculture in the high schools of the State. They will receive a compensation sufficient for expenses and will be given three credit hours for the work.

Alice Gertrude McCloskey, a 1908 graduate and assistant professor of rural education, died October 19. Recent appointments include the following: Albert

R. Bechtel, whose resignation from the Pennsylvania College and Station has been previously noted, and J. Marshall Brannon, as instructors in botany; Wallace R. Chandler as instructor in parasitology; Dr. W. T. M. Forbes as instructor in entomology; C. H. Guise as instructor in forestry; Edward Riley King as assistant professor of bee culture; J. C. McCurdy as instructor in farm engineering; William E. Mordoff as instructor in farm mechanics; Gilbert W. Peck as instructor in pomology; J. R. Schramm as assistant professor in botany; and Roy Glenn Wiggans as instructor in farm crops. C. E. Ladd, of the department of farm management, has been appointed director of the New York State School of Agriculture at Delhi.

Ohio State University and Station.—Correspondence courses in agriculture are being offered for the first time, 22 of these courses being announced. The registration numbers over 150.

John F. Cunningham, of Cleveland, and John Kaiser, of Marietta, have been appointed to the governing board of the university. Dr. Alfred Vivian has been appointed dean of the college of agriculture, Clark S. Wheeler, director of agricultural extension, and George W. Bush, state leader of county agents with headquarters at the college of agriculture. Other appointments include Dr. Paul L. Vogt, professor of sociology at Miami University, as professor of rural economics; Milligan C. Kilpatrick as instructor in poultry in the extension department beginning October 1; Ivan McKellip as field agent in cow testing; S. M. Salesbury, instructor in animal husbandry and dairying in the North Carolina College, as assistant professor of animal husbandry; P. H. Elwood, of the Massachusetts College, as assistant in horticulture; and Virgil Overholt as instructor in agricultural engineering in the extension service. N. R. Elliott, assistant in horticulture, has accepted an appointment as assistant horticulturist in the Kentucky University and Station.

In the station, B. S. Davisson has been appointed assistant in soil biology and W. C. Boardman assistant in the soil survey.

Oregon College and Station.—The Withycombe Animal Husbandry Club, named in honor of Governor James Withycombe, formerly director of the station, has been organized by the students of the animal husbandry department to establish closer relations with their instructors and the practical livestock men of the State.

Recent appointments include the following: W. J. Gilmore, of the Manitoba College, as assistant professor of farm mechanics, vice E. M. D. Bracker, resigned to engage in farming in Illinois; A. C. McCulloch, instructor in animal husbandry at the Ontario College, as instructor of poultry husbandry, vice A. G. Lunn; Roy E. Marshall as instructor in horticulture; L. Eugene Robinson, a graduate in architecture in the University of Pennsylvania, as instructor in rural architecture; and H. A. Vickers as secretary of college extension, vice Paul M. Collins. A. L. Lovett, associate professor of entomology, has been appointed acting head of the department of entomology of the college and station, vice H. F. Wilson, whose resignation is noted elsewhere.

Wisconsin University and Station.—A special field course in farm management was offered at the college of agriculture from June 21 to July 30. The class of about 12 students was quartered in tents pitched in successful farming regions, and gave considerable time to observing the farm practice in the vicinity.

Under a new law, the state department of agriculture has been reorganized with C. P. Norgord, superintendent of farmers' institutes, at its head. It now consolidates the former department of agriculture, which had under its control the management of the state fair; the state board of immigration; the state live stock sanitary board, which had control of infectious animal diseases; and the state apiary inspection; and by transfer from the College of Agriculture the nursery and orchard inspection, as well as the inspection of insecticides and fungicides. J. G. Sanders has resigned as head of the department of entomology to become state entomologist; Dr. S. B. Fracker, instructor in entomology, to become deputy nursery inspector; and C. E. Lee, as assistant professor of dairy husbandry and dairy husbandman, to become dairy specialist for the state dairy and food commission. H. F. Wilson, entomologist at the Oregon College and Station has succeeded Professor Sanders, and G. H. Benkendorf, Professor Lee.

F. B. Morrison, assistant to the dean, has been made assistant director of the station. W. A. Sumner, assistant in agricultural journalism at the Kansas College, has been appointed editor of station publications. The last legislature reduced the annual appropriation for station publications from $17,000 to $10,000.

Prospective Agricultural Meetings.—The sixty-eighth meeting of the American Association for the Advancement of Science will be held in Columbus, Ohio, from December 27, 1915, to January 1, 1916. Section M (Agriculture) will be addressed by its vice-president, L. H. Bailey, on The Forthcoming Situation in Agricultural Work, part 2. The section has also arranged a symposium on The Relation of Science to Meat Production.

The American Association of Economic Entomologists, the Entomological Society of America, the Botanical Society of America, the American Phytopathological Society, the Society for Horticultural Science, and the Association of Official Seed Analysts of North America are among the affiliated societies which are to meet with the association.

The seventh annual meeting of the American Association of Agricultural Engineers will be held in Chicago, December 28–30.

American Association for the Advancement of Agricultural Teaching.—The sixth annual meeting of this association was held in Berkeley, Cal., August 10.

A report of the standing committee on The Use of Land in Connection With Agricultural Teaching, prepared by the States Relations Service of this Department, was based upon a study of the home-project method as followed in teaching agriculture in the secondary schools of New York. In this method each pupil chooses a project for home study before March 1, and after this date most of the time set aside for laboratory work is devoted to the projects. Part of the time is spent in school in reference reading, the drawing of plans, and such other work as may be done to advantage, and as the summer approaches the project work gradually replaces class work.

The home-project plan is so new in agricultural instruction that many phases of its application are still in process of development. Among these are its relations to the school course in agriculture, the basis upon which credit should be given, and the relation of the home project to club work.

The home-project plan is considered a promising means of bringing the home and school together in educational problems. To be effective, however, hearty cooperation should exist between parents and teachers; just how to secure this cooperation is still a problem.

Projects may be grouped according to their chief aim, as production projects, the chief purpose of which is to produce an agricultural product at a profit; demonstration projects, where the chief aim is to demonstrate improved methods or materials; experimental projects, where there is uncertainty as to results; or improvement projects, where students may undertake the improvement of plants and animals, the home grounds, or the farm in general with little hope of immediate returns. There is thus a distinction between a project, the principal aim of which is profit, and those having other aims predominating, and the question arises as to which class of projects are most desirable from an educational point of view.

Inasmuch as proper supervision is admitted to be one of the most important factors in a successful project, and the critical time for most projects comes in the summer, high schools that do not employ teachers of agriculture for the full year are placed at a disadvantage. Lack of training on the part of teachers is another obstacle and brings up the question as to whether college courses in agricultural education should give special training for project work.

W. G. Hummel, in a paper on Greater Uniformity in High School Agriculture, enumerated the following advantages: (1) The eliminating of "freak" courses and valueless exercises and the inclusion of essentials duly proportioned; (2) the betterment of the science courses, making possible organized correlation of agricultural topics with the other branches of study, as for example, between farm mechanics and physics in the last high school year; (3) state aid can be allotted with greater fairness and effectiveness; (4) agricultural colleges can better define and grant adequate credits for high school agricultural work; and (5) students can more readily transfer from one school to another. In summing up his paper Professor Hummel declared that "there is no reason why agricultural work in the high school can not make better men and better citizens as well as better farmers and better farming."

Supervised Observation and Experience in the Preparation of Secondary Agricultural Teachers was the subject of a paper by K. L. Hatch. In this he discussed the academic, technical, and professional training of the prospective teacher of agriculture in high schools, favoring as requirements graduation from a standard college and a professional preparation equivalent to fifteen semester hours credit which should include three semester hours credit in special method and three in practice teaching. Three methods of giving practice teaching are being utilized by agricultural colleges: (1) The moot court, (2) the use of nearby schools, and (3) practice in teaching short courses in secondary and collegiate institutions. In the moot court and nearby school methods of practice teaching, however, the work is too limited, impossible to supervise properly, difficult of administration, disruptive of regular classes, and is artificial. The paper therefore held that the most satisfactory method of giving supervised practice teaching in departments of agricultural education in land-grant colleges is through secondary schools connected with the colleges and teaching in college short courses.

In a paper entitled Some Difficulties and Failures in Teaching Agriculture in Secondary Schools, Milo N. Wood pointed out that the school board of the community often expects too much in the way of immediate results or demands that the work show a handsome financial profit. Frequently the difficulty lies with the unpreparedness of the teacher for his work. Agricultural teachers are sometimes expected to teach too many side lines, such as arithmetic, chemistry, physics, music, drawing, and athletics, and time may be wasted in nonessentials, particularly in laboratory and school farm work.

G. A. Bricker discussed The Content of the Course in Special Methods of Teaching Public School Agriculture. In his opinion, standardization with reference to the content of these courses should now be possible, although there will be variations such as those due to the character of the local agriculture, the educational laws of the State, the scheme of scholastic organization within the institution offering the course, and the personality of the educator who is charged with its administration. By common consent, however, the course should include class room, laboratory, and field methods, the literature of the subject, including reference matter and school texts, the adaptation of special methods that are used in other school subjects, and an outline of definite and concrete topics showing their proper sequence of presentation and their relative importance to each other and to the course as a whole.

There is now believed to be material of sufficient importance to justify a course of at least two collegiate hours' value.

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, U. S. Bureau of Education, secretary.

Agriculture at the National Education Association.—Rural and agricultural education received unusual attention at the meeting at Oakland, Cal., August 16–28.

In a paper before the Department of Rural and Agricultural Education, C. H. Lane defined the meaning of high school extension work in agriculture. This comprises all educational efforts at the homes and on the farms of the people and also such work at the school itself as centers directly in interests away from the school. Community work in agriculture is, he deemed, a necessary part of the school that is maintained by the people for the service of the people. He maintained that before attempting extension work, however, the teacher should study the agriculture of the community, the character of the soil and improvements, systems of farming, the class of farmers, and the condition of the rural one-teacher schools and of the churches. The teacher may then extend his work by supervising the home project work with his pupils, directing agricultural instruction in the grades, organizing and following up boys' and girls' clubs, acting as organizer for the one-week short course for farmers, offering personal counsel and advice on certain days to farmers of the community, assisting and organizing farmers' reading courses, directing school agricultural exhibits locally and at the county fair, and through Saturday meetings with farmers and by farm visitation. He should also have an office in the high school in which facts pertaining to the agriculture of the community may be assembled and where they will be available for the use of any person who desires them. The agricultural teacher would thus be an organizer of information and of movements and a director of agricultural enterprises within his school community.

How Boys and Girls Respond to Home Work in a Large City was the title of a paper by George L. Farley, in which he showed the surprising amount of growth and interest in school and home gardening in the city of Brockton, Mass. Four years ago a citizen of the city offered \$25 to start the work and in the fall some 30 children had carried the work to successful completion. This year \$300 was given by citizens in addition to about \$1,000 furnished by the city and over 2,700 pupils carried on gardens. In addition to garden work the work has extended to the forming of poultry clubs, the keeping of bees, and canning clubs.

N. H. Forman read a paper on Gardening and Farming in the Philippine schools, this consisting largely of a review of the progress made in the Philippines along industrial lines since the requiring of industrial work in the public schools in 1905. More than 100,000 pupils were engaged in gardening during the school year of 1914–15 and more than 43,000 pupils had home gardens which were kept producing throughout the year as required school work.

Other papers read before this department were Educational Values of School Credit for Home, Vacation, and Other Out-of-School Work; Boys' and Girls' Demonstration Club Work as Units of Value in School Credit; Agricultural Education in Australia, which consisted largely of a historical review of the development of agricultural education in Australia; Means Now Employed in the United States for the Training of Rural Teachers and the Extent of Such Preparation for Work in Agriculture; and The Preparation of Rural Teachers Through State Colleges of Agriculture for Work in Agriculture, by President H. J. Waters. President Waters maintained that this duty is the function of the state normal schools, teacher training departments in high schools, and county normal training schools, but that the agricultural colleges can participate through summer schools. As an argument in favor of bringing rural school teachers in contact with the college, he cited the sympathetic atmosphere of the college toward rural life. He presented an adapted secondary vocational course in an agricultural college for the training of rural teachers, in which special attention is given to academic preparation for teaching.

Several years ago a commission of the association on the reorganization of secondary education was established to help bring about a satisfactory articulation of high school and college. This commission contains ten subcommittees, one of which is on agriculture. It has for its aim the working out of the proper kind of high school extension work in agriculture, the general aim of secondary agriculture, the high school agricultural library, and aims, materials, and methods in agriculture below the high school, as well as in poultry husbandry, horticulture, and other lines of secondary agricultural instruction. A round-table conference was held under the direction of the chairman, A. V. Storm, and dealt with the following topics: The High School Extension Work, presented by C. H. Lane; Aims, Materials, and Methods in Agriculture Below the High School, by E. C. Bishop; and The General Aim of Secondary Agriculture, by W. G. Hummel. It is expected that a final report of this subcommittee will be submitted to the full committee at the regular session of the Department of Superintendents in February, 1916.

Agricultural Work in China.—The Chinese Ministry of Agriculture and Commerce was granted last spring over $100,000 for the establishment of demonstration farms and now has in operation three cotton farms, one sugar plantation, two forestry estates, and three farms devoted to pasturage tests. There is also a model ranch at Chu Chow at North Anhui. A system of extension teaching is also projected, starting with the establishment of an extension school for training traveling lecturers and demonstrators. The employees must be men of practical farm experience in their respective districts and are to work in cooperation with the staffs of the demonstration farms.

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U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

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EXPERIMENT STATION RECORD

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1915

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EXPERIMENT STATION RECORD.

VOL. XXXIII. ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Progress made in the field of agricultural chemistry in the years 1912 and 1913, P. EHRENBERG (*Chem. Ztg., 38 (1914), Nos. 99, pp. 1022, 1023; 102–103, pp. 1038, 1039*).—A retrospect.

Francis Humphreys Storer, L. W. FETZER (*Biochem. Bul., 4 (1915), No. 13, pp. 1–9, pl. 1*).—A tribute to the services of Francis Humphreys Storer in the advancement of agricultural chemistry.

Publications of Francis Humphreys Storer, L. W. FETZER (*Biochem. Bul., 4 (1914), No. 13, pp. 9–17*).—A comparatively complete bibliography of the contributions of Francis Humphreys Storer to the literature on general, technical, and agricultural chemistry.

The chemistry of colloids and some technical applications, W. W. TAYLOR (*London: Edward Arnold, 1915, pp. VIII+328, figs. 22*).—After a general consideration of the topic, the methods of preparation, absorption, and the applications of colloid chemistry to dyeing, tanning, the soil, purification of sewage, and biology are gone into.

The arsenates of lead, R. H. ROBINSON and H. V. TARTAR (*Oregon Sta. Bul. 128 (1915), pp. 3–32, figs. 3*).—After considerable work was done, the Holland and Reed method (E. S. R., 28, p. 308) was not regarded as a safe one to use for the preparation of pure lead hydrogen arsenates, but it was found that fairly pure hydrogen arsenates can be prepared by the use of the reaction between lead nitrate and di-sodium hydrogen arsenate.

All attempts to prepare pure lead ortho-arsenate were unsuccessful. "Lead ortho-arsenate is not formed under the ordinary aqueous conditions employed in the manufacture of commercial lead arsenate, and it is not a component of the commercial material as has been formerly supposed."

Lead pyro-arsenate was prepared by heating lead hydrogen arsenate to a temperature slightly higher than 200° C. As the lead hydrogen arsenate has to be heated to a comparatively high temperature before loss of water occurs, it seemed evident that lead pyro-arsenate is not a constituent of commercial lead arsenate.

Basic lead arsenate is much less bulky than lead hydrogen arsenate. The latter has a very fluffy appearance, similar to that of wheat flour. The basic compound, owing to a tendency of its particles to collect together and settle out more rapidly from suspension, "perhaps prevents its being spread so evenly over the foliage of fruit trees by the usual methods of spraying as can be accomplished with the lead hydrogen arsenate." The specific gravity of lead hydrogen arsenate at from 4 to 20° C. is 5.786 and of basic arsenate is 7.105. Both of the compounds were found to be very insoluble.

"Field tests made by using the pure arsenates at strengths as high as 8 lbs. to each 100 gal. of water were tried for two consecutive seasons with no injury to foliage. The lead hydrogen arsenate was found to react very easily with a number of different substances, especially those of an alkaline nature. On the other hand, the basic arsenate is a comparatively inert material. Tests made with tent caterpillars showed the acid salt to be a much quicker acting poison.

"The necessity of more complete methods for the true valuation of commercial lead arsenates is pointed out. Satisfactory methods have been devised for, and applied to, commercial samples as follows: (a) The estimation of lead hydrogen arsenate in the presence of mixed salts, (b) the determination of lead carbonate, (c) new methods for water-soluble arsenic oxid and water-soluble impurities, (d) a method for acid insoluble impurities, and (e) the detection of acetates and the quantitative estimation of chlorin. The application of these methods shows a wide variation in the composition of the commercial arsenates and gives a better valuation of them than the methods now in use.

"The precipitates obtained from the reactions of lead acetate and lead nitrate with di-sodium hydrogen arsenate under certain conditions are mixtures of lead hydrogen arsenate and the basic lead arsenate. When hydrogen arsenate is mixed with lime-sulphur in the proportions used in field practice, a reaction takes place in which considerable quantities of lead sulphid and calcium arsenate are formed, accompanied by the deposition of free sulphur. Appreciable quantities of arsenic pass into solution due to the solubility of the calcium arsenate. The reaction between lime-sulphur and the basic arsenate is comparatively slight."

Plant pigments, C. J. West (*Biochem. Bul., 4 (1915), No. 13, pp. 151–160*).—A review of the chemistry of plant pigments other than chlorophyll. See also a previous note (E. S. R., 31, p. 427).

The organic phosphorus compounds of wheat bran, C. J. Robinson and J. H. Mueller (*Biochem. Bul., 4 (1915), No. 13, pp. 100–117*).—The work is divided into three parts. The first section deals with the results of a study of the precipitate obtained by adding copper acetate to an extract of wheat bran; the second, with the material resulting from the alcoholic precipitation of bran extracts; and the third describes a combination of the copper acetate and alcohol precipitation methods.

With Anderson's method (E. S. R., 33, p. 11) a tri-barium salt of phytin was obtained crystalline in structure and identical in properties with that of Anderson, but it corresponded more closely to the formula $C_6H_{18}O_{24}P_6Ba_3$. Both in the case of the barium salt and the free acid the compounds obtained appeared to contain six more hydrogen atoms to the molecule; while in carbon, barium, and phosphorus contents, they agreed very well with Anderson's compounds.

"There is in addition, a considerable amount of another substance, very similar in composition, the barium salt of which contains only 34 per cent of barium, instead of 38 per cent in barium phytate. The fact that this substance does not dialyze indicates that its molecule is larger than that of barium phytate.

"There is, finally, a compound differing widely from phytin in having more carbon and less phosphorus in the molecule, which by hydrolysis splits off a reducing sugar (pentose), and whose barium salt contains only about 31 per cent of barium. We do not believe the composition of this substance has been definitely fixed. It has not been obtained in crystalline form, the analogous crystalline brucin salt prepared by Anderson probably being simply brucin phosphate."

Some observations on phytin, W. HEUBNER (*Biochem. Ztschr.*, *64* (*1914*), *No. 4–6*, *pp. 409–421*).—The author finds that phytic acid is only gradually cleaved in a 1.5 normal acid solution at 37° C. Less than 1 per cent of the amount present is cleaved per day. Light accelerated the cleavage through acid very much.

The hydrolysis of maltose by hydrochloric acid under the Herzfeld conditions of inversion. A reply to A. J. Kluyver, W. A. DAVIS (*Jour. Agr. Sci.* [*England*], *6* (*1914*), *No. 4*, *pp. 413–416*).—"It is shown that contrary to the statements of Kluyver and others, maltose undergoes slight hydrolysis (to the extent of about 2 per cent when 1 per cent solutions of maltose are used) when heated with hydrochloric acid under Herzfeld conditions. It is preferable, therefore, to adopt 10 per cent citric acid, under the conditions formerly laid down, in estimating cane sugar in plant extracts when maltose is likely to be present."

The influence of low temperatures on enzyms, J. S. HEPBURN (*Biochem. Bul.*, *4* (*1915*), *No. 13*, *pp. 136–150*).—A review.

Habituation of lactic ferments to poisons, C. RICHET (*Rev. Gén. Bot.*, *25 bis* (*1914*), *pp. 583–587*).—The lactic ferment is found able to accustom itself progressively (as shown by increased acid formation) to solutions of potassium bromid. The optimum of adaptation was obtained at relatively high concentrations of the toxic salt, but if returned to the nonpoisonous mixture it recovered its normal powers in one or two days.

The significance of the amount of low molecular glycerids of fatty acids in milk fat of various animals, E. GUTZEIT (*Kühn. Arch.*, *5* (*1914*), *pp. 127–138*).—The Reichert-Meissl number of woman's milk fat was found to be 2.03. This is in agreement with the findings of Laves (2.5) and Pizi (1.42), but not with Sauvaitre (15.8). The Reichert-Meissl number of the fat in cow's, sheep's, and goat's milk is two or two and one-half times greater than the fat in asses' and mare's milk, and in the latter the Reichert-Meissl number is six times as great as in human milk. Pig's and dog's milk contains still less of these volatile fatty acids. Accordingly, it is concluded that herbivorous animals require milk with fat which contains a high water-soluble volatile fatty acid content and the omniverous and carniverous animals a milk fat with a low one.

The relation of the excessive amount of fatty acids of cow's milk fat to infantile gastrointestinal disorders is discussed.

The estimation of inorganic phosphoric acid in the presence of phosphoric acid esters, W. HEUBNER (*Biochem. Ztschr.*, *64* (*1914*), *No. 4–6*, *pp. 401–408*).—Inorganic phosphoric acid in the presence of 4 per cent by volume of concentrated sulphuric acid and 15 per cent of ammonium nitrate can be precipitated quantitatively at a temperature of 37° C. within 6 hours as ammonium phosphomolybdate. The presence of small quantities of phytin does not influence the results, but increasing amounts of this substance do. Glycero-phosphoric acid affects the results much less than phytin.

About the calculation factor used in determining phosphorus according to the Neumann method, W. HEUBNER (*Biochem. Ztschr.*, *64* (*1914*), *No. 4–6*, *pp. 393–400*).—Neumann states that 1 cc. of semi-normal sodium hydroxid is equivalent to 1.268 mg. of phosphorus. This factor (0.553) was found too low, 0.57 giving figures more nearly correct. The specifications set down by Neumann and Gregersen must be observed.

On the factor to be used for the calculation of the phosphoric acid in Neumann's method, S. L. JODIDI (*Jour. Amer. Chem. Soc.*, *37* (*1915*), *No. 7*, *pp. 1708–1710*).—In connection with an investigation on the chestnut bark disease, a careful redetermination of the factor employed in the Neumann method was made. The results obtained are essentially in agreement with those of Heubner, noted above.

"Gregersen's modification [E. S. R., 20, p. 111] to overtitrate the dissolved yellow precipitate with 0.5 normal H_2SO_4, with a view to remove the carbon dioxid present by boiling, and then titrate back with 0.5 normal NaOH, while in principle correct, is inconvenient, since it increased the time required for each individual analysis. Instead of Gregersen's modification, it is best to run a blank analysis—or, better, several blank analyses—which compensates the errors due (a) to impurities (phosphorus) present in the reagents employed, (b) to carbon dioxid contained in the liquids to be titrated, and (c) to the acidity caused by the action of the boiling standard alkali on the filter paper. The figure secured for the blank analysis is to be subtracted from the acidimetric analysis proper. With uniform work the same blank may be applied to one or even several series of phosphoric-acid estimations."

An extremely delicate colorimetric method for detecting and estimating nitrates and nitrites, E. A. LETTS and FLORENCE W. REA (*Jour. Chem. Soc. [London], 105 (1914), No. 618, pp. 1157–1161*).—For detecting nitrates and nitrites 0.5 cc. of the solution under examination is mixed with 1.3 cc. of sulphuric acid in a small porcelain crucible, and, after mixing with a glass rod, 0.5 cc. of diphenylbenzidin (0.01 gm. in 50 cc. of sulphuric acid) is added. A blue color indicates either form of oxidized nitrogen. Details for the quantitative determination are given. In the method the depth of color produced is compared with that resulting in a nitrate solution of known strength. When nitrites are in admixture with nitrates it becomes necessary to oxidize the nitrous acid to nitric acid with potassium permanganate.

Fat analysis in fat chemistry in 1913, W. FAHRION (*Ztschr. Angew. Chem., 27 (1914), No. 40, Aufsatzteil, pp. 273–290*).—An extensive review of the literature on this subject.

Determination of formic and acetic acids, E. HEUSER (*Chem. Ztg., 39 (1915), No. 10–11, pp. 57–59, fig. 1*).—The usual method of determining formic and acetic acids by acidifying with sulphuric acid and distilling with steam requires too much time for its execution. Furthermore if phosphoric acid is substituted for sulphuric acids the results are influenced, since the former passes over into the distillate. If, however, the vapors are passed through a flask filled with glass beads and heated on a water bath satisfactory results can be obtained.

The method proposed consists of mixing the sample with 50 cc. of water and 50 cc. of phosphoric acid (specific gravity 1.2) and distilling at 44° C. and 56 mm. pressure until a volume of 500 cc. remains in the distillation flask. Then 50 cc. more of water is added to the flask, and distillation is conducted as before. Carbon dioxid is passed through the flask during the distillation. A flask with glass beads is also necessary when acetic acid is being determined in a solution containing both acetic and formic acids. Formic acid is oxidized with potassium dichromate.

The estimation of boric acid in substances, alimentary or otherwise, JAY (*Compt. Rend. Acad. Sci. [Paris], 158 (1914), No. 5, pp. 357, 358; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 617, II, p. 217*).—A claim for priority over the Bertrand and Agulhon methods. See also work previously noted (E. S. R., 32, p. 206).

Method for the examination of meat extracts, J. SMORODINZEW (*Hoppe-Seyler's Ztschr. Physiol. Chem., 92 (1914), No. 2, pp. 214–220; abs. in Ztschr. Angew. Chem., 27 (1914), No. 91, Referatenteil, p. 629*).—The highest yield of purins and carnosin was obtained by precipitating with mercuric sulphate. Precipitating with phosphotungstic acid with an addition of sulphuric acid caused a loss in carnosin, and the use of lead salts involved a decrease in carnitin and had very little effect on increasing the yield of methylguanidin.

The quantitative determination of the amino acids of feeding stuffs by the Van Slyke method, H. S. Grindley et al. (*Jour. Amer. Chem. Soc., 37 (1915), No. 7, pp. 1778–1781*).—The object of this work was to determine quantitatively the amino acid content of feeding stuffs, those used being cotton-seed meal, tankage, and alfalfa hay. Consistently low percentages of amino acid nitrogen were found as compared with the results obtained by Van Slyke (E. S. R., 31, p. 610) with isolated proteins.

"A study is also being made of the free amid and the free amino acids of feeding stuffs, with the object of determining to what extent, if any, the so-called nonprotein nitrogenous substances affect the quantitative determination of the amino acids of feeding stuffs by the Van Slyke method.

"It is evident from the results given that there are marked differences in the amino acid content of the three feeding stuffs here reported. Hence, it is logical to suppose that the feeds would have a widely different nutritive value, particularly as supplements to such feeds as corn.

"The quantitative determination of the amino acids of feeding stuffs, together with the aid of the rapidly increasing evidence on the nutritive functions of the amino acids, will make it possible to extend our present knowledge of feeding stuffs."

Changes in the fat content of feces preserved by freezing without the addition of a preservative, C. A. Smith, R. J. Miller, and P. B. Hawk (*Jour. Biol. Chem., 21 (1915), No. 2, pp. 395–401*).—Analyses of feces before and after freezing at —12° C., it is concluded, show that simple freezing without the addition of a preservative is not applicable to the preservation of feces in which fat is to be determined. The fat of feces kept at a temperature of —12° C. undergoes both hydrolysis (shown by increase in fatty acid) and actual destruction (shown by decrease in total fat).

Food chemistry in the year 1913, J. Rühle (*Ztschr. Angew. Chem., 27 (1914), No. 92–93, Aufsatzteil, pp. 617–624; 94–95, pp. 625–630*).—A retrospect of work done during 1913, dealing with methods of food analysis and the composition of foods.

Tamarind sirup, W. C. Taber (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, pp. 607–609*).—The published analyses of tamarinds agree fairly well as to the amount of tartaric acid present. Fruit examined in the Bureau of Chemistry of this Department which was purchased in the New York market had an acidity of 10 per cent calculated as tartaric acid. A large quantity of the acidity was due to tartaric acid and the rest to undetermined acids. No citric acid was found in the sirups made from the fruit.

"The manufacturing process employed in making [true] commercial tamarind sirups consists simply in making a water extract of the tamarinds by adding water to the fruit, heating the mixture for a few hours, filtering it, and adding sugar until a solid content of approximately 60 per cent is obtained. . . .

"The formulas used for making the true tamarind sirup vary somewhat in the amount of fruit used, some manufacturers using as much as 30 to 35 per cent."

The results of an examination (chemical and organoleptic) of six samples of tamarind sirup prepared in the Bureau of Chemistry are given.

Home canning of fruits and vegetables, F. J. Crider (*South Carolina Sta. Circ. 27 (1915), pp. 15*).—This publication gives specific directions for home canning of fruits and vegetables by fractional sterilization, open kettle, and steam pressure methods. Canning recipes are included.

Progress made in the chemistry of the fermentation industry in the year 1913, O. MOHR (*Ztschr. Angew. Chem., 27 (1914), No. 50, Aufsatzteil, pp. 361–368*).—This deals with the chemistry and utilization of the raw materials, fermentation organisms, and processes, and fermented products.

METEOROLOGY.

A study of the radiation of the atmosphere, A. ÅNGSTRÖM (*Smithsn. Misc. Collect., 65 (1915), No. 3, pp. V+159, figs. 45*).—This report is based upon observations on nocturnal radiation made during expeditions to Algeria and to California. The report is accompanied by records of observations on temperature, pressure, and humidity of the air up to great elevations, made by means of balloon observations from points at or near the observing stations in southern California, as well as of pyrheliometric observations on Mount Whitney.

The more important conclusions reached are that at low altitude (less than 4,500 meters) the total temperature radiation increases with the water-vapor content of the air. An increase in the water-vapor pressure causes a decrease in the effective radiation from the earth to every point of the sky. "The total radiation which would be received from a perfectly dry atmosphere would be about $0.28 \frac{\text{cal.}}{\text{cm}^2 \text{ min.}}$ with a temperature of 20° C. at the place of observation. The radiation of the upper, dry atmosphere would be about 50 per cent of that of a black body at the temperature of the place of observation."

There are indications that the radiation during the daytime is controlled by the same laws that hold for radiation at night. The effect of altitude on radiation is masked by the temperature and humidity gradients of the air. Under normal conditions the effective radiation generally reaches a maximum at an altitude of 3,000 meters, but an increase of the humidity or a decrease of the temperature gradient of the air tend to shift this maximum to higher altitudes. Clouds reduce radiation in dependence upon their altitude and density, while the effect of haze is almost inappreciable when no clouds or real fog are formed.

It is further stated that it is probable that radiation from large water surfaces is almost constant at different temperatures as well as in different latitudes.

The humidity of the air, O. MARR (*Gsndhts. Ingen., 38 (1915), Nos. 7, pp. 73–80; 8, pp. 90–93*).—This article reports in detail results of studies of the moisture content of the air at different temperatures with constant pressure.

May frosts in Eberswalde and their prediction by means of the psychrometer, J. SCHUBERT (*Ztschr. Forst u. Jagdw., 47 (1915), No. 2, pp. 84–92, figs. 4*).—Observations on the relation of atmospheric humidity to the formation of frost are reported and discussed.

The influence of volcanic dust veils on climatic variations, H. ARCTOWSKI (*Met. Ztschr., 32 (1915), No. 5, pp. 195–199*).—A discussion of this subject has already been noted from another source (E. S. R., 32, p. 509).

Ground water level, rainfall, and soil texture, W. KREBS (*Met. Ztschr., 32 (1915), No. 1, pp. 44, 45*).—As the result of extensive investigations it is thought that the soil moisture content very materially influences the amount of rainfall in a district, and that in intensely cultivated districts the amount of water held by the soil decreases. A permanent drying out of the soil accompanied by the gradual receding of ponds and lakes in a district was found to be accompanied by a gradual decrease in rainfall.

Dew ponds: History, observation, and experiment, E. A. MARTIN (*London: T. Werner Laurie, Ltd. [1915], pp. 208, pls. 7, figs. 2; rev. in Amer. Jour. Sci.,* *4. ser., 39 (1915), No. 234, p. 683).*—This book embodies the results of previous observations by the author on dew ponds (E. S. R., 25, p. 719; 30, p. 118), as well as of more recent investigations made under the auspices of the Royal Society of England.

The author states that when he commenced his investigations he had a strong leaning in favor of the theory of the replacement of these ponds by dew, but was soon led to abandon this idea, and now believes that, although there is evidence to show that considerable condensation takes place and high-level ponds derive considerable water from condensation of atmospheric moisture other than rain, dew has little or nothing to do with it. He defines a dew pond as "one situated on the higher grounds, generally on the chalkdowns of the south of England, which retains by some means or other a supply of water throughout all but the most prolonged droughts, while those ponds situated on the lower lands have consistently dried up." He explains at length the construction of such ponds and discusses the popular notions in regard to their replenishment. He suggests that the terms mist pond, fog pond, or cloud pond might be more appropriately applied than the term dew pond, since the evidence collected indicates that the condensation of mist furnishes the clue to the perennial nature of these ponds.

The weather element in American climates, R. DE C. WARD (*Ann. Assoc. Amer. Geogr., 4 (1914), pp. 3–54, figs. 42*).—This is a monographic discussion of this subject under the headings of the weather element in the study of climate, paths of cyclones and anticyclones in the United States, and regional and seasonal weather types of the United States.

The most important paths of cyclones and anticyclones in the United States and their accompanying weather, J. V. HANN (*Met. Ztschr., 32 (1915), No. 5, pp. 216–222, figs. 4*).—This article is based upon that of Ward noted above.

Climate and meteorology, D. C. BATES (*New Zeal. Off. Yearbook 1914, pp. 69–90, figs. 6*).—This report reviews in some detail the main characteristics of the climate and meteorology of New Zealand, giving summaries of the available data regarding sunshine, temperature, rainfall, and other meteorological factors.

The climate of west Africa, H. HUBERT (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 6, pp. 142–144*).—The main characteristics of temperature, rainfall, and winds are briefly summarized.

The climate of Abyssinia, Addis Abeba, J. V. HANN (*Met. Ztschr., 31 (1914), No. 12, pp. 561–566*).—The main characteristics of pressure, temperature, and rainfall are briefly discussed on the basis of the available records.

Meteorological records, L. SMITH (*Rpt. Agr. Expt. Sta. St. Croix, 1913–14, pp. 38–49, pls. 6*).—Tables show the distribution of rainfall at the experiment station of St. Croix during the year ended June 30, 1914, and in different parts of the island in 1913. Temperature, pressure, and humidity records at the experiment station are also given.

Amount and composition of the rainfall at Annas Hope, St. Croix, L. SMITH (*Rpt. Agr. Expt. Sta. St. Croix, 1913–14, p. 37*).—The monthly rainfall and its content of chlorin, total nitrogen, nitrogen as ammonia, and nitrogen as nitrates from July 1, 1913, to June 30, 1914, are reported.

The rainfall régime of Australia, B. C. WALLIS (*Scot. Geogr. Mag., 30 (1914), No. 10, pp. 527–532, figs. 2*).—The main conclusions of this article are summarized as follows:

"(1) Australian rainfall swings with the sun. (2) The heavy rainfall of the north coast at midsummer is similar in intensity to that of Africa near the tropics of Cancer and Capricorn whenever the sun is vertically overhead. The quantity of the annual rainfall of this section of Australia differs from that of Africa because of the presence of the sea to the north. (3) Australian rainfall covers three periods in the year: (a) Mid-December to mid-April, great rainfall intensity in the north becoming less marked in higher latitudes, maximum effect in February; (b) Mid-April to mid-August, winter rains especially in the southwest, maximum in June; (c) Mid-August to mid-December, relative dryness throughout the continent, maximum dryness in November. (4) The heavy summer rains accompanying falling temperatures and the northward swing of the sum. (5) The absence of rain accompanies rising temperatures when the land air is relatively much warmer than the sea air. (6) The heavy winter rains are most intense during the coldest months. (7) The rainfall régime of Australia is essentially similar to that of Africa and is associated with the similarity of air movements south of the equator."

SOILS—FERTILIZERS.

The biochemical decomposition of nitrogenous substances in soils, W. P. KELLEY (*Hawaii Sta. Bul. 39 (1915), pp. 25, fig. 1*).—Ammonification experiments in silica sand and fresh heavy clay soil from a citrus orchard to determine under different conditions the percentage of ammonia derived from the bacterial decomposition of casein, dried blood, soy-bean cake meal, cotton-seed meal, and linseed meal are reported, together with a study of the effects of bacterial action on different groups of nitrogen compounds.

It was found that ammonification of casein in both silica sand and soil was much more rapid during the first two days than that of dried blood, soy-bean cake meal, cotton-seed meal, or linseed meal, while soy-bean cake meal was second in the order of decomposition. A much higher percentage of the total nitrogen in casein was ammonified in soil than of the other materials. When equal amounts of nitrogen were added, casein was still more rapidly ammonified than the other materials and cotton-seed meal and soy-bean cake meal were more completely ammonified than dried blood or linseed meal. Later the yield of ammonia from dried blood exceeded that from cotton-seed meal. Under anaerobic conditions all of the materials were ammonified very slowly during the first two days, after which the casein was converted into ammonia approximately to the same extent as under aerobic conditions, but the other materials were decomposed much less vigorously.

With equal amounts of both nitrogenous and nonnitrogenous matter present the final yields of ammonia from the different materials, with the exception of dried blood, agreed closely, but the initial decomposition of casein was still greater than that of the other substances. By adding 1.586 gm. of starch to 1.072 gm. of casein ammonification was reduced practically 50 per cent throughout nine days, and effects on the ammonification of dried blood were still more marked. With varying amounts of casein the yields of ammonia in four days increased as the amounts of casein present increased. Extending the incubation period beyond four days did not materially increase the yield of ammonia, and the decomposition of the second and third gram added after 1 gm. had been acted upon four and eight days, respectively, was slightly more vigorous than that of the first gram.

Casein when mixed with silica sand or in solution was completely hydrolyzed by the action of bacteria in seven days. In solution the rate of hydrolysis exceeded that of ammonification, but the latter was not so active during the first five days as when mixed with soil.

The determination of the different groups of nitrogen compounds before and after bacterial action in casein, dried blood, soy-bean cake meal, cotton-seed meal, linseed meal, coconut meal, globulin from cotton-seed meal, and zein from maize showed that, with the exception of linseed meal and zein, the basic diamino acid nitrogen was converted into ammonia more rapidly than the nitrogen of other groups. With casein, soy-bean cake meal, and cotton-seed meal the more rapid ammonification of the basic nitrogen was especially noticeable. These results are taken to indicate that all portions of the organic nitrogen in the different materials used as fertilizers and green manures are not equally susceptible to ammonification.

Further investigations, including a study of the decomposition of individual amino acids and acid amids, are in progress.

The loss of nitrogen and organic matter in cultivated Kansas soils and the effect of this loss on the crop-producing power of the soil, C. O. SWANSON (*Jour. Indus. and Engin. Chem.*, 7 (*1915*), *No. 6, pp. 529–532*).—With reference to the average decrease in crop-producing power shown by Kansas soils in spite of improved seeding and tillage methods, data previously reported by the author on the chemical composition of representative Kansas soils (E. S. R., 32, p. 26) are cited to show that the elements nitrogen and carbon have disappeared from the cultivated soils in proportionately larger quantities than the other essential elements. These soils have lost in round numbers from one-fifth to two-fifths of the nitrogen and from nearly one-fourth to one-half of the organic matter. This loss of organic matter and nitrogen is considered to be the most important cause of the decreased crop-producing power of the soils.

Protozoology applied to the soil, N. KOPELOFF, H. C. LINT, and D. A. COLEMAN (*Trans. Amer. Micros. Soc.*, *34* (*1915*), *No. 2, pp. 149–154*).—A new method for counting protozoa, consisting of an adaptation of the blood-counting apparatus (Blutkörperzählapparat) whereby the organisms may be counted directly, rapidly, and accurately is described, and experiments to determine the medium best adapted for the large and rapid multiplication of the various kinds of protozoa are reported.

Ten per cent hay infusion proved to be the most favorable medium for the development of large numbers of small flagellates, as well as small and large ciliates. Hay infusion in various concentrations, with and without the addition of egg albumin, was well adapted to the development of the organisms. Hay infusion plus 5 per cent egg albumin proved superior to all other media for the development of ciliates. Soil extract was an excellent medium, though somewhat inferior to hay infusion plus 5 per cent egg albumin, and with the soil used in the experiment lower concentrations than those recommended by Cunningham and Löhnis (E. S. R., 31, p. 26) developed protozoa in a shorter period of time. Three per cent chicken manure was an excellent medium for the development of small ciliates. The general order of appearance of protozoa was as follows: Small flagellates, small ciliates, large flagellates, and finally large ciliates. "The numbers and species of protozoa which can be obtained from a given soil are largely dependent upon the media employed [and] time of incubation, as well as the kind of soil used."

Radio-activity of soils and waters, A. GOCKEL (*Die Radioaktivität von Boden und Quellen. Brunswick: Friedr. Vieweg & Son, 1914, pp. V+108, figs. 10; rev. in Wasser u. Abwasser, 9* (*1915*), *No. 5, p. 135*).—This book summarizes the present knowledge of the radio-activity of soils and waters and contains the following chapters: The radio-activity of the rocks forming the earth's crust, radio-active minerals, the radio-activity of the soil air, soil emanations, the radio-activity of waters, radio-activity and soil heat, and methods of measurement. Methods of procedure in studies of radio-activity are given particular attention throughout the book. It is stated that so far as is now known most soils show radium and thorium emanations. A bibliography is appended.

Studies in the drying of soils, M. A. KLEIN (*Jour. Amer. Soc. Agron., 7 (1915), No. 2, pp. 49–77, fig. 1*).—In this article the work of others bearing on the subject is reviewed, and two experiments made to determine the effect of drying the soil on its chemical and biological condition and on plant growth are reported.

The object of the first experiment was to determine, under controlled conditions, the effect of drying the soil to different moisture contents on plant food in the soil and on plant growth. Two heavy clay-loam soils, differing only in content of organic matter, were placed in 3-gal. pots, saturated, and then allowed to dry until they reached their permanent moisture content, which varied from 15 to 30 per cent in the soil containing little organic matter and from 15 to 40 per cent in the other, the highest figures indicating saturation. They were then divided into two series, one being planted to wheat at 25 per cent moisture content and the other kept bare at the different moisture contents. The wheat, after being harvested, was followed by millet and buckwheat in turn.

It was found in this experiment that the drying of soil previous to planting had a beneficial effect on plant growth. In the clay loam with little organic matter, which had been previously held at saturation, the yield of dry matter was smallest, while in the clay loam containing considerable organic matter and which had been held at saturation the yield was as large as in those with the lowest moisture content. The factor causing the beneficial effect due to drying is, therefore, considered to be affected by the organic matter in the soil.

Previous drying of the soil had no effect on the total nitrogen in the dry matter of the crop. The water-soluble matter in the clay loam containing little organic matter was increased by drying, while in the same soil with a high content of organic matter the opposite occurred. In the planted series of both soils drying resulted in a decrease in the nitrates in the soil, but no effect was observed in the unplanted series. Denitrification occurred in the soil samples when incubated at 30° C. for seven days. Drying had little effect on the available potassium, calcium, or phosphorus in the soil.

The object of the second experiment was to determine the effect of drying a soil on its physiological condition as measured by carbon dioxid production and nitrification. The clay loam soil was transferred to new pots and kept at an optimum moisture content for 14 months, after which different pots were submitted to from one to three wettings and dryings in a drying room at 30° before determinations of carbon dioxid production and nitrification were made.

It was found that bacterial activity as measured by the carbon dioxid production was greatly increased by a previous drying of the soil. In the soil that was not wet again after drying the bacterial activity was greatly inhibited and the carbon dioxid production ceased after seven days. One drying of the soil greatly increased the activity over the original soil. In the soil kept at an optimum moisture content for 35 days after drying the production of carbon dioxid became normal again. A soil dried twice did not show a much greater activity than when dried once, while three dryings showed no increase over two dryings.

Drying the soil greatly reduced the nitrates, and rewetting of the dry soil for a period of 16 days further decreased nitrification. In the soil held moist for 35 days after one drying and in those previously dried twice and three times, an increase in nitrification was found over that in the sample dried once. The maximum was, however, reached at two dryings. "These results show that the activity of the nitrifying organisms is increased by a previous drying of the soil, but reaches a maximum at two dryings." Adding organic or inorganic nitrogen to the soil was accompanied by a marked increase in nitrate production.

"From the results obtained in this investigation and by other workers it would seem that the increase in bacterial activity on drying a soil is not a question of bacterial numbers, but depends upon the relative resistance of the important soil organisms. In a consideration of the effect of drying a soil on the physiological condition of the soil no definite conclusions can be drawn until more knowledge is obtained relating to the effect on the different groups of organisms. . . .

"The results of these studies show that the drying of soil affects the physical, chemical, and biological factors, resulting in an increased plant growth. The increased crop growth on a soil that has been previously dried is of importance to the practical question of soil management, more especially in the arid regions where the soil is often air-dried."

A biblography of related literature is appended.

A study of the Atterberg plasticity method, C. S. KINNISON (*U. S. Dept. Com., Bur. Standards Technol. Paper 46* (*1915*), *pp. 18, figs. 3*).—In this paper Atterberg's method of measuring the plasticity of clays (E. S. R., 32, p. 617) is briefly described, results obtained by him are reviewed and discussed, and experiments with twenty different clays are reported in which this method of measuring plasticity was compared with some of the present methods.

"Atterberg classifies the condition of a clay with varying amounts of water into five states, as follows: (1) The upper limit of fluidity or the point where the clay slip flows as water; (2) the lower limit of fluidity or flow where two portions of the clay mass can be made to barely flow together, when placed in a shallow dish which is sharply rapped with the hand; (3) the normal consistency, or sticky limit, being the condition in which the clay is most workable, is no longer sticky and will not adhere to metal; (4) the rolling limit, or the condition in which the clay can no longer be rolled into so-called threads between the hand and the surface on which it may rest (this is the lower limit of the workable condition); (5) the condition in which the damp clay will no longer hold together when subjected to pressure."

The plasticity of 20 different clays was measured by Atterberg's method and their water of plasticity and volume shrinkage determined, together with the amount of water which the dry powdered clay would absorb when allowed to stand over a dilute sulphuric acid solution. Classification according to the Atterberg method and that based on the percentage of water of plasticity were found to agree more closely than those obtained by any two other methods used. The disagreement in the different evaluations was, however, such as to indicate that neither of these methods used alone will suffice, as each produced results which contradict facts observed in every-day experience with the clays. Since Atterberg's rating was nearest the mean, it is considered preferable to either of the ratings based on shrinkage or water of plasticity. It was found further that Atterberg's plasticity number can not be satisfactorily used alone to evaluate clays with reference to their plasticities unless they are all of one type, and will not, therefore, accurately classify a large number of clays of various types.

From these results it is thought that Atterberg's factor should be coordinated with the water of plasticity, this scheme, it is stated, giving promise of separating the nonsticky and safe working clays from the sticky varieties difficult to work.

Soil analysis, E. J. RUSSELL (*Jour. Bd. Agr.* [*London*], *22* (*1915*), *No. 2, pp. 116–119*).—It is pointed out in this article that to derive the maximum assistance from soil analysis the farmer must bear in mind that "the simplest problem for the expert is to compare soils and, therefore, the chances of success are greatest when a soil survey has been made or when some similar soil has been under proper field experiment. . . . The farmer must . . . arrange to go over the land with the expert and discuss on the spot the various points on which information is desired; the necessary samples can then be drawn with the proper tools and with all due precautions. . . . When no satisfactory standards exist and where the expert has not made a personal inspection, so much balancing of probabilities has to be done that no expert can give more than a general opinion."

Soils of Pennsylvania, F. MENGES (*Penn. Dept. Agr. Buls. 250* (*1914*), *pp. II+481, pls. 8; 257* (*1914*), *pp. 285, pls. 8*).—This is a popular report on the soils of Pennsylvania, consisting chiefly of a discussion by townships of the origin and capacity of the soils in the State, together with suggestions as to their adaptation to different crops. It was thought advisable to undertake the general survey upon which this report is based because of the great variety and wide diversity of the soil formations of the State and the necessarily limited extent of the surveys made by the Bureau of Soils of this Department.

The soils of the Hawaiian Islands, W. P. KELLEY, W. McGEORGE, and ALICE R. THOMPSON (*Hawaii Sta. Bul. 40* (*1915*), *pp. 35*).—This bulletin discusses briefly the general properties of the soils of the Hawaiian Islands and points out the practical bearings of the investigations (E. S. R., 27, pp. 118, 842; 30, pp. 419, 420; 31, pp. 11, 723; 32, p. 719; 33, p. 122) that have been made on them, especially on the upland soils above the sugar belt.

Hawaii is characterized by a rolling topography, and in almost every section the arable land is broken up by gulches or deep ravines. Owing to the very diverse character of the soils, "the methods of classification and mapping usually employed in soil surveys are not adapted to Hawaiian conditions, and nothing less than a systematic sampling of almost every acre will suffice to give an accurate idea of the location of all soil types."

The soils are lateritic in nature, range from 6 in. to many feet in depth, and, with the exception of small areas near the sea, have been formed from the disintegration products of basaltic lava. They are, therefore, highly ferruginous and basic. Unusual types of soil also occur on the islands, there being on Oahu highly manganiferous and titaniferous soils. Much of the soil at lower elevations has been formed by sedimentation and erosion from higher elevations. "After a few years of cultivation, but little demarcation between the soil and the subsoil is left except in locations of heavy rainfall. The humus content in passing downward decreases slowly, but the fertility in the drier sections is not greatly different for many feet below the surface. . . . No injurious effects, such as commonly follow the turning up of inert subsoil, are produced in the drier sections by plowing to the depth of 30 in."

The soils, in general, are divided, as regards mechanical composition, into clay, silt, sandy, and humus soils, the clay type predominating. The predominant color is red. "The potash content, on the whole, is rather below the average, but frequently it is relatively more soluble than usual and consequently more available. It is also more constant in different sections of the islands than any other of the so-called plant-food constituents. Phosphoric acid is comparatively abundant, but there is a wide range of variation in the percentages present. . . . Notwithstanding the high percentages of phosphoric acid in Hawaiian soils, the availability is, on the whole, rather low, and phosphate fertilization is necessary in most instances except where the humus content is high. . . . The humus content is high as compared with mainland soils, and consequently the nitrogen is also high, but its availability is low, due to poor aeration. . . . Notwithstanding the highly basic character of Hawaiian soils, they generally give an acid reaction toward litmus. . . . The amount of water-soluble ferrous iron . . . is extremely small, except where there is insufficient aeration. . . . In general the aeration of Hawaiian soils is not sufficient for the best development of beneficial bacteria. . . . The results of experiments indicate that the iron and alumina present may partially take the place of lime in maintaining the necessary neutral condition. On the other hand, experiments show that magnesium carbonate seems to be distinctly detrimental to nitrification, while the magnesia naturally present in the soils does not seem to interfere. . . . Ammonification is more active in Hawaiian soils than nitrification, and investigations show that aeration is not as essental to this process as it is to nitrification."

Proper drainage, frequent deep plowing, and proper rotation of crops to maintain the humus supply are considered to be essential in the proper management of the soils. The application of lime for the improvement of heavy clays has been of doubtful effect. "With the exception of phosphoric acid, all the mineral elements of plant food in Hawaiian soils are soluble in water to a considerable extent, and if suitable physical conditions be maintained, and the humus content kept up, the need for mineral fertilizers will be greatly reduced. The solubility of the mineral constituents can also be considerably increased by soil heating."

Tables of mechanical and chemical analyses of a large number of soils and subsoils taken from different parts of all of the principal islands are also given.

Van Bemmelen's method in the study of lateritic soils and the process of laterization in Italian soils, A. de Dominicis (*Staz. Sper. Agr. Ital., 47 (1914), No. 4, pp. 282–296; abs. in Chem. Abs., 9 (1915), No. 5, pp. 680, 681*).—The work of others bearing on the subject is briefly reviewed, and experiments with soils from northern and southern Italy, using van Bemmelen's method for studying lateritic soils, are reported, from which it is concluded that even though van Bemmelen's method gives no quantitative results it does give information regarding the nature of the soil colloids. Of the two classes of colloids, the first includes those soluble in hydrochloric acid in which the ratio of alumina to silica is not less than 1:3, and the second class consists of compounds of alumina and silica in the ratio of less than 1:3 and which are soluble only in sulphuric acid.

The results of these studies appear to be in accord with those of Barnardini and Mazzone (E. S. R., 30, p. 320) with reference to the lateritic nature of the soils of southern Italy.

Soils, H. J. Vipond (*Union So. Africa Dept. Agr. Rpt. 1913–14, pp. 218–230, pls. 10*).—Chemical and mechanical analyses of various types of Transvaal soils are reported and discussed.

Chemical analyses of a number of soils and subsoils from the different forest stations showed them to be of five classes, namely, soils with good percentages of nitrogen, soils well supplied with lime, heavy soils, medium to sandy loams, and sandy soils. There appeared to be a regular decrease in the percentages of lime, magnesia, potash, and phosphoric acid soluble in strong hydrochloric acid as the soils varied from heavy to light. There was, however, little difference between the heavy and light soils with reference to available phosphoric acid and potash. "All five groups appear to contain adequate amounts of available potash for cereal production, but very inadequate amounts of available phosphates," while the heavy soils, medium to sandy loams, and sandy soils "also appear to be deficient in nitrogen and are certainly deficient in lime."

Mechanical and chemical analyses of a number of soils belonging to six typical groups, namely, (1) black turf soils, (2) red and brown heavy loams or clay loams, (3) gray and brownish gray heavy loams to clay loams, (4) red and brown medium to sandy loams, (5) gray and brownish gray medium to sandy loams, and (6) sandy soils and a number of miscellaneous soils, are also reported.

"One feature of these soils is their poverty in the silt, fine silt, and very fine silt fractions. In this respect the typical gray soils are better supplied than the typical red sedentary soils, but even they show comparatively small percentages of the finer silts. The gray soils also contain less fine gravel and 'sand' and more 'fine sand' than the corresponding red and brown soils."

The important cementing material of the soils was found to be iron oxid. Data on the relation between the color of soils and their iron oxid content indicate that "the gray soils are very much poorer in iron oxid than the red and brown soils, and the brown soils are as a rule poorer than the red soils except where the humus content is high. The brown in any case is to be regarded as a mixture of red due to iron oxid, and black due to humus. The percentages of iron oxid in the clay fraction would probably be a better guide, as the iron oxid locked up in the ironstone grains (which are abundant in many soils) can not have much coloring effect."

Studies of two soils showed that in one case a third and in the other case a quarter of the total phosphoric oxid in the soil was locked up in the ironstone grain.

Experimental data on podzol formation, V. P. Smirnov (*Ezheg. Geol. i Min. Rossii, 14 (1912), No. 7–8, pp. 206–210, fig. 1; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 3, pp. 228, 229*).—In experiments with a sandy podzol soil two glass tubes 5 cm. in diameter were filled with the soil in its natural stratification, and distilled water, distilled water containing carbon dioxid, and a solution of ammonia were allowed to percolate through the soil for twenty-four hours. The filtrates contained different amounts of leached-out organic and inorganic constituents, the smallest amount being in the distilled water containing carbon dioxid and the most in the ammonia solution.

These results, together with preliminary analyses of the soil layers, led to the conclusion that the cementing material of the subhorizons of podzol soil consists of organic matter and colloidal silica. In the tube treated with ammonia a brown ring appeared between the lower subhorizon and the subsoil, which is thought to be an ortstein formation.

The question of the formation of secondary minerals in the ortstein-producing horizons of soils, B. B. Polynov (*Ezheg. Geol. i Min. Rossii, 14 (1912), No. 9, pp. 273–280; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 3, p. 228*).—A brief morphological description and mechanical and chemical analyses of each layer of two podzol soils are reported, together with experiments on the absorptive power of each layer for ammonia.

A marked increase in absorptive power and in amount of sesquioxids, chemically combined water, alkaline earths, potassium, and mechanical clay (less than 0.01 mm.) was observed in the ortstein-producing subhorizons as compared with the upper horizons. The increase in absorptive power for ammonia is attributed to the presence in the ortstein-producing layers of "secondary soil minerals," such as the collodial hydrates of silica and ferric oxid, which have a high absorptive power for ammonia, and also to accumulations in these layers of zeolite-like secondary hydrous aluminum silicates of magnesium, potassium, and calcium.

Alkali or kalar experiments and completion report of the Daulatpur reclamation station, Sind, G. S. Henderson (*Dept. Agr. Bombay Bul. 64 (1914), pp. 34, pls. 6, figs. 2*).—In this report experience in the United States and in

Egypt on the reclamation of alkali land is briefly reviewed, soil conditions with reference to alkali in the province of Sind are described, and reclamation experiments extending from 1908 to 1913, inclusive, on 400 acres of loam to sandy loam soil which was typical of the worst areas of kalar (alkali) land in Sind are reported.

It is stated that the alkali problem in Sind is not a difficult one. "None of the lands so far examined in use for agricultural purposes contain very high percentages of alkali, but a number of these contain just sufficient kalar to have an injurious effect on the yields of the crops." The reclamation experiments included leveling, flooding, and draining of the land, and cropping to berseem (Egyptian white clover), sorghum, and cotton.

Considering the cost of reclamation and the crop returns, it is stated that the experimental farm has not paid. The berseem demonstrated its fitness as a rotation crop for the country.

Methods of reclamation, including flooding and cropping to rice and white clover, based mainly on the ability of these crops to withstand large amounts of water, are discussed.

Technical means of improving alkali soils, L. Kirillov (*Khoziaistvo, No. 26 (1913); abs. in Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *15* (*1914*), *No. 2, p. 147*).—For the improvement of alkali soils the author recommends shallow plowing (1.75 to 3.5 in.) in the fall, followed immediately by deepening the soil an inch more. For the winter the soil is to be covered by old manure which is plowed under in the spring. The sowing must be early and preferably of broad-leaved plants in rows so that a cultivator can pass through later. It is thought that the effect of such treatment will last for from three to four years, permitting the growth of perennial grasses, like alfalfa, for from four to five years, after which the treatment should be repeated.

The transformation of sulphur and sulphur compounds in agricultural soil, a contribution to the knowledge of the sulphur cycle, H. Kappen and E. Quensell (*Landw. Vers. Stat., 86* (*1915*), *No. 1–2, pp. 1–34*).—The authors review briefly the work of others bearing on the subject and report experiments on the transformations undergone by sulphids, free sulphur, and sulphites in different soils.

It is concluded from these experiments that hydrogen sulphid produced in soils by bacterial action or rotting of organic compounds passes into the form of ferrous sulphid which is decomposed in the soil air, the iron being oxidized to iron oxid and the sulphur being set free. The free sulphur in finely divided condition is then oxidized into sulphites and these into sulphates. The speed of this transformation of free sulphur into sulphates was found to be dependent on the form of sulphur used, the so-called milk of sulphur being the easiest form oxidized. Oxidation of free sulphur took place more quickly in natural than in sterilized soil. This is taken to indicate that bacteria may aid in the the transformation of sulphur compounds in soil, although it is thought that the process is mainly a chemical one since all known methods of soil sterilization are considered to have an effect on the other soil properties.

It is further concluded that the transformation of sulphur compounds takes place much more rapidly in soils than elsewhere and that different soils exert specific influences on the speed of such transformation. It was also found that sulphids and sulphites are transformed so rapidly in soils that the germination or development of plants is not injuriously affected.

Rich harvests on poor sand soil, A. Koch (*Mitt. Deut. Landw. Gesell., 30* (*1915*), *No. 21, pp. 311–315, figs. 5*).—Pot experiments with clean sand and a mixture of clean sand and clay, both of which were completely fertilized and planted to corn, wheat, rye, oats, and buckwheat are reported, the purpose of which was to determine the influences of the physical properties of soil on the yield of crops.

The crops grew much faster and the yields were considerably greater on the sand clay mixture than on the sand. With corn the best results were obtained with a mixture of 5.4 kg. of sand and 0.9 kg. of clay. The wheat, rye, oats, and buckwheat yield on the sand-clay mixture were as large as in good loam soil. When sand was treated with nitric acid and water allowed to percolate through nearly all the nitric acid was washed out, while the sand-clay mixture under the same circumstances retained a large part of the nitric acid.

Experiments to explain the greater crop-producing power of the sand-clay mixture on the basis of greater absorptive power for plant food, greater moisture-retaining power, and greater capillarity were unsuccessful. Studies of the root development of the crops and physical experiments with the two soils led to the conclusion that the sand grains when wet offer considerable resistance to the growth and spreading of plant roots, while when mixed with clay the clay acts as a lubricant between the sand grains, thus permitting roots to spread throughout the mixture, making a greater feeding area, and resulting in larger crop yields.

It is concluded from the results as a whole that the physical condition of a soil determines in large measure the availability and extent of utilization of plant food by plants and, therefore, exercises considerable influence on the yield of crops.

Unfavorable influence of too close a stand of trees on the water economy of poor pine soils, ALBERT (*Ztschr. Forst u. Jagdw., 47 (1915), No. 4, pp. 241–248, figs. 2*).—Investigations on the effect of thinning out the stand of pine trees on the moisture content of light sand soil of relatively low fertility are reported.

A pine tree thicket 20 to 25 years old was divided into three plats. The number of trees on two of the plats was reduced and the resulting brushwood removed from one and allowed to remain on the other. Soil moisture observations made during two growing seasons thereafter showed that in the soil of the thinned-out plats there was a noticeable and permanent increase in the moisture content. The increase was greater for the plat on which the brushwood covering was allowed to remain. This is attributed to the decrease in evaporation caused by the covering. It is also thought that the brush increased the fertility of the soil.

It is concluded that a proper thinning-out of pine tree growths on poor sand soils, but allowing the brush to remain, is beneficial not only to the trees but to the soil.

A note on relative saturation, G. BROWN (*Jour. Ecology, 3 (1915), No. 1, pp. 30, 31*).—The author discusses and proposes as a general expression for the condition of a soil with regard to its relative saturation, the formula $(w-m)/W$, in which $w=$ the mass of a given quantity of soil with its contained moisture, $m=$ the mass of same soil when air dry, and W the maximum water capacity, all being expressed in grams.

For each natural habitat there will be a minimum, an optimum, and a maximum value of the ratio, the optimum indicating those edaphic conditions under which the association or formation remains stable, the maximum and minimum indicating the limiting conditions beyond which it can no longer be maintained as such, but will be replaced by a drier or wetter type. Relative saturation as here indicated would, it is claimed, prove an efficient measure of the soil water without taking into consideration the physical condition of the soil, and would serve to differentiate edaphic conditions and to distinguish natural habitats.

Pot tests with fertilizers compared with field trials, G. N. COFFEY and H. F. TUTTLE (*Jour. Amer. Soc. Agron., 7 (1915), No. 3, pp. 129–139, fig. 1*).—Pot fertilizer experiments with wheat on different soil types are reported, the purpose of which was to determine the value of pot tests for indicating the fertilizer requirements of a given soil.

The pot tests were made with soils as similar as possible to those upon which field trials are being conducted and the results compared with those secured in the field, the idea being to duplicate field conditions and fertilizer treatments as nearly as possible. Five-gallon glazed clay pots about 10½ in. in diameter and 12 in. deep were used. The surface soil and the first 6 in. of subsoil from different fields were used, and equal weights (about 10 kg.) of both soil and subsoil were used in each pot. It was found that the results of pot tests and field trials made as indicated agreed on the whole very closely.

Data on the experience with fertilizer pot tests at other experiment stations were also obtained, the consensus of opinion of those reporting success being that if one element is needed the pot test is quite reliable in indicating it, while if two or more elements are lacking the pots may differ from field indications.

It is concluded from the results of these experiments and the experience of other stations that pot tests may be made of very great value in determining the relative need of the soil for different plant food elements. To secure the best results the soil should be placed in the pots in as nearly the same position and condition as in the field and receive the same fertilizer treatment as in field practice. "Both soil and subsoil should be used, the surface soil being taken to the depth at which the most marked change takes place, usually about the depth to which it is plowed. Air drying and excessive handling should be avoided. . . .

"A somewhat larger quantity of seed per acre should be sown and the plants thinned to about the same number per acre as in the field and to an equal number per pot. While most stations have grown the plants to maturity, the results secured here seem to show that with wheat a period of one month to six weeks is sufficient to indicate the relative fertilizer need of the soils studied. The dry weight is considered most reliable. The tests should be made in not less than triplicates and statistical methods should be applied."

General notes on manures, their value and use, J. S. J. MCCALL (*Nyasaland Dept. Agr. [Pub.], 2 (1915), pp. 8*).—General information on the subject, including brief instructions as to the purchase of fertilizers, is given with particular reference to the tobacco-raising localities of Nyasaland.

Illustration of important properties of peat litter, G. KEPPELER (*Mitt. Ver. Förd. Moorkultur Deut Reiche, 33 (1915), No. 3, pp. 41–44, pls. 2*).—Comparative experiments on the properties of peat litter and straw with reference to their values when used in stable manure are reported.

It was found that 300 gm. of peat litter absorbed 4,500 gm. of water as against 800 gm. of water absorbed by 300 gm. of straw. Two gm. of peat litter absorbed approximately 1 liter of ammonia in the same time that 2 gm. of straw absorbed only 0.2 liter of ammonia. It was also found that pulverized straw molded much more quickly than pulverized peat with the same content of water and nutritive solution.

These results are taken to indicate that peat litter is much more valuable than straw for use in stable manure, inasmuch as its superior absorptive power for water and ammonia and its inhibitive action toward bacterial decomposition will prevent the loss of ammonia from animal excrement.

Investigations on the absorptive power of peat dust for water, H. MINSSEN (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 33 (1915), No. 3, pp. 44–52*).—Experiments with eight samples of four different kinds of peat are reported, the purpose of which was to determine their absorptive powers for water when pulverized to the following different degrees of fineness: Ten to 20 mm., 4 to 6 mm., 3 to 4 mm., 2 to 3 mm., 1 to 2 mm., 0.4 to 1 mm., 0.2 to 0.4 mm., 0.1 to 0.2 mm., and less than 0.1 mm.

From the results obtained, the peat dust made from pure kinds of peat having grains 0.2 to 2 mm. in diameter is considered to have on the average the greatest absorptive power for water.

Peat litter and nitrogen deficiency, W. BERSCH (*Ztschr. Moorkultur u. Torfverwert., 13 (1915), No. 1, pp. 33–38*).—Data from various sources are reviewed which, taken as a whole, indicate that peat litter, owing to its greater absorptive power, when used in the handling of animal excrement permits less loss of nitrogen by leaching and evaporation than straw litter and produces a stable manure much richer in available nitrogen.

The influence of lime nitrogen on the germination of barley and wheat, R. TRNKA and B. MYSIK (*Ztschr. Landw. Versuchsw. Österr., 18 (1915), No. 3, pp. 58–63*).—Experiments with a sandy loam soil well stocked with humus and plant food to determine the effect of additions of 200, 600, and 1,200 kg. per hectare (178, 534, and 1,068 lbs. per acre) of lime nitrogen on the germination of wheat and barley, when planted at the same time as and 4, 8, 13, 17, and 26 days after treatment with lime nitrogen, are reported.

The smallest addition of lime nitrogen retarded the germination of wheat and barley planted at the time of treatment. The retardation with wheat was, however, greater than with barley. The medium application of lime nitrogen retarded the germination of both wheat and barley planted at the same time as and 4 days after treatment, but the recovery of the barley was rapid while the wheat recovered more gradually. With the largest lime nitrogen addition the barley planted at the time of treatment and 4 days later was retarded strongly, and the effect was noticeable in barley planted 8 days later. The recovery was also very gradual. The germination of wheat planted at the time of treatment and 4 days later was almost completely inhibited, no germination taking place until after the seventh day in the second case. In wheat planted 8 days after treatment only slightly unfavorable effects were noticeable. The transformation of the lime nitrogen into urea, ammonia, and nitric acid occurred very rapidly.

The action of the nitrogen of a new molasses-sludge fertilizer, T. PFEIFFER and W. SIMMERMACHER (*Fühling's Landw. Ztg., 64 (1915), No. 7–8, pp. 177–187*).—The work of others on the fertilizing value of molasses sludge in different combinations is briefly reviewed, and pot experiments with oats and mustard on a sand soil mixed with loam, comparing ammonium sulphate and a so-called superphosphate molasses sludge fertilizer as sources of nitrogen, are reported. This fertilizer contained 1.87 per cent total nitrogen, 0.08 per cent ammonia nitrogen, 9.21 per cent water-soluble phosphoric acid, and 4.44 per cent potash. Sufficient superphosphate was added with the ammonium sulphate to place the ammonium sulphate pots on the same basis as the molasses sludge pots with reference to phosphoric acid.

Greater yields of oats were obtained with the ammonium sulphate than with the molasses-sludge fertilizer, but in both cases the increase in yield decreased as the nitrogen additions increased. This result is attributed in both cases to the presence of an excess of phosphoric acid, it being found that in pots receiving no nitrogen fertilization the yield of dry matter was greater with low than with high phosphoric acid fertilization.

After harvesting the oats, mustard was planted in the pots to determine the after effect of the two fertilizers. It was found that the molasses-sludge fertilizer had a better after effect than the ammonium sulphate. The increase in the combined yields of oats and mustard increased in amount as the nitrogen additions increased. It is thought, therefore, that at least in the case of the molasses fertilizer the excess of phosphoric acid favored the utilization of the nitrogen by the plants.

In consideration of these results and of those obtained by others it is concluded that the molasses-sludge fertilizer is from 53 to 74 per cent as effective as ammonium sulphate as a source of nitrogen for plants.

The production of phosphate rock in 1914, W. C. PHALEN (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1914, pt. 2, pp. 41–56*).—This report deals with the production, sale, and use of phosphate rock in different States, and with imports and exports of fertilizer materials during 1914.

The marketed production of phosphate rock in the United States in 1914 was 2,734,043 long tons, which represents a decrease of 12 per cent in quantity and 19 per cent in value compared with the production in 1913, and a decrease of 7 per cent in quantity and 17 per cent in value as compared with the average annual production of the 4-year period prior to 1914. The quantity of phosphate rock mined in 1914 was 2,649,174 long tons, or nearly 16 per cent less than that mined in 1913. In Florida the decrease amounted to nearly 19 per cent, in Tennessee 3 per cent, in South Carolina 1.4 per cent, and in the Western States 13 per cent.

There was reported to the Survey in 1914, 48,317 long tons of phosphate rock as having been sold in finely ground form for direct application to the soil. During 1914, 964,114 long tons of phosphate rock were exported from the United States, mainly from Florida, which represents a decrease of 402,394 long tons as compared with the export in 1913.

The phosphate industry in the Southern and Western States and in foreign countries is briefly discussed.

Potash production in California, T. H. NORTON (*U. S. Dept. Com., Com. Rpts., No. 137 (1915), pp. 1166–1169*).—This report states that attempts to develop a domestic potash industry are more advanced in California than in any other section. The most promising mineral source of potash is thought to be the saline deposits at Searles Lake in San Bernardino County. It is also stated that experiments have indicated the technical feasibility of extracting sulphate of potash from Utah alunite, but the utilization of the enormous masses of seaweed growing off the Pacific coast is considered to offer better chances of solving the potash problem. Data as to the supply, composition, harvesting, preparation, direct use, and extraction of the potash of kelp are given. The author is of the opinion that any extended successful development of the industrial extraction of potash salts from the kelp beds "would ultimately place this country in a position to cover not only the large domestic demand for these compounds, but to meet German competition in other lands, more especially in supplying the wants of countries on the Pacific."

The waste from sawmills as a source of potash, C. T. GIMINGHAM (*Jour. Bd. Agr. [London], 22 (1915), No. 2, pp. 146–148*).—Attention is drawn to the possibility of utilizing wood ashes and flue dust obtained from sawmill furnaces in place of kainit when potash manuring is contemplated by farmers and timber merchants in the neighborhood of sawmills. Analyses of wood ash and flue dust showed that the latter is the more valuable, sometimes containing as high as 10 per cent of potash and having about the same fertilizing value as kainit.

Cultivation of seaweed in Ireland, G. H. PETHYBRIDGE (*Dept. Agr. and Tech. Instr. Ireland Jour., 15 (1915), No. 3, pp. 546–549, pls. 5*).—It is pointed out in this article that the varieties of seaweed useful as potash manure all grow attached to rocks or stones, and consequently these weeds are absent from those portions of the coast where such rocks and stones are not present; that is, in sandy or muddy bays or estuaries. The process of so-called cultivation here described consists in providing suitable anchorage, generally large stones, between the tide marks in such localities, upon which the seaweed may be made to grow.

Experiments with a kieselguhr-sulphite fertilizer, L. KERN (*Papier Ztg., 40 (1915), No. 10, pp. 194–196; abs. in Chem. Abs., 9 (1915), No. 8, p. 1086*).—A mixture consisting of equal parts of waste sulphite liquor from chemical pulp mills and impure kieselguhr, containing appreciable amounts of soluble potash, phosphates of lime, and soluble silica, was found to be easy to distribute and to be of considerable fertilizing value.

Experiments with hay crops showed that the sulphurous acid of the waste liquor had passed into harmless compounds. An analysis of a sample of the mixture gave the following results: Loss on ignition, 36.74 per cent; nitrogen, 0.15; total sulphates, 4.04; silica soluble in hot hydrochloric acid, 0.099; silica soluble in caustic soda solution, 33.39; iron and alumina, 1.33; lime, 4.43; magnesia, 0.15; phosphoric acid, 0.99; and potash, 0.48 per cent. The value of this mixture as a fertilizer is attributed largely to its considerable content of soluble silica. The organic matter present in the mixture also appeared to be beneficial in soils deficient in humus and furnished a favorable medium for bacterial growth.

Agricultural lime analyses (*Md. Agr. Col. Quart., No. 68 (1915), pp. 11*).—Actual and guarantied chemical analyses of 133 samples of agricultural lime offered for sale in Maryland during the period from June, 1914, to May, 1915, and mechanical analyses of 16 samples of ground limestone and ground oyster shell are reported, together with a brief statement on the use of lime. The text of the Maryland lime-inspection law is also given. A warning is given against the purchase of so-called stone-meal fertilizer, which, it is stated, contains approximately only 20 per cent of calcium and magnesium oxids and no soluble potash or phosphoric acid.

Favorable action of manganese on the bacteria of leguminous plants, M. D. OLARU (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 8, pp. 280–283; abs. in Chem. Abs., 9 (1915), No. 11, p. 1525*).—Experiments on the effect of manganese on the nitrogen-fixing bacteria from the root nodules of leguminous plants are reported.

Manganese sulphate was added to a nutritive medium (containing 2 per cent sucrose), in which the bacteria were cultivated, in amounts varying from 1 part per 10,000,000 to 1 part per 100,000. After incubating at 19° C. for 48 hours, it was found that the maximum increase in nitrogen was obtained when the manganese was present in the strength of 1 part per 200,000 of nutritive medium. Two other experiments with a slightly weaker nutritive medium which contained less initial nitrogen, extending over 50 and 114 days, showed that the optimum quantity of manganese was 1 part per 50,000 of nutritive medium in each case. The nitrogen increases in the presence of manganese were in all cases considerably greater than in the controls.

From these results the use of manganese as a fertilizer is thought to be important from the standpoint of the bacterial fixation of nitrogen.

Mussels as manure (*Jour. Bd. Agr. [London], 22 (1915), No. 2, pp. 156, 157*).—From an inquiry made by the Board of Agriculture of England into the manurial value of mussels it was found that in some cases "mussels would have a certain manurial value. The whole mussel (shell and contents) would seem to contain from 0.7 to 1 per cent of nitrogen, 0.14 to 0.54 per cent of phosphate, and from 0.09 to 0.13 per cent of potash." The mussel shells consist almost wholly of carbonate of lime. To obtain the best results it is considered advisable to crush or grind the mussels and mix them with the soil.

Soot as manure (*Jour. Bd. Agr. [London], 21 (1915), No. 11, pp. 1043–1046; abs. in Mark Lane Express, 113 (1915), No. 4353, p. 261; Jour. Soc. Chem. Indus., 34 (1915), No. 7, p. 369; Chem. Abs., 9 (1915), No. 12, pp. 1651, 1652*).—The composition, fertilizing value, and use of soot on different crops are briefly discussed.

It is shown that soot is very variable in weight and composition. Domestic soot is usually the richest and may contain from 3 to 6 per cent of nitrogen. The lighter the soot the higher the percentage of nitrogen. The weight per bushel varies from 9 to 33 lbs., and a good soot should not weigh more than 28 lbs. per bushel. The average soot from dwelling houses was found to contain about 1 lb. of nitrogen per bushel. Soot is especially recommended for the top-dressing of wheat and other grain in early spring. It is usually applied at the rate of about 20 bu. per acre. It is most easily handled and gives the best results if mixed with loam and superphosphate and potash salts before application.

Analysis of the flue dust from iron works is reported showing phosphoric acid 0.96 per cent, potash 5.92, and lime 7.28. It is stated that there are large quantities of this material which might be profitably used as a fertilizer.

Analyses of fertilizers—fall season, 1914, B. W. Kilgore et al. (*Bul. N. C. Dept. Agr., 36 (1915), No. 4, pp. 92*).—Actual and guarantied analyses of 264 samples of fertilizers and fertilizing materials offered for sale in North Carolina during 1914 are reported which show that their composition is, as in previous years, in general about as guarantied. Brands of fertilizers registered for the season 1914–15 are also reported with their guaranties.

Commercial fertilizers, W. B. Cady (*Porto Rico Bd. Agr. Expt. Sta. Bul. 13 (1915), pp. 15; Spanish Ed., pp. 13*).—This bulletin contains actual and guarantied analyses of 91 samples of fertilizers and fertilizing materials for sale in Porto Rico in 1914 and of 13 samples of guano and 3 samples of wood ashes. Of the fertilizers analyzed 23 were found to be deficient in one or more constituents. The phosphoric acid content was equal to the guaranty in all but 4 samples and in many samples exceeded the guaranty. The guanos analyzed contained sufficient fertilizer material (0.3 to 8.40 per cent of nitrogen, 2.54 to 37.18 per cent of phosphoric acid, and from none to 3.7 per cent of potash) to be considered worth exploiting.

A short note on the purchasing of fertilizers and the text of the law regulating the registration and inspection of fertilizers and fertilizing materials are also given.

Analysis of fertilizers by the Virginia Department of Agriculture for 1915 (*Dept. Agr. and Immigr. Va. Bul. 100 (1915), pp. 13–25*).—Actual and guarantied analyses and valuations of 213 samples of commercial fertilizers and fertilizing materials offered for sale in Virginia in 1915 are reported. According to the actual analyses, of the total number of samples examined, about 8 fell below the guaranty in composition.

[Fertilizer analyses], H. J. Vipond (*Union So. Africa Dept. Agr. Rpt. 1913–14, pp. 230–233*).—Analyses of bat guano, commercial fertilizers received from manufacturers and farmers, kraal manure, and limes and limestones are reported. The quality from the agricultural standpoint of limestones available in Transvaal is discussed.

Statistics of the commercial fertilizer industry in Austria-Hungary, F. W. Dafert and R. Miklauz (*Ztschr. Landw. Versuchsw. Österr., 18 (1915), No. 1–2, pp. 1–10*).—Statistical data on the production, sale, use, exports, and imports of superphosphate, Thomas slag, sodium nitrate, ammonium sulphate, and potash salts in Austria-Hungary for the year 1907 to 1912, inclusive, are reported.

AGRICULTURAL BOTANY.

Studies on variation and selection, A. L. and Mrs. A. C. Hagedoorn (*Ztschr. Induktive Abstam. u. Vererbungslehre, 11 (1914), No. 3, pp. 145–183, figs. 4; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 4, p. 477*).—This is a survey of the progress that has been made in the Mendelian interpretation of variation and selection. The difficulties of the present terminology are pointed out and a plea is made for a more precise definition and use of terms. Some criticisms by zoologists are discussed in connection with facts previously cited by the authors (E. S. R., 31, p. 130), who claim that genes can not be modified by any selection.

Graphic representation of Mendelian inheritance, P. Wagner (*Jahresber. Ver. Angew. Bot., 11 (1913), No. 2, pp. 137–141, fig. 1*).—A device is described which is intended to present concretely to students of heredity and breeders the manner and practical results of the combination, in breeding practice, of one, two, or three pairs of characters as carried through several generations. Examples of the results obtained from its use are discussed.

Inheritance of the capacity for production, T. Roemer (*Fühling's Landw. Ztg., 63 (1914), No. 8, pp. 257–268; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, pp. 1010, 1011*).—Investigations cited are held to show that there is no essential difference as regards mode of inheritance between morphological and biological characters. But since biological characters are apparently the expression of a number of units, the investigation of the Mendelian inheritance of capacity for production is very difficult on account of the numerous slight variations arising in the second generation. Although (on account of the difficulty or impossibility of analyzing the hybrids according to their capacity for production) agricultural breeding work can not utilize Mendelian laws with as much certainty and fullness as can some branches of horticultural work, it is held that in the crossing of two races all the possible combinations of the unit characters borne by each will appear, that the further possibilities of crossing will become evident, and that the only true test of hereditary disposition and hence of breeding value in a strain is not its outward appearance but its actual progeny.

These points hold for all types of breeding, and the possibility of obtaining thereby forms more productive or otherwise more valuable than either parent is regarded as highly important. It obviates the necessity of using individuals having extreme development in greatly desired lines, perhaps combined with deficiency in less desirable ones, so that by the third generation the breeder may reach a definite result without any fear of valuable material having been unwittingly discarded.

Morphology as a factor in determining relationships, J. M. Greenman (*Amer. Jour. Bot., 2 (1915), No. 3, pp. 111–115*).—Discussing some investigations and views on morphology and relationship as recently published, the author calls attention to the necessity for cooperation by the larger botanical institutions throughout the world. This is held to be an essential condition for the numerous specialized and intensive studies necessary to development of the life histories of plants and other exact and detailed study of problems bearing upon the main phases of phylogeny and the chief lines of evolution of the higher plants.

The experimental study of genetic relationships, H. H. Bartlett (*Amer. Jour. Bot., 2 (1915), No. 3, pp. 132–155*).—The author holds that the immediate aims of the geneticist are (1) to observe the origin of new and distinct forms, the genetic relationship of which must, therefore, be known, (2) to determine the conditions which brought these forms about, so as to be able to produce them at will, and (3) to study their hereditary behavior and their morphological and chemical characteristics in order to provide a basis for sound deduction in regard to the genetic relationships of organisms. All of these aims are declared to have been realized in some measure as a result of the recent activity in the study of genetics. This view is upheld in a synthetic discussion of the work and opinions of various authors.

Subdivisions should extend as far as any one finds necessary, since the geneticist needs to have definite designations for much smaller groups than the ecologist or the morphologist is likely to be interested in. Manuals should supply the needs of either class.

The genetic relationship of parasites, F. D. KERN (*Amer. Jour. Bot.*, *2 (1915), No. 3, pp. 116–131*).—This discussion lays emphasis on parasites as an aid in determining specific and generic relationships in their hosts. This is illustrated with examples drawn from the author's previous study (E. S. R., 27, p. 424) on hosts as paralleling parasitic species of the genus Gymnosporangium.

Systematic relationships among the nodule bacteria of some legumes, R. KRÜGER (*Beiträge zur Artenfrage der Knöllchenbakterien einiger Leguminosen. Inaug. Diss., Univ. Leipsic, 1913, pp. 56; abs. in Ztschr. Bot., 6 (1914), No. 9, pp. 782, 783*).—The author has been able by cultivation, it is claimed, to separate *Bacillus radicicola* into four groups according to the legumes with which they are associated, namely, *Lupinus perennis*, *L. angustifolius*, *L. luteus*, and *Ornithopus sativus; Vicia sativa* and *Pisum arvense; Medicago lupulina*, *M. sativa*, *Melilotus albus*, and *Trigonella fœnumgræcum;* and *Lotus uliginosus*, *Anthyllis vulneraria*, and *Tetragonolobus purpurea*.

No relationship was noted between *V. sativa* and *V. faba* in this regard, and *Phaseolus vulgaris*, *Trifolium pratense*, *Onobrychis sativa*, and *Soja hispida* showed no relationship among themselves or with the others studied in this respect.

Problems in soil bacteriology, J. G. LIPMAN (*Abs. in Science, n. ser., 42 (1915), No. 1079, p. 316*).—Attention is called to the desirability of a further study of a number of problems in relation to soil bacteria, among them the location of species, their associative and antagonistic relations, their rôle in the formation of humus, and the effect of temperature, moisture, aeration, and other factors influencing their activity in the soil.

The effect of certain organic soil constituents on the fixation of nitrogen by Azotobacter, B. WILLIAMS (*Abs. in Science, n. ser., 42 (1915), No. 1079, pp. 320, 321*).—This paper gives the results of a study of the effect of various organic compounds, such as are likely to be found in soils, on the growth of Azotobacter.

The results indicate that the fixation of nitrogen by Azotobacter is only slightly influenced by the compounds investigated. Hydroquinon and salicylic aldehyde were the most toxic of any compounds studied, while esculin, quinic acid, and borneol gave marked stimulation to the growth of the organism. As a rule, the effects of the compounds on the micro-organism were not in accord with what has been reported of their action on higher plants. Concentrations which are fatal to certain higher plants only slightly depressed fixation. Such compounds as nicotin, picolin, guanidin, and skatol exhibited toxic properties similar to those usually ascribed to these substances, though caffein stimulated the growth of the organism. Many of the nitrogenous compounds used, which have been reported as beneficial to higher plants, had a markedly depressive effect on nitrogen fixation. In this respect the simpler compounds were more pronounced than were the more complex, and it is suggested that this condition is not one of toxicity, but that the nitrogen of the compounds was used in preference to that of the atmosphere. Urea, glycocoll, formamid, and allantoin were especially active in depressing fixation.

Selection of nitrogen compounds by Aspergillus, W. ZALESKI and D. PJUKOW (*Ber. Deut. Bot. Gesell., 32 (1914), No. 7, pp. 479–483*).—As a preliminary to a more general investigation regarding the selective power of mold fungi from among nitrogen compounds, the authors have studied the relative utilization by Aspergillus of nitrogenous material in case of ammonium and salts amino acids supplied in a nutritive solution containing also glucose and mineral salts.

It appears that in the presence of a good carbon source ammonia is a better nitrogen source for mold fungi than are amino acids individually, but it is thought that a suitable admixture of the latter may prove to be still better for this purpose.

Formation of albumin in yeast, W. ZALESKI and W. ISRAILSKY (*Ber. Deut. Bot. Gesell., 32 (1914), No. 7, pp. 472–479*).—The results of a preliminary study of yeast supplied with nitrogen sources in different combinations are claimed to support the view that yeast forms its nitrogenous material not from ammonia or from amino acids separately but from a certain admixture thereof.

Theories of fermentation, C. L. ALSBERG (*Abs. in Science, n. ser., 42 (1915), No. 1080, p. 359*).—According to the author, there are two types of theories of fermentation, one of which deals with the mechanism by which the substance fermented is converted into the end products of fermentation, while the other deals with the physiological rôle which fermentation plays in the life of the fermentation organism.

In the present paper it is suggested that fermentation is the expression of the metabolism of energy of a micro-organism. As an explanation of why a small mass of organisms converts a relatively large mass of material, the author calls attention to the energy requirements of the organisms, which possess a large surface area in comparison with their mass, and to the fact that there are excessive losses of heat due to radiation from the liquid medium in which the organisms live.

Albuminous crystalloids in potato leaves, HELENA HUBERT (*Österr. Bot. Ztschr., 64 (1914), No. 7, pp. 273–277*).—The author reports that the formation of albuminous crystalloids is plentiful in young leaves of potato plants grown from tubers in darkness and moisture, but much less so in plants grown in light and that the crystalloids diminish rapidly in etiolated plants after these are exposed to light. The crystalloids, which appear only in the leaves, are abundant in the intumescences on the leaf surfaces, also in the interior portions of the leaf, when grown under glass, but they disappear with the shrinking of the intumescences.

Anthocyanin in plants, V. GRAFE (*Umschau, 18 (1914), No. 32, pp. 643–646*).—This is a discussion of contributions by several authors mentioned regarding the presence, composition, and significance of anthocyanins in plant cells.

A study of chloroplasts, A. P. PONOMAREW (*Ber. Deut. Bot. Gesell., 32 (1914), No. 7, pp. 483–488*).—The author gives some details of a preliminary study of living chloroplasts as regards their structure, varying consistency, coagulation, vacuolation, chemical behavior, and evidences noted of colloidal characters.

A contribution to the physiological theory regarding chlorophyll, D. IWANOWSKI (*Ber. Deut. Bot. Gesell., 32 (1914), No. 7, pp. 433–447, fig. 1*).—Concluding a further study (E. S. R., 31, pp. 127, 128) of the relation between light absorption and the production of coloring materials in leaves, the author states that the absorption of blue light waves is related to the presence of the yellow pigment, which weakens greatly the violet rays which are energetically absorbed by the photosynthetic pigments. These facts explain the protective influence, previously noted, of the yellow pigments on the photosynthetically active coloring material.

The curve of absorption in clear sunlight shows a second maximum of assimilative energy in the violet region, but its height is lessened by the presence of the yellow pigment.

Green plants are thus fitted by the properties of their pigments to assimilate carbon in direct sunlight without suffering excessive injury to their chlorophyll. They employ a portion of the energy of the less effective red rays for this purpose, these being readily absorbed, while the violet rays are in part suppressed by the yellow pigment.

Substances separated by plants in arid regions of Argentina, C. SPEGAZZINI (*An. Soc. Cient. Argentina, 77* (*1914*), *No. 3–4, pp. 151–158*).—This is a discussion of plant efflorescences, exudations, and incrustations under arid conditions, as regards their production, properties, and probable significance.

Changes due to climate and soil in cultivated crops, J. BUKOVANSKY (*Wiener Landw. Ztg., 64* (*1914*), *No. 93, pp. 823, 824, figs. 2*).—It was found that severe losses in spring, despite promising early growth in case of clover from southern Europe as compared with that from more northerly regions, were correlated with the mode of growth of the smaller roots, which in the former variety radiated from a region near the surface, but in the latter branched mainly from the deeper portions of a strong tap root.

Phenological dates and meteorological data recorded by Thomas Mikesell between 1873 and 1912 at Wauseon, Ohio, J. W. SMITH (*Mo. Weather Rev., Sup. 2* (*1915*), *pp. 23–93, pl. 1, fig. 1*).—Phenological data are given of 16 different kinds of fruits, 20 varieties of field and garden crops, 48 species of forest trees, shrubs, and vines, and dates of blossoming of 114 different species of plants, for the period 1883–1912. In addition, tables are given showing the principal meteorological data and certain crop and fruit yields in the county where the observations were made. No attempt has been made to correlate the data regarding the weather conditions and the advance of vegetation, the object of the paper being to record this new series of observations for the use of students of the subject.

Studies in the physiology of germination, E. HEILPERN (*Österr. Bot. Ztschr., 64* (*1914*), *No. 7, pp. 286–293, figs. 2*).—In experiments with seeds of *Æthusa cynapium*, *Acer platanoides*, *Geranium pyrenaicum*, *Ranunculus acer*, *Œnothera biennis*, and *Silene acaulis*, all showing a rest period, it was found that no considerable influence was exerted on germination by exposure to snow, ice, water, or air at 0° C. regardless of the existence of a rest period.

As to duration, the rest period differed in different plants, appearing to be in some degree an individual property, but not to depend upon locality and date of harvesting in a given species.

Dimorphism as to fruit forms was shown by *Tragopogon dubius*, *T. orientalis*, and *T. porrifolius*, those of the first named showing also physiological dimorphism as regards germination.

The action of plant metabolism products on plants, I, II, W. SIGMUND (*Biochem. Ztschr., 62* (*1914*), *No. 5–6, pp. 299–386; abs. in Jour. Chem. Soc.* [*London*], *106* (*1914*), *No. 620, I, pp. 787–789*).—These two articles deal with the action of about 70 nitrogenous products on the germination of various seeds, the first part dealing with alkaloids and the second including glucosids, tannins, and their cleavage products. The percentage germinating after treatment and the rate of growth of roots and stems were investigated in each case as affected by the different substances and the results given in connection with each.

Light intensity and substratum as related to germination, A. OTTENWÄLDER (*Ztschr. Bot., 6 (1914), No. 10, pp. 785–848, figs. 8*).—Experimentation similar to that of Lehmann (E. S. R., 28, p. 327) is said to have shown that germination of seeds depends largely upon temperature, but both this requirement and that of light are found to differ, not only in general with species, but individually with age and parentage. The light requirement as regards intensity is closely related to temperature, the former increasing as the latter is lowered. The illumination period is related also to temperature, but more closely to light intensity. Seeds which are sensitive to light are also strongly influenced by weak acids.

The hypothesis of a catalytic influence of light is said to have received support from these observations.

A bibliography is appended.

The influence of light from the mercury vapor lamp on the germination and early growth of plants, W. CARL (*Beitr. Biol. Pflanz., 12 (1914), No. 3, pp. 435–437, pl. 1*).—The author states that ultraviolet rays were found to exercise an injurious influence on sprouting plants as regards both germination and subsequent development in the early stages. This is claimed not to be due to warmth or to ozone but to the chemical influence of the ultraviolet rays.

The influence of light on etiolated leaves, E. SCHÖNFELD (*Beitr. Biol. Pflanz., 12 (1914), No. 3, pp. 351–412, figs. 55*).—Reporting experiments with light influence on numerous plants, mostly of familiar species, the author states that individuals whose leaves had remained small in darkness usually renewed growth measurably with access of light, this response, however, being weaker in older leaves and in general stronger in the younger parts. Beyond a certain point no response was obtainable.

On account of the fact that recovery may be limited to certain portions, abnormal leaf forms may result, some of which are described. Recovery of color and renewal of growth are held to be separate phenomena, the former always preceding. The longitudinal growth of parallel veined etiolated leaves when brought into the light is checked, but these show a tendency toward attainment of normal breadth.

A bibliography is appended.

The influence of humidity and illumination on growth in length of seedlings, HELENE JACOBI (*Österr. Bot. Ztschr., 64 (1914), No. 3–4, pp. 94–101; abs. in Bot. Centbl., 126 (1914), No. 9, p. 212*).—Continuing previous work (E. S. R., 28, p. 227), the author has investigated the joint effects of moisture and light on plants.

It was found that in experiments carried out with bean seedlings in moist air where the product of light intensity by exposure period was a constant a larger value of the time factor was needed than heretofore to produce retardation of growth; that is, the presence of moisture decreased the effect of the intensity factor on the growth of the plant.

The influence of air movements on illumination of foliage, J. VON WIESNER (*Ber. Deut. Bot. Gesell., 32 (1914), No. 8, pp. 559–565*).—This is a discussion of the tendencies noted of leaves on certain plants to assume positions habitual or advantageous in direct or in diffused light or to return to such positions after being disturbed by wind of longer or shorter duration and of the loss of this tendency in aging leaves.

Effect of high frequency currents on plants, E. HOMBERGER (*Umschau, 18 (1914), No. 36, pp. 733–735, figs. 2; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, pp. 1430, 1431*).—The author carried out experiments with several common vegetables along the same general lines as those followed by Lemström, Lodge, and others (E. S. R., 20, p. 930; 21, p. 317), by employing alternating electrical currents of very high potential and rapidity of oscillation. It is claimed that the large increase in growth and in chlorophyll formation was due to the oscillating field and not to heat generated by the current.

The influence of chloroform on assimilation by chlorophyll, K. VON KÖRÖSY (*Hoppe-Seyler's Ztschr. Physiol. Chem., 93 (1914), No. 1–2, pp. 145–153, fig. 1*).—The author found in experiments with *Elodea canadensis* that a 0.074 per cent solution of chloroform lowered chlorophyll assimilation by this plant.

Internal factors regulating plant growth, R. DOSTÁL (*Biol. Listy, 1914, p. 205; abs. in Bot. Centbl., 125 (1914), No. 23, p. 585*).—This is a study of the developmental correlations observable within the plant itself.

The author found that parts of a stem of *Scrophularia nodosa*, bearing a few leaves, when cultivated separately developed from the basal portions root-like structures, from the middle portions leaves, and from the terminal portions flower buds. It is held that under normal conditions the leaves regulate development in their axillary buds and affect likewise that of neighboring portions of the stem. The leaves exert an influence upon floral development. The activity of the cotyledons also shows a correlation with the development of their axillary and higher buds. This is probably to be ascribed to the organic material given up by the cotyledon, as on its exhaustion (especially in carbohydrates) the correlation decreases or disappears.

Green leaves do not appear to regulate stem development, but they do appear to influence root development, as do also other organs as a rule.

Cell adjustment following decapitation and inversion of shoot, F. NEEFF (*Ztschr. Bot., 6 (1914), No. 6, pp. 465–547, pl. 1, figs. 32*).—This is a contribution to experimental anatomy of plants, being an account of studies, with bibliography, regarding the effect of decapitating or inverting a growing shoot on the laterals, as shown by the resulting position and arrangement of the cells, fibers, and tissues and the relations of the cambium thereto.

The rise of sap in trees, FARENHOLTZ (*Naturwissenschaften, 2 (1914), No. 24, pp. 594, 595; abs. in Bot. Centbl., 126 (1914), No. 21, p. 549*).—This is a discussion of the more important views offered up to this time regarding the causes of sap ascent in trees.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from January 1 to March 31, 1913 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 34 (1915), pp. 51, pls. 6*).—This inventory gives economic notes regarding about 400 plant introductions, the material being largely contributed by correspondents in various foreign countries who have sent the material either in response to requests or on their own initiative.

FIELD CROPS.

Management of irrigated land, F. KNORR (*Nebraska Sta. Bul. 152 (1915), pp. 5–24*).—This bulletin briefly discusses various phases of irrigation and gives results of the effect of fall irrigation on potatoes, corn, beets, barley, wheat, and oats for 1911, 1912, and 1913 at the Scottsbluff substation, in cooperation with the Bureau of Plant Industry of the U. S. Department of Agriculture.

The average gain in yield for each crop was, respectively, 2, 22, 15, 23, 19, and 15 per cent for the three years.

In a study to determine the best method of irrigating potatoes the following yields were obtained as averages for 1912, 1913, and 1914: Two hundred and ninety-six bu. per acre by irrigating every row and keeping the soil moist and the plants in a growing condition; 270 bu. per acre by beginning irrigation after the plants required water, then irrigating every row according to common farm practice; 239 bu. per acre by irrigating alternate rows at such times as the crop required water (at the first irrigation every other row was skipped, at the second irrigation the skipped rows were irrigated and the previously irrigated rows omitted, and so on throughout the season); 234 bu. per acre by irrigating every row but permitting the plants to suffer between irrigations; and 215 bu. per acre by irrigating every other row throughout the season. The rank in marketable tubers was 1, 2, 4, 3, and 5.

Data here presented that were collected by the U. S. Reclamation Service show that with barley, corn, oats, potatoes, rye, stock beets, sugar beets, and wheat, larger yields were obtained when the crops were grown on alfalfa stubble than when grown on land that had not been in alfalfa. In some cases the increase was over 100 per cent.

Sowing alfalfa in the spring with and without a nurse crop and in the grain stubble are noted as three successful methods that were tried. With the exception of the first crop it was found best to irrigate alfalfa after the hay was cut. The time of cutting alfalfa made no material difference as to the total yield obtained during the year, provided the irrigation was normal. Tests showed that three cuttings produced as much hay as four cuttings, provided the last cutting was made at the same time in both cases.

It was more profitable to plow under second or third alfalfa stubble than to plow under the whole crop in the production of sugar beets. In all instances of either spring or fall plowing of alfalfa stubble in various ways for sugar beets, the yield was not affected as long as the work was done well and the alfalfa crowns destroyed so as to prevent volunteer growth. Sugar beets planted in rows 18 and 20 in. apart were more successfully irrigated and in general produced more than rows spaced 24 and 28 in. apart.

County experiment farms in Ohio.—Annual reports for 1914, C. E. Thorne (*Ohio Sta. Bul. 286* (*1915*), *pp. 225–244, 246–291, figs. 8*).—This bulletin comprises reports for 1914 of the work of the experiment farms located in Miami, Paulding, Hamilton, Clermont, and Washington counties in continuation of that previously noted (E. S. R., 31, pp. 226, 430), with the exception of the Washington County experiment farm, the work of which is here reported for the first time. A brief outline of the work of these farms by C. W. Montgomery is included. The reports for the several farms give results of fertilizer and barnyard manure experiments with rotation crops including corn, oats, wheat, soy beans, clover, tobacco, and sugar beets, and of variety tests with corn, oats, wheat, and soy beans.

A general summary of the fertilizer work states that in every case, excepting at Paulding, acid phosphate has produced a marked increase of crop. "When the acid phosphate has been reinforced with muriate of potash there has been a further increase of crop in all the tests, excepting again that at Paulding, but the additional increase has not always been sufficient to cover the added cost of the fertilizer. At Wooster the increase in corn has abundantly justified the use of the potassium, while that of wheat has not. The residual increase in the clover and timothy, however, has been sufficient to justify the adding of the potassium salt, with a margin to spare, even when the cost of the potassium has been more than twice as great as that of the phosphorus. At Strongsville the increase due to the potassium salt has not in any case been sufficient to cover the additional cost of the fertilizer, the average total gain for the addition of 260 lbs. of muriate of potash in each rotation being but $1.39 over that produced by acid phosphate alone.

"Where the potassium salt has been added in the smaller quantities used in the other tests, the cost being 50 cts. per acre for each crop at Germantown, Carpenter, and Findlay, and $1.25 per acre for each crop at the county experiment farms, this additional cost has been returned in the increase with a liberal margin in every crop, but the wheat crops have not always been sufficiently increased to pay for the potassium without the help of the residual effect on the clover following the wheat. Taking the entire rotation, however, the present indications are that on all these county experiment farms the use of such a combination of phosphorus and potassium as has been employed in these tests will produce a greater net gain per acre than will the phosphorus alone.

"The addition of nitrogen in nitrate of soda has been justified at Wooster in the total results of the rotation, although the increase of corn has not recovered the additional cost of the fertilizer. The smaller quantity of the nitrate used at the district and county experiment farms has been paid for in the increase at Carpenter only, the apparent increase of wheat in rotation 2 at the Miami county farm being offset by the low yield of corn, indicating that soil variation has as yet had more to do with the effect than nitrogen in the fertilizer. The average results of the two years' work on the Clermont county farm justify the addition of nitrogen to the fertilizer, and it is highly probable that these results will be confirmed by longer tests, as the soil of that farm had been depleted by a still longer period of exhaustive husbandry than that which had brought the Wooster farm to its present condition."

The addition of acid phosphate to farmyard manure at the rate of 40 lbs. to the ton of manure has given increased yields.

[Field crops] work of the Belle Fourche reclamation project experiment farm in 1914, B. Aune (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1914, pp. 1–6, 8–14, 16, fig. 1*).—This reports the continuation of work previously noted (E. S. R., 32, p. 430), and gives data on climatic and crop conditions of the project in South Dakota, together with acreage, yields, and farm values of crops produced in 1914, an inventory of live stock, and notes on cooperative work. Yields of the rotation crops are given for 1914 and the average yields compared with those of 1912 and 1913. The average sugar content of beets for 1912, 1913, and 1914 was 14.8, 19.1, and 22.1 per cent, respectively.

Data show a decided increase in yields of all crops in 1914 over the preceding seasons, except with potatoes.

"Beets after oats (manured) have given a higher average yield for the three years than beets after oats without manure. The difference, though, in favor of manured oats was not large until 1914, when the average of the plats after the manured oats was 1.3 tons higher than the average of the plats after oats without manure. Corn after beets has shown a decided effect of the preceding crop. In the seasons of 1913 and 1914 corn after beets had an unhealthy appearance during the early part of the summer and the yields obtained were comparatively low. Potatoes after manured beets have shown an increase in yield over potatoes after beets without manure, while potatoes after manured oats have not yielded any higher than potatoes after oats without manure. Spring wheat after alfalfa has produced high yields all three years."

In testing 14 different rates varying from 2.5 to 25 lbs. of seed per acre, the best yields of alfalfa generally were obtained on the plats where a light rate of seeding was used. From 4.5 to 6 lbs. per acre seemed satisfactory.

Early spring seeding of alfalfa was more satisfactory than late spring seeding, and better results were obtained with a nurse crop than without one. A decided advantage is noted in seeding alfalfa in late summer in grain stubble.

The net return in 1914 from a 12-acre alfalfa field on gumbo soil, from which the second cutting was made a seed crop, was $37.70 per acre. Experiments in fall irrigation of alfalfa showed a slight difference in favor of the plats not fall irrigated. "As long as the fall irrigation has no detrimental effect on the alfalfa, it appears desirable to irrigate in a dry fall, in order to start the alfalfa early in the spring."

Variety tests with corn gave yields ranging from 31.5 to 45.4 bu. per acre. Experiments in spacing corn in rows 42 in. apart show that 14 and 17 in. in the row gave more satisfactory results than 7, 10, or 21 in.

The work of the San Antonio experiment farm in 1914, S. H. Hastings (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1914, pp. 16, figs. 6*).—This reports work in continuation of that previously noted (E. S. R., 32, p. 332), and aside from giving data on the climatic conditions for the year at San Antonio, Tex., data are included on rotation experiments, experiments with cotton, milo maize, Canada field peas, Sudan grass, corn, and cowpeas, and experiments in pasturing oats, and brief notes on horticultural work.

The value of rotation is shown in the higher yields of crops in 2-year rotations rather than with the same crops grown continuously, except in instances where cotton followed sorghum.

"The effect of manure on crop yields at San Antonio under the conditions during the years 1910 to 1914 have not been consistently significant. The yields of cotton, corn, and milo maize have generally been slightly increased by manuring. The increases, however, have not been sufficient as yet to justify the expense of the treatment. Manure has caused a slight decrease in the yield of oats following manured cotton."

As a result of testing the single-stalk method of growing cotton (E. S. R., 32, p. 434), it is stated that "in all cases the close-spaced rows gave higher yields than adjoining rows in which the plants were wide spaced, the range of increase being from 88 to 125 per cent in favor of the close-spaced rows. Results with cotton thinned 25, 41, and 51 days after planting were somewhat inconclusive. Planting cotton in rows 4 ft. apart resulted in larger yields than spacing rows 3, 5, or 6 ft. apart.

Results of experiments with Canada field peas, including a test of 70 varieties, have shown this crop to be valuable as a green-manure crop and for hay.

It is noted that "oats can be pastured up to January without seriously injuring the hay crop. It is advisable, therefore, to plant early in the fall, at least as early as the first of October. Pasturing the oats severely in the winter and early spring has a very marked effect in reducing the yields of hay or grain, but this in turn may be offset by returns from the pasture."

Division of field husbandry.—Summary of results, 1914, W. L. Graham et al. (*Canada Expt. Farms Bul. 83 (1915), pp. 55*).—This bulletin is a general summary of continued work previously noted (E. S. R., 32, p. 530), giving data as to yields, cost of production, rotation of crops, and the results of different cultural methods obtained on the various experiment farms of Canada. The crops used in these experiments were mangels, turnips, corn, hay, wheat, oats, barley, potatoes, buckwheat, timothy hay, peas, alfalfa, flax, and clover. The cost of production on the various farms is given as follows: Barley $12.78

per acre, 23.7 cts. per bushel; potatoes $49.25 per acre, 21 cts. per bushel; wheat $13.78 per acre, 43.7 cts. per bushel; hay from $11.90 to $13.25 per acre and from $5.70 to $5.86 per ton; corn silage from $21.97 to $30.75 per acre and from $1.91 to $5.36 per ton; turnips from $28.98 to $45.56 per acre, from $1.86 to $2.50 per ton, from 5.4 to 8.73 cts. per bushel; oats from $15.90 to $18.30 per acre and from 24.7 to 33 cts. per bushel.

Fertilizer tests at the central farm in a rotation of mangels, oats, clover hay, and timothy have shown a distinct advantage of barnyard manure alone over commercial fertilizer on this soil, but point to the possibility of combining the two to good advantage if the manure is scarce or high in price. Fertilizer tests with oats, potatoes, and turnips, and variety tests with oats, turnips, sugar beets, and carrots, are also reported.

Report of the Bavarian Cereal Breeding Station in Weihenstephan, 1912–13, L. KIESSLING (*Landw. Jahrb. Bayern, 4 (1914), No. 6, pp. 576–633*).—This summarizes work in breeding and variety testing of cereals for 1912 and 1913.

Results of variety tests of wheat, oats, and rye, G. M. GARREN (*North Carolina Sta. Bul. 232 (1915), pp. 3–28*).—The results given in this bulletin include tests made at the Buncombe, Iredell, Blantyre, and central station farms, covering periods ranging from 1 to 10 years and presented in tabular form. It is noted that with wheat practically all of the evidence of these experiments is in favor of the smooth varieties outyielding the bearded, and that home-grown seed also outyielded that imported from outside the immediate vicinity.

"Abruzzi rye has been found to far excel the common rye in yield of both grain and straw. It is also ten days to two weeks earlier. It is especially recommended for those who wish to sow rye for late fall or early spring pasture, or for winter cover crop.

"There has been found, upon the whole, about 50 per cent difference between October sown and December sown wheat on the Iredell test farm. In every instance there is a progressive decrease in yield from the sowing on October 10 to that on December 21. This is based on two years' tests and the results will doubtless not be changed by future experiments. Wheat in the vicinity of the Iredell test farm should be sown as early in October as danger from the Hessian fly will permit."

Storing the grain crop, J. F. HOFFMANN (*Landw. Hefte, No. 28 (1915), pp. 40, figs. 10*).—A treatise on methods for the artificial drying of grains, with illustrations of various types of dryers.

Zellers' hay and coal table (*Hooper, Nebr.: The Zellers Publishing Co., 1915, pp. 51*).—This is a table giving the values of pounds and tons up to two tons with prices ranging from $2 to $14.25 per ton.

Stacks, E. RABATÉ (*Vie Agr. et Rurale, 5 (1915), No. 13, pp. 229–234, figs. 6*).—This article gives the results of a study of the site, form, dimensions, construction, cover, and cubature of stacks. Mathematical formulas and diagrams are used to calculate scientifically the true proportions and cubature of different forms of stacks of hay and cereals.

Selection of yellow alfalfa at the Krasnokutsk Experimental Station, P. N. KONSTANTINOV (*Selsk. Khoz. i Lîesov., 246 (1914), Oct., pp. 173–191*).—This gives the results of selection and hybridization work with *Medicago falcata* in an effort to secure a plant sufficiently hardy to withstand the soil and climatic conditions of southeastern European Russia and sufficiently prolific to become a valuable forage crop.

The composition of yellow alfalfa at various stages of development was found to be as follows:

Composition of yellow alfalfa at various stages of growth.

Stage of growth.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Beginning of bloom	16.42	5.19	36.00	34.62	7.77
Blooming	14.70	3.97	36.89	37.64	6.80
Ripening of seeds	13.03	3.11	37.11	39.97	6.78
Dying	7.65	2.42	35.76	49.52	4.65

Consideration of the parents and the hybrids showed that an upright growth was made by *M. sativa* and a rather trailing growth by the yellow alfalfa, while the hybrids were intermediate in this character; the hybrids were also intermediate between the parents in thickness of growth and height. The yellow alfalfa bloomed most uniformly. In the coloring and the width of the leaves and the drooping attitude of the leaves, the hybrid plants ranged between the parents. In abundance of foliage the hybrids approached the yellow alfalfa, while in shape and coloring of the seed the hybrid ranged between the parents.

A special type of cage for the isolation of the flower stalk of mother beets, O. Munerati (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat. 5. ser., 23 (1914), II, No. 12, pp. 616–620, figs. 3*).—This describes a cage consisting of a square-framed top covered with wire netting to which is attached a muslin curtain that surrounds the stalk and is secured around it at its base. The whole is supported by two sticks driven into the ground on opposite sides of the plant. It is noted that this type of cage effectively prevents cross-pollination, yet admits air and light and allows of easy access to the flower stalk for hand-pollination or examination.

Red clover seed production: Pollination studies, J. M. Westgate and H. S. Coe (*U. S. Dept. Agr. Bul. 289 (1915), pp. 31, figs. 7*).—This bulletin briefly reviews the work of previous investigators and describes the structure, development, and fertilization of red clover flowers as well as the experimental methods employed by the authors in securing cross-pollination and self-pollination at Ames, Iowa (in collaboration with H. D. Hughes, L. H. Pammell, and J. N. Martin), Lafayette, Ind. (in collaboration with A. T. Wiancko and F. E. Robbins), and Arlington, Va.

In regard to potency of pollen in self-pollination it is noted that "an examination of 30 flowers which had been self-pollinated for 55 hours showed good germination on the stigmas, but no fertilization. The number of pollen grains germinating on the stigmas ranged from 3 to 25 in each of the 30 flowers. The tubes had made a slow growth and none exceeded 4 mm. in length. An examination of 20 flowers which had been self-pollinated for 90 hours showed that one pollen tube had attained a length of 7.5 mm., while the others were 5 mm. or less in length. At this rate of growth the longest tube would have required about 48 hours more to reach the ovules, or about six days to traverse the entire distance from stigma to ovule. Flowers examined four days after springing the carinas showed the eggs in a disintegrated condition. It is therefore probable that in case of self-pollination the pollen tubes do not reach the ovules in time to effect fertilization. An examination of the 30 flowers which had been cross-pollinated for 55 hours showed that fertilization had taken place in all of them."

The use of the thumb and finger or of a toothpick or toothbrush in artificial manipulation of the flower resulted in practically no seed in covered heads and in a reduced number in exposed heads as compared with those not covered and not manipulated.

As results of covering untreated heads of clover with tarlatan it is noted that "since no more seed was produced by these heads than may be accounted for by insects working on the flowers when they were occasionally exposed for a short time on account of rains or grasshoppers, we may say that clover flowers must be pollinated by some agency before any seed is produced."

Clover heads covered before any flowers opened and kept covered, except while being artificially self-pollinated, until mature produced an average of 0.16 seed per head in 1911 and 0.09 in 1912. One hundred and twenty-five heads were worked in the first instance and 170 in the second. Not a single seed was produced in flowers pollinated with pollen from another head on the same primary branch, and only one seed was produced in using pollen from a head on a different primary branch of the same plant when 200 flowers were used on 10 heads. Fourteen and three-tenths seeds per head were produced in 13 heads, in which 20 flowers each were pollinated from a separate plant. "The results obtained in the last three experiments, as well as with all preceding ones, show that clover is practically self-sterile and that pollen must come from a separate plant in order to effect fertilization."

"The bumblebee is an efficient cross-pollinator of red clover. Bumblebees are able to pollinate from 30 to 35 flowers a minute. The honeybee proved to be as efficient a cross-pollinator of red clover as the bumblebee in 1911. When the precipitation was considerably below normal in June, July, and August, 1911, and but few nectar-producing plants were to be found, honeybees collected large quantities of pollen from red clover. In order to collect pollen they must spring the keels of the flowers. In doing this they cross-pollinate the flowers.

"A clover cross-pollinizing machine which was offered for sale on the market did not prove to be an efficient cross-pollinator of red clover. The various types of hand-operated brushes which were used did not prove efficient as cross-pollinators of red clover. In nearly all cases where these brushes were used the seed yield was decreased instead of increased. This was undoubtedly due to the bristles of the brushes injuring the flowers, since the average seed yield of the plats which received these treatments with the brushes was lower than that of the plats which received but one treatment."

A bibliography of nearly 50 titles is appended.

Custom ginning as a factor in cotton-seed deterioration, D. A. Saunders and P. V. Cardon (*U. S. Dept. Agr. Bul. 288 (1915), pp. 8, figs. 5*).—This bulletin gives the results of a test at Greenville, Tex., to determine the amount of mixing of cotton seed that may occur at the gin. The amounts of red seeds that appeared in samples of seeds taken at 5, 10, 15, 20, 25, and 30 minutes after the starting of the gin, in which the seed roll in the roll box had been stained red, were 52 per cent, 17.1, 7.4, 2.8, 0.5, and 0.1, respectively.

"It has been shown that no less than 14 to 16 per cent, and probably much more, of the seed delivered to a patron at custom gins as ordinarily operated is seed of the variety ginned just previous to the arrival of his cotton. The results indicate also that some seeds from the second bale preceding are likely to appear in the seed delivered to the patron. This means that if different varieties are being ginned consecutively a patron will receive in the seed delivered to him at the gin an admixture of at least three varieties. It is apparent that if such seed is planted opportunity is afforded for a vast amount of cross-fertilization in the field, and deterioration begins."

It is noted that mixing may also occur to a small extent in the flues and in the distributing, cleaning, and feeding devices.

As ways of minimizing the amount of mixing it is suggested that the patron cooperate with the ginner. The flues, feeders, and cleaners should be made as clean as possible and the roll in the roll box should be dropped before ginning to secure seed for seeding purposes.

A study of inheritance in the cotton hybrid, Sea Island and native St. Croix, S. C. HARLAND (*Rpt. Agr. Expt. Sta. St. Croix, 1913–14, pp. 50–60, pl. 1*).—This article gives detailed descriptions of a native St. Croix and a Sea Island "chance" variety of cotton and the F_1 and F_2 generation hybrids resulting from a cross between these two varieties. The characters described include bracts, boll characters, calyx, and lint characters.

Experiments with cotton in Sicily in 1914, A. BORZÌ (*Bol. R. Giard. Colon. Palermo, 2 (1915), No. 2, pp. 67–84*).—Tests of 11 varieties showed a range of from 32 to 35 per cent in yield of lint. In fertilizer tests with 600 kg. of superphosphate per hectare there was produced 1,447 kg. of seed cotton, which was a larger yield than with other fertilizers, including sulphate of potash, cyanamid, and barnyard manure. Descriptions of the most promising varieties are given.

Variation in the male hop, Humulus lupulus, H. WORMALD (*Jour. Agr. Sci. [England], 7 (1915), No. 2, pp. 175–196, pl. 1*).—This gives results of examinations of male hop plants of both English and Oregon origin.

The hops were found to vary in time of flowering and in characteristics of the bine, leaves, laterals (inflorescences), stipules, and flowers. The following type characters were discovered: (1) Time of flowering—early, medium, and late; (2) color of bine—green and red; (3) length of laterals—long and lax, short and dense; and (4) glands on the leaves—numerous and few.

Classification of broom millets, M. G. SIRÏUSOV (*Selsk. Khoz. i Lîesov., 246 (1914), Dec., pp. 556–573, figs. 4*).—The author arranges about 40 varieties of broom millet into three groups, viz, *Miliaceum effusum, M. contractum* or *M. nutans*, and *M. compactum*, based upon the color of the grain. It is noted that a flower required about 27 minutes to open, the greatest activity taking place between 11 a. m. and noon.

Observations on potato culture, V. G. KOTELNIKOV (*Selsk. Khoz. i Lîesov., 246 (1914), Oct., pp. 221–232*).—It is noted that large tubers used as seed produced larger yields, but that the net profit was not so great as when smaller tubers, averaging about 2 oz. each, were planted. Experiments showed that the vegetative energy of smaller tubers was greater by 7 to 11 per cent and that a thicker planting of two small tubers in the same hill gave 30 per cent more yield than larger ones planted more thinly.

Prairie grass, W. S. HILL (*Jour. Agr. [New Zeal.], 10 (1915), No. 4, pp. 313–318, figs. 4*).—This notes the improvement by selection of *Bromus unioloides* at the Moumahaki Experimental Farm. The yield has been increased from 100 to 183, or nearly doubled.

The culture of rice in California, C. E. CHAMBLISS and E. L. ADAMS (*U. S. Dept. Agr., Farmers' Bul. 688 (1915), pp. 20, figs. 7*).—This contains recommendations based upon the results obtained at the Biggs Rice Field Station and a study of the conditions under which rice has been grown in California. It covers preparation of the seed bed and of the seed, manner of seeding, irrigation and drainage, methods of harvesting and thrashing, cost of production, varieties (including variety tests), methods of improvement of the crop, notes on rice products, and eradication of weeds.

Rye grass culture, H. MAYER GMELIN (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch.* [*Wageningen*], *8* (*1915*), *No. 4, pp. 161–195*).—Results are given of cooperative experiments with several farmers to demonstrate the relative values of ordinary English rye grass, Improved English rye grass, and Italian rye grass. The average yields of hay for 1914 were, respectively, 295.25 kg. (3 cuttings), 318.25 kg. (3 cuttings), and 365.8 kg. (2 cuttings) per 100 square meters (119.6 sq. yds.).

Uses of sorghum grain, C. R. BALL and B. E. ROTHGEB (*U. S. Dept. Agr., Farmers' Bul. 686* (*1915*), *pp. 16, figs. 12*).—This discusses the uses of sorghum grain as a feedstuff and as a food, with data as to the digestibility, preparation, and storage of the grain.

Statistical data also show the value and acreage of grain sorghums in parts of Kansas and Oklahoma in comparison with the corn crop.

Chemical analyses of air-dry samples of various grain-sorghum varieties grown at the Amarillo Cereal Field Station, Amarillo, Tex., from 1908 to 1912, inclusive, are reported and summarized below:

Composition of various grain sorghums.

Kind of sorghum.	Number of analyses.	Water.	Protein (N×6.25).	Fat.	Carbohydrates.	Fiber.	Ash.	Weight.	
								1,000 kernels.	Bushel.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Grams.*	*Lbs.*
Milo maize	67	9.32	12.54	3.15	71.89	1.48	1.62	36.1	58.1
Dwarf milo maize	55	9.38	12.16	3.27	72.09	1.47	1.63	31.4	58.2
Average of milo maize	122	9.35	12.37	3.21	71.97	1.48	1.62	34.0	58.1
Feterita	8	9.58	14.00	2.90	70.32	1.48	1.72	32.2	55.9
Blackhull kafir corn	78	9.58	14.10	3.47	69.49	1.58	1.78	21.6	58.0
Dwarf blackhull kafir corn	13	9.95	13.09	3.25	70.49	1.52	1.70	16.6	58.7
Red kafir	37	9.56	12.01	3.16	72.03	1.51	1.73	18.5	58.3
Average of kafir corn	128	9.61	13.39	3.35	70.33	1.55	1.76	20.1	58.2
Shallu	10	10.38	15.17	3.69	66.86	1.92	1.98	15.1	57.9
Grand average of all varieties	268	9.52	13.01	3.29	70.95	1.53	1.70	26.6	58.1

Studies in Indian sugar canes.—I, Punjab canes, C. A. BARBER (*Mem. Dept. Agr. India, Bot. Ser., 7* (*1915*), *No. 1, pp. 112, pls. 19, fig. 1*).—The classes of cane found in the Punjab are given. The morphological characters used in the description of the classes of cane are cane measurements, color of cane, and characters of the joint, bud, leafy shoot, leaf sheath, and lamina.

Morphological study of variation in wheats with special reference to spike form, L. DETZEL (*Landw. Jahrb. Bayern, 4* (*1914*), *No. 10, pp. 839–902, pls. 27, figs. 5*).—This gives data secured by measurements of the length, thickness, and weight of internodes of stems of wheat plants, and discusses the tillering and the relation of parts of the plants to the structure of the spike. An apparatus for measuring the internodes of the spike is described, also ten types of spikes on the basis of the structure and form of the spike. "A close relationship exists between the general morphological structure of the plant and the minor forms of the plant parts, which relationship can be slightly modified by certain influences."

Inheritance of awn color in wheats, L. KIESSLING ET AL. (*Landw. Jahrb. Bayern, 4 (1914), No. 2, pp. 102–170*).—This work reviews previous investigations along this line and gives the results of studying the inheritance of the white, yellow, light brown, and brown colors in the awns of wheats hybridized primarily for other purposes, since 1908. These colors or the factors producing them seem to have followed the theoretical ratios very closely, i. e., 1:3, 1:3:3:9 and 1:3(×3):9(×3):27.

Report of the division of agronomy and botany for 1915, J. L. BURGESS (*Bul. N. C. Dept. Agr., 36 (1915), No. 9, pp. 4–82*).—Results are given of the examination and testing of 1,011 samples of farm seeds and 445 samples of vegetable seeds during 1915 according to the North Carolina Pure Seed Act.

A device for sampling grain, seeds, and other material, E. G. BOERNER (*U. S. Dept. Agr. Bul. 287 (1915), pp. 4, figs. 6*).—This bulletin gives a description of the mechanical structure and method of operation of a device "developed primarily to meet the demands of grain and seed dealers and laboratory workers for securing a reliable sample of grain or seed from a larger portion of the material to be examined, graded, or analyzed. It can also be used for sampling flour, meal, feeds, coal, ore, or any other material of like kind for examination or analysis and to mix or blend and divide two or more streams of unlike material of the kind specified, so that the two resulting streams will be a thorough mixture of the original two or more kinds of material. Another application of the device which should be of special interest to the grain trade is that a sample can be divided so that one-half can be used for testing and grading and the duplicate half either turned over to the seller or to the buyer of the grain or retained for future reference."

The operation of the device does not require power of any kind, gravity being all that is necessary to make the material pass through it.

Eradication of ferns from pasture lands in the eastern United States, H. R. COX (*U. S. Dept. Agr., Farmers' Bul. 687 (1915), pp. 12, figs. 8*).—This gives results of experiments conducted in southern New York to eradicate the hay-scented fern (*Dennstædtia punctilobula*). It was found that cutting off the tops close to the surface of the ground twice a year for two years would kill out nearly all of the ferns.

Experiments were made in 1912 and 1913 to test the efficacy of spraying as compared with cutting and to learn the best method of obtaining a stand of grass and clover on the fern-infested areas. The spray materials used were solutions of salt, arsenite of soda, and iron sulphate. These materials were used in quantities of equal value. The results of these tests showed the following facts:

"Salt is the best spray material of the three. With ferns at an average degree of thickness on the land, 150 lbs. of salt dissolved in 60 gal. or more of water to the acre for each application are sufficient. Two sprayings a year are about as effective as four, and are to be recommended. Cutting is somewhat cheaper than spraying. Furthermore, the cutting does not interfere with young clover and grass coming in on the infested patches after the first treatment. This method, therefore, is to be recommended in preference to spraying in most situations. In some places the land is so stony as to interfere with cutting, in which case spraying may be the best method. It was found that scattering seed on the patches where ferns had grown was the most important means of getting a stand of grass and clover, and that liming and fertilizing in addition to the seeding were of considerable benefit."

It is noted that similar methods would probably be equally effective in eradicating the brake (*Pteris aquilina*).

HORTICULTURE.

[Report on horticultural investigations], B. Aune (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1914, pp. 14, 15*).—A variety list is given of orchard and small fruits and ornamental trees and shrubs planted on the Belle Fourche Experiment Farm in 1914, together with a brief note on the condition of trees and shrubs previously planted.

Onions, R. W. Jordan (*St. Paul, Minn.: Webb Publishing Co., 1915, pp. 95, figs. 41*).—A practical treatise on onion culture which discusses the onion with reference to its history, botany, importance, climatic and soil requirements, varieties, importance of good seed, fertilizers preparation of seed bed and seed planting, different types of onion growing, care and management of the crop, harvesting storing marketing yield and cost of growing and onion pests.

Onion cultivation, F. Watts (*Imp. Dept. Agr. West Indies Pamphlet 78 (1915), pp. 30*).—A concise treatise on the growing, harvesting, and marketing of onions.

Some tests of tomatoes, L. B. Uichanco (*Philippine Agr. and Forester, 4 (1915), No. 3, pp. 59–68, 70–80*).—An account is given of tomato growing in the Philippine Islands, including a discussion of insect pests and diseases, and data on variety, pruning, training, fertilizer, irrigation, and transplanting tests.

A bibliography on tomatoes and tomato culture is appended.

Rail shipments and distribution of fresh tomatoes, 1914, W. A. Sherman, P. Froehlich, and H. F. Walker (*U. S. Dept. Agr. Bul. 290 (1915), pp. 12, pl. 1, fig. 1*).—In this bulletin an effort has been made to list largely by railroad stations the actual shipments of tomatoes for table use in 1914, the returns being incomplete in some cases owing to the failure to receive reports from certain shipping agents. In addition to tabular data for the various States, the data are also presented in the form of a map and charts, all of the areas shipping at a given period being grouped in a zone and thus showing the various competing areas as well as the dates of heaviest crop movement.

The total reported shipments of table stock for 1914 was 11,995 carloads, nearly one-half of the entire crop being shipped from the State of Florida. The States next in importance are Mississippi, New Jersey, and Texas, each shipping from 1,100 to 1,500 cars. It has been estimated that a somewhat greater number of tomatoes is grown for canneries, catsup factories, etc., than for table use.

Pruning (*Oregon Sta. Bul. 130 (1915), pp. 72, figs. 58*).—This bulletin is comprised of five separate articles, as follows: Plant Physiology as Related to Pruning, by W. M. Atwood (pp. 4–11), in which the author calls attention to the various conditions which surround the tree and which are often sufficiently effective to modify or do away entirely with the beneficial effects of thorough pruning practiced without regard to the other conditions; The Study of Fruit Buds, by E. J. Kraus (pp. 12–21), in which a discussion is given of the nature of fruit-bud development and location of buds on different classes of orchard trees, and a table is included showing the relation of position of bloom to bearing in the commoner varieties of Oregon apples and pears; Pruning Young Trees, by C. I. Lewis (pp. 22–47), in which consideration is given to the principles of pruning and their application to young nonbearing and bearing trees of various orchard fruits; and Pruning the Bearing Apple and Pear Tree (pp. 48–60) and Pruning the Bearing Prune Tree (pp. 61–72), both by V. R. Gardner.

A complete work on the pruning of fruit trees, J. F. MOODY (*Perth, Western Australia: Govt., 1912, pp. 135, figs. 175*).—A treatise on the pruning of all kinds of fruits and nuts grown in Western Australia.

New dosage tables, C. W. WOODWORTH (*California Sta. Bul. 257 (1915), pp. 3–16, figs. 3*).—A new principle applicable to the construction of dosage tables was discovered while making a careful comparison of the rate of charge in the dose necessary to compensate for the differences in leakage. The principle is that an arithmetical series of leakages is related to a geometrical series of dosages and both correspond to the same complex series of sizes of tents.

This bulletin discusses the application of the above principle to the construction of dosage tables and points out the errors in the tables commonly used. A set of tables based on the new principle is given and discussed.

The fruits of Germany (*Deutschland's Obstsorten, 7 (1911), I, Nos. 19, pls. 8, figs. 4; 20, pls. 8, figs. 5; 21, pls. 8, figs. 5; II, Nos. 22, pls. 4, figs. 3; 23, pls. 4, fig. 1; 24, pls. 8, figs. 4; 8 (1912), I, Nos. 25, pls. 8, figs. 4; 26, pls. 8, figs. 4; 27, pls. 8, figs. 3; II, Nos. 28, pls. 12, figs. 6; 29, pls. 12, figs. 4; 30, pls. 12, figs. 5; (1913), I, Nos. 31, pls. 8, figs. 5; 32, pls. 8, figs. 6; 33, pls. 8, figs. 6; 12 [1913], Nos. 34–36, pls. 36, figs. 14; with descriptive text*).—A continuation of serial accounts of German fruits started in 1905 and consisting of sets of three parts with descriptions of four varieties of fruit in each part (E. S. R., 24, p. 641). The annual sets of the years noted continue descriptions of pear and apple varieties and also describe a number of currants, gooseberries, and cherries. The descriptions and illustrations follow the arrangement in the sets previously noted.

Recent progress in fruit production in Hungary, D. ANGYAL and J. GYÖRY (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 5, pp. 652–657*).—A short account of the fruit industry in Hungary with reference to climatic conditions, distribution of the chief species of fruit trees, native and foreign varieties, area of orchard lands and estimated yields, research work and education, state encouragement of the fruit industry, and associations.

Fruit packing and the marketing and exporting of fruit, J. F. MOODY and J. RAMAGE (*West. Aust. Dept. Agr. Bul. 46 (1915), pp. 77, figs. 108*).—A treatise on the packing and marketing of citrus and deciduous fruits with special reference to the preparation of fruit for the export trade.

The pollination of the pomaceous fruits.—II, Fruit bud development of the apple, F. C. BRADFORD (*Oregon Sta. Bul. 129 (1915), pp. 10, pls. 6*).—This is the second of a series of studies of the pollination of pomaceous fruit (E. S. R., 29, p. 541).

In the present bulletin the author describes and illustrates with a series of plates the development of fruit buds of the Yellow Newtown apple. Buds were gathered throughout the work in six separate classes as follows: Axillary buds on the newest wood; terminal buds on the newest wood; buds from young spurs on second-year wood which had not borne fruit but seemed likely to bear in the following year; buds from spurs which were bearing in the current year; buds from spurs which had borne previously but had not blossomed in the current season, in other words, were "resting a year;" and buds from spurs which had blossomed but which had not set fruit, or having set fruit, had lost it early through dropping or thinning. Consideration is given to fruit bud differentiation in these various classes. A bibliography of literature cited is appended.

The earliest differentiation in fruit buds was visible during the first ten days of July, there being possibly a slight variation from year to year. Samples from material gathered throughout a period of three years show very little, if any, difference between the stages reached at a given date in different years until well toward blossoming time, when the buds apparently become more responsive to external conditions. In the buds under observation the sepals, petals, and outermost cycle of stamens were easily recognizable by the fifth of August. By the middle of September the petals have become longer and wider, the stamens show frequently the bi-lobed appearance, the other two cycles of stamens have appeared and are well differentiated, and in many cases the carpels are already of fair size. Between this time and the last of November the most striking change is in the carpels, which by the latter date have enlarged considerably. Carpels are also beginning at this time in the side buds. Material gathered the middle of February showed little or no change in the terminal blossoms but pollen mother-cell formation in the side buds is evident. During February and March the pistils begin to push up rapidly and the ovules appear. The petals and stamens appear to have completed their development and to be awaiting the expanding of the blossoms.

A partial attempt was made to ascertain whether there is any difference among varieties in the time of fruit bud formation. The buds were examined from a number of different varieties on August 7, 1913. Although no conclusion can be drawn from this study the work as far as it went showed beyond probability that there is some little difference between varieties in their respective times of fruit bud formation, or at least as manifested in the development of the bud at the time when the samples were taken. In relation to the periods of ripening or to the times of blossoming the relative development in August has no exact correspondence. There is, however, more agreement with times of blossoming than with the period of ripening. A hasty examination of material gathered from the same trees in December, 1913, indicated an approach to a uniform winter stage for the different varieties.

An apple orchard survey of Berkeley County, E. C. AUCHTER (*West Virginia Sta. Bul. 151* (*1915*), *pp. 3–75, pl. 1, figs. 25*).—This bulletin presents the results of a survey of the commercial apple orchards in Berkeley County, made during the summers of 1912 and 1913. Information is also given relative to the importance and distribution of the other fruit industries in Berkeley County, together with statistics on the fruit industries of West Virginia as a whole.

The survey included a total of 247 orchards of 5 acres or more and comprising 11,204.6 acres. Sixty per cent of these trees had not reached bearing age. Only 6 per cent of the total apple trees in the county were over 18 years of age. The largest yields and incomes were obtained from those orchards between 19 and 22 years of age. Only a limited amount of data was secured on orchards older than this. The commercial orchards varied in size from 1 to 487 acres. The typical orchard is about 15 acres in area, although the average-sized orchard due to so many large company orchards is 45 acres. Although sufficient data could not be obtained to warrant conclusions as to the relation of size of orchard to yield and income, the survey indicates that the largest orchards are not the most profitable.

The exposure or slope of the orchards is not an important factor in Berkeley County, since the sites are not steep or hilly. Eighty and five-tenths per cent of the orchards were planted by the square system, usually 30 by 30 ft. apart, although the tendency in later years was to plant 33 by 33 or 36 by 36 ft. apart. Generally only 3 or 4 varieties were found in a commercial orchard. Most of the bearing trees are Ben Davis, York Imperial, Grimes, and Arkansas (Mammoth Black Twig). In recent planting there is a tendency to eliminate Ben Davis and cut down the number of York Imperials, substituting such varieties as Stayman, Winesap, Jonathan, and Delicious.

Only a limited amount of data was obtained from company and rented orchards, but the survey indicates that those orchards managed by the owners themselves are giving the largest yields and incomes. The largest yields and incomes are being obtained on the average from soils of limestone origin. Clean cultivation with cover crops is the popular method of handling orchard soils. The 3-year-average income for orchards that have been cultivated 5 years or more since bearing is 108.3 per cent greater than for those orchards which have been in sod continually for the same length of time. The nonbearing orchards are generally intercropped with corn, although in many a 3-year rotation of corn, wheat, and hay is used. Stable manure on sod orchards gave the highest yield, while in cultivated orchards about the same yields were obtained from the use of either manure or commercial fertilizer. The greatest yields were obtained when both were used.

Although about 80 per cent of the orchards are pruned in the spring, pruning has not been practiced systematically and in most cases is poorly done. The most common insects found are San José scale, codling moth, green aphis, and woolly aphis, all being well controlled except the woolly aphis on the roots. The most troublesome diseases are collar blight, apple or cedar rust, and leaf spot. Black rot and twig blight are serious in some orchards. The collar blight is especially bad on the Grimes. Practically every orchardist in the country sprays. Lime-sulphur and arsenate of lead is the mixture generally used.

Data are given on the cost of labor and various orchard operations. The cost of producing a barrel of apples was $1.25. The 3-year-average gross price per barrel was $2.25, leaving a net profit of $1 per barrel, and with a 3-year average yield of 40.2 bbls. per acre the net profit per acre was $40.20. About 50 per cent of the orchards in the county are producing below the average in yield and income, others are yielding twice as much as the average.

The fertilization of peach orchards, W. H. ALDERMAN (*West Virginia Sta. Bul. 150* (*1915*), *pp. 3–39, figs. 10*).—This bulletin describes three cooperative fertilizer experiments with peaches. The first was started by L. C. Corbett in 1899 in the Miller orchards at Paw Paw and continued through 1904. The second was started by A. L. Dacy under the direction of the author in 1911 in a 7-year-old orchard on the property of the Sleepy Creek Orchard Company, and the third was started in 1911 in a young orchard at Cherry Run, W. Va. The results of the three experiments are presented and discussed and a brief review is given of fertilizer experiments with peaches conducted at other stations.

In the earlier work in West Virginia better results were secured from complete fertilizers than from incomplete fertilizers. Of the separate elements, nitrogen gave the best results. Potash checked development and in some cases killed the trees and phosphoric acid exerted no influence on vigor or productiveness.

The experiments at Sleepy Creek and Cherry Run were both conducted on a shale loam soil, low in fertility. In the Sleepy Creek test the yearly growth of trees treated with nitrate of soda has been double that of plats receiving no nitrogen. The bearing surface of nitrogen-fertilized trees was two and one-half times that of the nonnitrogen-fed trees at the end of the second year and there was a still greater difference at the end of the fourth year. The leaves of the nitrogen blocks were healthier and larger in size and about two and one-half times as numerous. The nitrogen plats set an average of 76 per cent fruit buds each year against 60 per cent on the nonnitrogen plats. The yield of fruit was nearly doubled by the use of nitrogen. The fruit was not so highly colored on the nitrogen blocks and maturity was delayed several days. The high color of the fruit on the nonnitrogen plats is attributed to the extra sunshine that penetrated the sparse sickly foliage rather than to the influence of potash or any other fertilizer.

Nitrogen and potash in combination produced slightly larger fruit. The average gross income per acre from all nitrogen plats was $468.85 and from the nonnitrogen plats $275.43. The influence of lime appears to have been largely negative, although the production was somewhat increased.

In the experiment on young trees at Cherry Run, there was no appreciable influence of any fertilizer the first year. After the first year nitrogen produced a strong growth of wood and foliage while potash apparently weakened the vigor of the tree. Practically all of the small crop of fruit produced the fourth year was from nitrogen-fed trees.

The author concludes that the theory that heavy fertilizing with nitrogen is injurious to the peach is shattered by these experiments, as is also the former conception of the value of potash. Recommendations for shale and other soils low in fertility are 200 to 250 lbs. of nitrate of soda per acre for bearing trees and 0.5 lb. per tree for young trees after the first year. It is suggested that the necessary nitrogen may be advantageously supplied by means of leguminous cover crops, but this point has not been clearly demonstrated.

Experiments in fertilizing with catalytic substances of vine ash, S. CETTOLINI (*Bol. Quind. Soc. Agr. Ital., 20* (*1915*), *No. 13, pp. 431–438*).—Data are given and discussed showing the effect on the quantity and composition of the must and wine of grapes fertilized with the following substances: Calcium sulphate, aluminum sulphate, magnesium sulphate, potassium permanganate, iron sulphate, sodium chlorid, and sulphur.

Citrus culture, W. J. ALLEN (*Dept. Agr. N. S. Wales Farmers' Bul. 90* (*1914*), *pp. 96, pls. 5, figs. 108*).—A treatise on the culture, harvesting, marketing, and diseases of citrus fruits, with special reference to conditions in New South Wales.

The mangosteen, D. FAIRCHILD (*Jour. Heredity, 6* (*1915*), *No. 8, pp. 339–347, figs. 4*).—A discussion of the mangosteen with reference to its distinguishing characteristics, edible qualities, and the possibility of its successful culture in tropical North America, together with notes on attempts to cultivate the mangosteen in other tropical countries and its adaptability for grafting on related species.

The palms of British India and Ceylon, indigenous and introduced, E. BLATTER (*Jour. Bombay Nat. Hist. Soc., 22* (*1913*), *No. 3, pp. 444–463, pls. 8, fig. 1; 22* (*1914*), *No. 4, pp. 665–681, pls. 7, fig. 1; 23* (*1914*), *No. 2, pp. 269–281, pls. 5*).—In continuation of previous articles (E. S. R., 30, p. 444) a descriptive account is given of a number of additional native and introduced palms of British India and Ceylon.

Experiments in the germination of coffee carried out in Brazil, E. NAVARRO DE ANDRADE (*Fazendeiro, Sao Paulo, 8* (*1915*), *No. 1, pp. 3–8; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 5, pp. 710, 711*).—The results are given of a comparative germination test of whole fruit, of seed without pulp, and of decorticated seed freed also from the parchment-like membrane. Generally speaking, the best germination was secured by planting whole fruits.

Tea culture in the Caspian Provinces of Persia and in Trans-Caucasian Russia, G. D. HOPE, trans. by C. BERNARD (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Proefstat. Thee, No. 36* (*1915*), *pp. 27, pls. 2*).—This comprises Dutch translations of descriptive accounts dealing with the culture and preparation of tea in the Caspian Provinces of Persia and Trans-Caucasian Russia.

Experiment to determine the most suitable distance apart for planting in nurseries, G. D. HOPE and H. R. COOPER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1915), pp. 36–38*).—The results of this experiment, which was conducted at the Tocklai Experimental Station, indicate that the width of planting tea seed best suited for nurseries is not less than 9 in. and not more than 12 in. Between these limits the choice would be dependent on the kind of seed and soil.

Suggestions for the manurial treatment of tea soils, G. D. HOPE and P. H. CARPENTER (*Indian Tea Assoc. [Pamphlet], 1915, pp. II+88, pl. 1*).—A discussion of the principles and practice of manuring tea, including a classification of the tea soils of Northeast India with special reference to their manurial treatment.

Experiment to determine the effect of lime on the growth of tea seedlings, G. D. HOPE and H. R. COOPER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2 (1915), pp. 39, 40*).—In this experiment, which was conducted at the Tocklai Experimental Station, the soil was known to require lime. Both the check plat and limed plat were given cattle manure at the rate of 20 tons per acre, the limed plats receiving slaked lime containing 51 per cent calcium oxid at the rate of 1 ton per acre. As compared with the check plat there was a 49 per cent increase in weight of 100 plants, a 28 per cent increase in average height, and a 9 per cent increase in average circumference of the tea seedlings on the limed plat.

A summary of the investigations of Dr. P. van Romburgh, C. E. J. Lohmann, and Dr. A. W. Nanninga (1892–1906), J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 31 (1914), pp. 58*).—The investigations here summarized consist largely of chemical studies of the volatile products of fresh fermented tea, the content in caffein and other alkaloids in different cultivated teas, fermentation and fertilization studies, investigations of changes taking place in the tea leaf, manufacturing tests, etc.

Medicinal plants and their cultivation in Canada, J. ADAMS (*Canada Expt. Farms Bul. 23, 2. ser. (1915), pp. 60, figs. 36*).—This bulletin deals with the medicinal properties of certain plants and discusses the possibility of growing these plants in certain parts of Canada. Consideration is given to soil, climate, and cultivation; collection and drying; imports and exports of medicinal plants; medicinal plants for which there is a considerable demand; medicinal plants used in moderate or small quantities; and foreign medicinal plants which might grow in Canada.

A bibliography dealing with the various medicinal plants is included. An appendix contains a note with reference to changes in medicinal plants made in the 1914 edition of the British Pharmacopœia.

Field book of western wild flowers, MARGARET ARMSTRONG (*New York and London: C. P. Putnam's Sons, 1915, pp. XX+596, pls. 48, figs. 500*).—A popular field book illustrating and describing a large number of the commoner wild flowers growing in Washington, Oregon, California, Idaho, Nevada, Utah, and Arizona. The flowers found only in the Rocky Mountains are not included. Attention is called to the fact that exceedingly few of the western flowers cross the Rockies and are found in the East.

New Zealand plants suitable for North American gardens, L. COCKAYNE (*Wellington: Govt., 1914, pp. 35*).—A descriptive list is given of evergreen and deciduous trees and shrubs, climbing plants, herbaceous and semiwoody plants, and ferns believed to be suitable for open air culture in the Pacific coast region, where there is little danger of severe frosts.

FORESTRY.

Annual report of the forestry bureau, C. R. PETTIS (*Ann. Rpt. Conserv. Com. N. Y., 4* (*1914*), *pp. 65–179, pls. 15*).—This comprises a report of the activities of the New York State Forestry Bureau for the fiscal year ended September 30, 1914. The report deals with the administration of the forest preserve, forest fire protective work, forest legislation, forest products, forest extension, and reforestation. Appended to the report is an account of a forest survey of a parcel of state land by A. B. Recknagel and B. H. Paul (pp. 119–137), and a report upon the resources of the forest preserve by C. R. Pettis (pp. 139–179).

Report of the director of forestry for the year 1914, R. H. CAMPBELL ET AL. (*Dept. Int. Canada, Rpt. Dir. Forestry, 1914, pp. 133, figs. 29*).—A report of the work of the forestry branch for the year 1913–14, to which are attached the reports of the officers in charge of the various subdivisions, including the tree-planting division, the forest reserves in the various Provinces, fire ranging, and the forest products laboratories of Canada. A report on wood bison is also included.

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended December 31, 1914, W. F. SHERFESEE (*Ann. Rpt. Dir. Forestry P. I., 1914, pp. 78*).—The usual progress report on the administration, investigation, and reconnaissance work in the Philippines for the fiscal year ended December 31, 1914.

Data showing applications for the homestead purchase and lease of the public lands, timber cut by species, revenues, timber licenses, utilization of forest products from public and private forests, exports and imports of forest products, etc., are appended.

Progress report of forest administration in the Andamans for the year 1913–14, J. L. BAKER (*Rpt. Forest Admin. Andamans, 1913–14, pp. 3+VI+35, pl. 1*).—This is the customary report on the administration of the state forests of the Andamans, including a financial statement for the year ended June 30, 1914. The more important data relative to forest areas, working plans, forest protection, miscellaneous work, revenues, yields, etc., are appended in tabular form.

Reforestation on the Black Hills National Forest, P. T. SMITH (*Ames Forester, 3* (*1915*), *pp. 5–9*).—A summary of progress made in reforestation work on the Black Hills National Forest during the last ten years.

Range reconnaissance on the Wallowa National Forest, E. H. STEFFEN (*Ames Forester, 3* (*1915*), *pp. 10–28, pls. 2, figs. 2*).—An account of the systematic examination and study of the range on the Wallowa National Forest.

The Abney hand level and the chain on intensive forest surveys, C. R. ANDERSON (*Forestry Quart., 13* (*1915*), *No. 3, pp. 338–343*).—The author calls attention to the poor results secured with the aneroid barometer in mapping on intensive surveys and gives directions and data for the use of the Abney hand level and the chain, which equipment has given rather general satisfaction in mapping forest surveys.

Rules of thumb for volume determination, F. R. MASON (*Forestry Quart., 13* (*1915*), *No. 3, pp. 333–337*).—The author here presents some rules of thumb for volume determination which are believed to be applicable for trees of various species.

A windfall problem, G. T. BAKER (*Forestry Quart., 13* (*1915*), *No. 3, pp. 317–324, fig. 1*).—The study here reported was conducted to ascertain if possible the cause of the considerable windfall occurring in the virgin woods on the Snow Creek watershed of the Olympic National Forest.

The results in general indicate that the danger of windfall is little affected by exposure or topography, except in the case of very steep exposed localities. Tall dominant trees with well-formed crowns are more liable to be wind-thrown than others. Much of the windfall among the shorter trees is due to opening up the stand or a disturbance of root systems by the falling of the larger trees.

A calendar of the leafing, flowering, and seeding of the common trees of the eastern United States, G. N. LAMB (*Mo. Weather Rev. Sup. 2* (*1915*), *pp. 5–19, figs. 4*).—The preliminary chart or calendar here given has been formulated from data on the flowering, leafing, seed ripening, seed falling, and leaf falling of the common trees, which have been collected for a number of years, both by observers under the direction of the Forest Service and by individuals working alone.

The calendar includes some 72 species. In view of the lack of uniformity and incompleteness of observations in many cases, the chart is tentative in nature, but it is believed it will serve as a general guide to the seasonal functions of the different species. The use of the chart is explained and directions are given for making phenological observations, together with brief descriptions of the general range of each species.

A bibliography of literature used in compiling the chart is included.

The progress of wood identification in the Philippine Islands, E. E. SCHNEIDER (*Forestry Quart.*, *13* (*1915*), *No. 3, pp. 325–332*).—A short review of investigations having to do with the identification of Philippine woods.

See data on some secondary tree species, E. A. ZIEGLER (*Forestry Quart.*, *13* (*1915*), *No. 3, pp. 361–364*).—Data are given on some seed experiments carried on by A. B. Wells in the Pennsylvania State Forest Academy nursery in 1910 and 1911.

The maximum growth of Japanese timber species, S. HONDA (*Jour. Col. Agr. Imp. Univ. Tokyo*, *6* (*1915*), *No. 1, pp. 1–6, pls. 4*).—A list is given of Japanese trees according to their size and the largest existing specimen trees, together with tabular data showing the average maximum growth of some 49 species.

Loblolly or North Carolina pine, W. W. ASHE (*N. C. Geol. and Econ. Survey Bul. 24* (*1915*), *pp. XVI+169, pls 27, figs. 5*).—A report on the loblolly or North Carolina pine (*Pinus tæda*), prepared under the direction of the North Carolina Geological and Economic Survey in cooperation with the Forest Service of the U. S. Department of Agriculture, with reference to its use by landowners, lumbermen, and others interested in timber.

The subject matter is presented under the following general headings: The tree and how to identify it, economic status of loblolly pine, physiography of the Coastal Plain and Piedmont Plateau regions, commercial distribution, associated species, forest characteristics, silvical requirements, the wood and its uses, commercial use for turpentine, growth, volume tables, graded volume tables, increase in the value of the trees, and management. Under forest management is taken up the determination of the best age at which to cut for saw timber or cordwood in order to utilize most profitably the forest crop. The best methods of cutting in order that the forests may be perpetuated are discussed for the different types. Protection from fire, especially for the young growth, is advocated and the advisability of artificial restocking by seeding or planting is considered.

Accompanying the text are over 80 tables presenting data on various phases of the subject.

Longleaf pine distinguished visually from loblolly or shortleaf, A. KOEHLER (*Engin. Rec.*, *72* (*1915*), *No. 11, pp. 319, 320, figs. 5*).—A detailed study of the wood of longleaf, loblolly, and shortleaf pines, recently made at the

Forest Products Laboratory of the U. S. Department of Agriculture, has shown that the size of the pith in conjunction with the diameter of the second annual ring furnishes a reliable guide for determining the above species of wood without the aid of a microscope. This method of identification is described and a chart is given showing the relation of the pith diameter to the diameter of the second annual ring.

Strength tests of structural timbers treated by commercial wood-preserving processes, H. S. BETTS and J. A. NEWLIN (*U. S. Dept. Agr. Bul. 286* (*1915*), *pp. 15, figs. 7*).—This bulletin describes experimental tests made by the Forest Service in cooperation with the Illinois Central Railway and one eastern and two western wood-preserving companies to determine how the strength of bridge stringers is affected by commercial creosote treatment. An account is given of the materials tested, methods of treatment, method of testing, and the results of tests. A bibliography of publications relating to strength tests of various woods is also given.

The tests have shown in general that timber may be very materially weakened by preservative processes, although creosote in itself does not appear to weaken the timber. A preservative process which may seriously injure one timber may have little or no effect on the strength of another. A fair comparison of the effect of a preservative process on the strength of different species can not be made unless it is the common or best adapted process for all the species compared. The same treatment given to a timber of a particular species may have a different effect upon different species of that species, depending upon the form of the timber used, its size, and its condition when treated.

The artificial preservation of mine timbers, F. MOLL (*Forestry Quart.*, *13* (*1915*), *No. 3, pp. 308–316*).—An account of various European methods of preserving mine timbers, abstracted from the German by F. W. Haasis. See also a previous note (E. S. R., 30, p. 647).

Study on vegetable ivory, F. VIGNOLO-LUTATI (*Ann. R. Accad. Agr. Torino*, *57* (*1914*), *pp. 137–148, pl. 1*).—A short comparative study of vegetable ivory derived from different plants.

DISEASES OF PLANTS.

Annual report of the botanist and plant pathologist, F. STOWARD (*Dept. Agr. and Indus. West. Aust. Ann. Rpt. 1914, pp. 21–32*).—Sprain, a potato disease thought to be of physiological nature and not hereditary, appears to be accentuated by dry-soil conditions. *Heterodera radicicola* has been discovered attacking potatoes for the first time in this region. Potato blight (*Phytophthora infestans*) reappeared after the lapse of a year, being reported from numerous points in several districts.

Premature shedding of blooms by tomato, which could not be associated with any organism, was ascribed to conditions of cultivation and season. Tomato wilt was almost invariably associated with *Fusarium* spp., which may constitute normally a portion of the fungus flora of the soil in this region. No case of tomato blight could be ascribed to *P. infestans*, and if such a disease is present it is thought to be rare.

Studies on cereals are briefly reported. Copper sulphate used alone for wheat smut was shown to cause loss, or more particularly abnormality in germination, in a large percentage of wheat seed tested.

Vine mildew (*Öidium tuckeri*) and anthracnose (*Glœosporium ampelophagum*) were the most prevalent of the vine diseases noted. The former was controlled by several dressings of finely powdered sulphur, beginning as soon as the foliage is formed. The latter yielded to preventive treatment, a precaution recommended being early destruction of all infected prunings. An unusual case of root rot may have been connected with a fungus rot of a neighboring fence.

Diseases of alfalfa included rust (*Uromyces striatus*), leaf spot (*Pseudopeziza medicaginis*), and European root disease (*Rhizoctonia medicaginis*), but none of these appears to amount to an epidemic.

The most common citrus disease was that due to *Armillaria mellea*, which is frequently traceable to residues of stumps or of other timber. A preliminary investigation of a rind disease of obscure origin has been commenced.

Studies with poisonous plants, seed investigations, etc., are also reported in this connection.

Mycology, F. J. F. Shaw (*Ann. Rpt. Bd. Sci. Advice India, 1913–14, pp. 99–105*).—This is largely a summary of material in articles most of which have already been noted from other sources. A note is also given on systematic mycology, with a list of articles published during 1913–14. Among the diseases dealt with are some affecting rice, sugar cane, palms, cotton, and sesame.

The more important plant enemies and their control, H. K. Andersen (*De vigtigste Plantesygdomme og deres Bekæmpelse. Hasley, Denmark: R. Torkildsens Bogtr. 1913, pp. 82, figs. 49*).—Some common diseases and disorders of cultivated plants are discussed, with control measures appropriate thereto, after which some animal enemies of economic plants are discussed on the same general plan.

The control of plant diseases in Sweden, J. Eriksson (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1546–1553*).—This is a brief review of researches, publications, and other steps taken looking to the control of plant diseases in Sweden since the beginning of work in 1876, also an account of the appearance, progress, and effects of some important diseases in that country. Among these are American gooseberry mildew (*Sphærotheca mors-uvæ*), which appeared in 1905 and is now present in most of the Swedish gardens; potato canker (*Synchytrium endobioticum* or *Chrysophlyctis endobiotica*), observed in 1912 and soon brought under control; about a dozen rusts named of cultivated cereals or of allied grasses, also other kinds of rusts, as those on white pine and on hollyhock, and other plant diseases, as *Monilia fructigena* and *M. cinera* on fruit trees, and *Podosphæra leucotricha*, causing apple mildew. Mention is also made of articles reporting investigations on various diseases. Recent efforts for the establishment of international collaboration for the control of plant diseases are also noted, but it is thought that the most important diseases causing about 90 per cent of the annual losses can not be advantageously controlled by legislative measures.

Some work of official botanical institutions is also briefly noted.

Mercury chlorophenol as a fungicide, T. Remy and J. Vasters (*Illus. Landw. Ztg., 34 (1914), Nos. 91, pp. 769–771; 92, pp. 776–778, fig. 1*).—A report is given of tests employing low percentages of mercury chlorophenol, a commercial preparation, against certain plant diseases.

In case of stinking smut of wheat it appears to be safe and at least as effective as others in use. Results with wheat and barley treated for loose smut were less conclusive, but no injury resulted from its use, and the same facts are noted in regard to oats treated for low germinability. Leaf spot of peas, while not entirely prevented, was lessened by this treatment. *Glœosporium lindemuthianum* on garden beans was decreased without injury to the crop. Beet rot was decreased by treatment of the seed balls. Seed treatment of barley reduced leaf stripe. The remedy appears especially beneficial in treating a combination of stinking smut, Fusarium, and leaf stripe of grains.

Infection experiments with parasitic fungi, IV, O. TREBOUX (*Ann. Mycol., 12 (1914), No. 5, pp. 480–483*).—This is a continuation of studies previously noted (E. S. R., 28, p. 844) regarding the habits and tendencies of several rust fungi in connection with host plants.

The 1914 outbreak of rust on winter grain in Bavaria, L. HILTNER (*Wchnbl. Landw. Ver. Bayern, 1914, No. 25; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, p. 1091*).—In parts of Bavaria alarm was caused by rust on wheat and rye, due generally to *Puccinia glumarum*, occasionally associated with *P. triticina*. The features of the outbreak are compared with those of a previous one.

It is thought that the rust is less severe on fields properly manured, also on those having a good even stand as compared with those having a thin stand.

The true cause of severe outbreaks is held to be the weather, the outbreak occurring after a number of hot days followed by frosts or heavy dews and cool weather. Local quick-growing varieties were most severely attacked, other varieties, especially pedigreed ones, remaining nearly free. Mist seems very favorable to the spread of rust. The first reports of attack came from the same place each year, confirming, it is held, the importance of atmospheric factors.

The cause and prevention of dry spot of oats, W. KRÜGER and G. WIMMER (*Ztschr. Ver. Deut. Zuckerindus., No. 704 (1914), II, pp. 707–758, pl. 1, figs. 12*).—A description is given of this trouble, with an account of an extended study thereon. It is claimed to be primarily physiological, due to the injurious influence of residues of physiologically alkaline salts (in particular sodium nitrate), and avoidable by altering the character of the soil as regards alkalinity. This may have been increased in soils at first only slightly alkaline by reactions occurring in connection with commercial fertilizers employed, calcium carbonate being significant in this connection.

Suggestions made regarding the treatment of excessively limy soils include the employment of iron chlorid, iron sulphate, or powdered sulphur, and the use of green manure crops or stable manure.

Experimental studies on the causes predisposing wheat to attack by Erysiphe graminis, V. RIVERA (*Ricerche Sperimentali sulle Cause Predisponenti il Frumento alla "Nebbia." Rome: R. Staz. Patol. Veg., 1915, pp. 42, figs. 4*).—An account is given of studies on the germinability of the conidia of *E. graminis* and the receptivity of wheat plants for the fungus as influenced by various factors.

It is stated that a condition predisposing the host to attack is diminution of turgor, which may be due to dryness of the soil or to elevation of the temperature of the air. Germination of the conidia, on the ther hand, is favored by a state of moderate humidity and temperature. These facts may help to explain the contradictions in the claims made by investigators. The question of susceptibility may reduce itself to a consideration of the relation between cellular turgor in case of the fungus and epidermal tension on the part of the host. The constitution of the cell sap and membranes as determined by nutritional supply may be a further factor.

A bibliography is appended.

A new disease of germinating wheat, P. J. O'GARA (*Science, n. ser., 42 (1915), No. 1079, pp. 313, 314*).—The author reports having observed considerable unevenness of the stand in Utah wheat fields in April, 1915, there being a large proportion of very weak plants. The fields were known to have been infested in the previous year by the wheat straw worm, but a careful examination of the infected plants did not reveal the presence of the larvæ of this insect.

An examination of the plants in the laboratory showed that the wheat kernels were infected with a fungus which is believed to be an undescribed species of Podosporiella, a description of which is promised later.

A new alfalfa leaf spot in America, L. E. MELCHERS (*Science, n. ser., 42 (1915), No. 1085, pp. 536, 537*).—The author reports having observed in the vicinity of Manhattan, Kans., alfalfa plants which were not producing a normal amount of foliage, the stems being sparsely set with spotted leaves, which were affected with a singular leaf spot. The diseased plants all presented an unthrifty appearance and were also somewhat smaller than normal.

The spots, which were generally circular or elliptical, were scattered irregularly over the entire surface, frequently occurring along the margins. During the earliest stages the spots were small and dark reddish-brown. They soon increased in size and had a dark-brown margin bounding the ashen-gray center. The diseased tissue did not fall out and the leaves remained intact. The spots were confined almost exclusively to the leaflets, but they have been observed on the petioles.

Material has been studied in the laboratory, and experiments show the pathogenicity of the fungus, which is said to belong to the genus Pleosphœrulina. The species has not been definitely determined.

Treatment of beet seed for control of root scab, W. KRÜGER and G. WIMMER (*Ztschr. Ver. Deut. Zuckerindus., No. 705 (1914), II, pp. 845–847*).—Comparative tests with several fungicidal preparations for prevention of root scab showed little or no protective value except in case of carbolic acid of 0.5 per cent strength, which reduced attack to 5 or 10 per cent of the whole number of plants.

Celery diseases (*Inst. Phytopath. Wageningen, Vlugschr. 9 (1914), pp. 3*).—Leaf spot (*Septoria apii*) is reported as widely prevalent. An effective seed treatment is 0.25 per cent formalin. Only soil free from infection should be used, and Bordeaux mixture is advised if the disease appears on the plants.

The same seed treatment is applicable to rust or scab (*Phoma apiicola*). Seed beds on infected soil require treatment with strong formalin.

A bacterial rot for which no effective treatment is yet available is also noted on ground having deficient drainage.

Diseases of crucifers (*Inst. Phytopath. Wageningen, Vlugschr. 10 (1914), pp. 4, fig. 1*).—Finger-and-toe of crucifers (*Plasmodiophora brassicæ*) is controlled by repeated applications of lime. Notes are given on *Phoma oleracea*, which is controlled by measures effective as against the cabbage fly (*Anthomyia brassicæ*), carrying the infection, also on *P. apiicola*, which is controlled by treating the seed and seed bed with formalin.

Root nodosities of crosses between swedes and turnips, L. HEDWEG (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, pp. 833–836, pls. 4*).—This is a short account of information obtained in Denmark in researches on crosses between swedes and turnips and the nodosities occurring on their roots. These nodosities, which are of various forms according as the hybrid in question is rape-like, swede-like, or turnip-like, are described separately, and their characters are contrasted with those of the finger-and-toe swellings caused by *Plasmodiophora brassicæ*.

It is claimed that the constancy of the Danish strains of swedes and turnips resulting from years of selection may now be considered as thoroughly established.

Peppermint rust, B. GRÓF (*Kisérlet. Közlem., 17 (1914), No. 4, pp. 657–661, figs. 2*).—The phases of attack by *Puccinia menthæ* on Japanese peppermint are described.

Collection and destruction of all fallen leaves in autumn and spraying with 2 per cent copper sulphate are recommended, as are also repetition of the spraying in early spring and removal of the crop early in June before development of the uredo stage is complete.

Potato diseases, E. HENNING (*Kort översikt över viktigare smittosamma sjukdomar hos potatisen. Stockholm: Wilhelmssons Boktr., 1915, pp. 28, figs. 8*).—A brief discussion is given of *Hypochnus solani*, *Phytophthora infestans*, *Synchytrium endobioticum*, *Spongospora scabies*, Fusarium, and such disorders as bacterial ring rot, scurf, and leaf roll.

Potato diseases (*Bol. Agr. Téc. y Econ., 6 (1914), No. 71, pp. 1031–1040*).—This is a brief discussion of direct and contributory local causes of potato diseases or disorders, including fungi, bacteria, and nematodes, also of some protective measures as used in certain localities.

Blight resistance in potatoes, W. S. HILL (*Jour. Agr. [New Zeal.], 8 (1914), No. 4, pp. 370, 371, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, p. 1088*).—The author notes comparative experiments showing the superiority of the variety Gamekeeper over Up-to-date, as regards resistance to late blight. He also discusses briefly some other qualities.

Fusaria of potatoes, C. D. SHERBAKOFF (*New York Cornell Sta. Mem. 6 (1915), pp. 87–270, pls. 7, figs. 51*).—The results of a monographic study begun in 1911 of the species of Fusarium found on the potato are given. In this work the fungi were studied in their Fusarium stages, no attempt being made to determine their perfect forms. All the cultures were made from diseased parts of the potato plant received from nearly every experiment station in the United States, most of them isolated from tubers affected with dry or soft rots.

In all the author recognizes 61 species and varieties of Fusarium, and in addition he gives descriptions of 3 species of Ramularia which are said to be often found on the potato and easily confused with species of Fusarium. The following new species and varieties are technically described: *F. cuneiforme*, *F. udum solani*, *F. falcatum fuscum*, *F. caudatum solani*, *F. metacroum minus*, *F. subulatum brevius*, *F. effusum*, *F. truncatum*, *F. lucidum*, *F. diversisporum*, *F. biforme*, *F. anguioides*, *F. anguioides caudatum*, *F. arthrosporioides*, *F. arthrosporioides asporotrichius*, *F. sporotrichioides*, *F. arcuosporum*, *F. ferruginosum*, *F. sanguineum*, *F. sanguineum pallidium*, *F. bullatum*, *F. bullatum roseum*, *F. angustum*, *F. redolens solani*, *F. lutulatum*, *F. lutulatum zonatum*, *F. sclerotioides*, *F. sclerotioides brevius*, *F. oxysporum asclerotium*, *F. oxysporum longius*, *F. oxysporum resupinatum*, *F. subpallidum*, *F. subpallidum roseum*, *F. clavatum*, *F. discolor triseptatum*, *F. culmorum leteius*, *F. martii viride*, *F. martii minus*, *F. solani cyanum*, *F. solani suffuscum*, *F. striatum*, and *R. solani*.

In connection with the investigation, the author made some studies on environmental conditions and also the pathogenicity of the fungi. Extensive inoculations of potato plants with all the Fusaria described in the memoir yielded negative results, and would indicate that they are not wilt producers. Several series of inoculations of potato tubers showed that a considerable number of species of Fusarium can cause more or less rapid decay of the tubers, but that most of the species reported upon produced rot only after the tubers had begun to sprout. The most common rot-producing organism, at least in the eastern United States, is claimed to be *F. cœruleum*. The inoculation experiments carried on with tubers seem to indicate that some species of the fungi, while differing morphologically, may act very similarly so far as their pathological conditions are concerned, and that others closely related from the morphological standpoint differ widely in their pathogenicity.

The transmission of potato mosaic through the tuber, E. J. Wortley (*Science, n. ser., 42 (1915), No. 1083, pp. 460, 461*).—The author states that the mosaic disease of potato is very prevalent in Bermuda on the variety Bliss Triumph, the yield of affected plants being reduced from 10 to 75 per cent.

An inspection of the fields on Long Island in which stock was being grown for shipment to Bermuda for seed purposes showed the general presence of mosaic on this variety. The same conditions existed in Maine, where stock for Long Island had been obtained.

Tubers from healthy and mosaic plants were obtained in Maine and later planted in Bermuda, with the result that diseased plants were produced through planting tubers from mosaic parent plants. The yield was greatly reduced due to the presence of the disease, but the experiments indicate that the trouble may be controlled by field selection of stock intended for planting.

It is believed that these experiments are the first to show definitely that the potato mosaic disease is transmitted through the tubers.

Powdery scab of potatoes in Oregon, F. D. Bailey (*Science, n. ser., 42 (1915), No. 1082, pp. 424, 425*).—The occurrence of potato scab due to *Spongospora subterranea* is reported. The lot of potatoes in which the disease was first found is said to have been raised on a farm in the isolated district of Tillamook County, Oreg., where, according to the grower's statement, seed of the variety was introduced from an eastern State some 12 or 15 years ago, and no seed had been introduced since that time. A hasty survey of the county did not show the presence of the disease on any other farm, but one diseased specimen was discovered at a store from which there was no possibility of tracing it to the grower.

The fact that the district is isolated and that potatoes are not raised in sufficient quantity for export is believed to be the reason why the disease has not been more generally disseminated.

Wart disease of potatoes, J. Eriksson (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 2, pp. 276–278*).—Inquiry and research in England since 1909 have shown that black scab of potato, caused by *Chrysophlyctis endobiotica* (*Synchytrium endobioticum*), tends to spread slowly but steadily, the organism retaining its virulence in the soil for years and resisting all the ordinary fungicides but affecting different varieties of potato unequally. Common English varieties are divided into three groups with reference to the resistance that they have shown to this disease. The formalin treatment tested recently in Sweden has already been noted. (E. S. R., 31, p. 842).

Withering of the panicle in rice, P. Poli (*Gior. Risicolt., 4 (1914), No. 14 pp. 206–209, figs. 2; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, p. 1365*).—Colatura, a disease of rice, is described. It consists in a form of abortion of some flowers, which reduces the yield. Certain Japanese varieties are more resistant than those native to Italy. The disease is said to be entirely distinct from a somewhat similar injury to the emerging panicle, which is caused by hail.

As the result of researches carried out in different seasons, the disease is considered due to excessive fertility combined with a period of intense cold during the last phase of flower formation, while the panicle is still inclosed.

A disease affecting the sisal hemp plant, C. K. Bancroft (*Jour. Bd. Agr. Brit. Guiana, 7 (1914), No. 4, pp. 181, 182; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1246, 1247*).—Examination of material collected locally has confirmed the conclusions of Shaw (E. S. R., 29, p. 346) regarding the identity and mode of attack of the organism, *Colletotrichum agaves*, which is shown to be a wound parasite on the sisal plant in British Guiana since 1908 or earlier.

The disease affects first the older leaves, frequently near the tips, spreading to young leaves and finally to all parts of the plant and to neighboring plants, and causing the appearance of yellow patches.

Careful supervision with immediate destruction of affected leaves and the application of such fungicides as Bordeaux mixture are suggested.

Leaf spot disease of sisal in German East Africa, K. Braun (*Pflanzer, 10 (1914) No. 4, pp. 188–197, pl. 1; abs in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, p. 1085*).—A leaf spot disease of sisal, which has been noted previously (E. S. R., 20, p. 155), was more than usually noticeable in 1913. Investigations have shown that this appearance, which is described, may be produced experimentally by even short exposures to temperatures which frequently occur in this region in summer. It is not known whether other unfavorable factors may not increase the susceptibility of the plant in this respect.

Occurrence of the bacterial disease of Sudan grass in the Salt Lake Valley, Utah, P. J. O'Gara (*Science, n. ser., 42 (1915), No. 1079, pp. 314, 315*).—It is claimed that a bacterial disease of Sudan grass has been recently observed in Utah. The specimens exhibited elongated reddish-brown blotches on the leaves, many of the lower leaves being entirely dead. On the under surface of the spots were found characteristic reddish crusts or scabs consisting of dry bacterial ooze, which had come from the interior of the leaves. An examination showed the presence of bacteria, and the author thinks there is little doubt that the disease is due to the broom corn bacterial organism (*Bacillus sorghi*) first studied by Burrill, whose conclusions were later confirmed by Kellerman and Swingle.[a]

Diseases and enemies of sugar beets and alternating crops in Bohemia, H. Uzel (*Ztschr. Zuckerindus. Böhmen, 38 (1914), No. 11, pp. 571–578*).—This is a condensed report, dealing with nematodes and other animal parasites of sugar beets, with the leaf fungi *Sporidesmium putrefaciens*, *Phyllosticta betæ*, and *Cercospora beticola*, and with such bacteria as those causing root rot and scab. As regards alternating crops notes are given of *Tilletia tritici* on wheat, *Urocystis occulta* on rye, *Ustilago jensenii* on barley, and *Phytophthora infestans* on potato.

Control of beet nematodes, H. C. Müller and E. Molz (*Ztschr. Ver. Deut. Zuckerindus., No. 707, 1914, II, pp. 959–1050, figs. 3*).—This is an account of studies bearing upon the control of *Heterodera schachtii* in relation to sugar beets, including experiments with chemical, physical, and other means.

Both potassium carbonate and sodium carbonate seemed to favor an increased nematode attack. Results were not favorable to the use of sulphur or sodium chlorid. Carbon bisulphid at 3 cm. depth in the soil gave better results than at 20 cm. Formaldehyde gave as good results with employment of a smaller quantity. Allyl alcohol was effective whether used pure or diluted with water. Several other treatments increased more or less the severity of attack. A modification of the Kühn method of trap plants is recommended.

Nematodes were found in the greatest numbers at 10 to 20 cm. below the surface, few or none being found at 50 to 60 cm. depth. The vertical or horizontal distribution of nematodes introduced into sterile soil was comparatively slow under experimental conditions.

Sugar cane gummosis, J. Groenewege (*Meded. Proefstat. Java-Suikerindus., 5 (1915), No. 3, pp. 29–124, pls. 7; Arch. Suikerindus. Nederland. Indië, 23*

[a] U. S. Dept. Agr., Office Expt. Stas. Bul. 2, pt. 2, p. 34.

(*1915*), *No. 7, pp. 189–284, pls. 7*).—This is an extended study of *Bacterium vascularum* in its causative relation with gummosis of sugar cane, which is described in connection with associated factors and conditions. A bibliography is appended.

The new disease or dry disease of the sugar cane, C. K. BANCROFT (*Jour. Bd. Agr. Brit. Guiana, 7* (*1914*), *No. 4, pp. 183–187; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5* (*1914*), *No. 9, p. 1247*).—The symptoms, progress, and effects of this disease are described. It is said to have been observed first in this colony in 1907, but to have spread since that time to estates elsewhere, its progress being apparently slow and its tenure uncertain in some localities.

Investigations have borne out the conclusions of Stockdale (E. S. R., 32, p. 441) inasmuch as *Marasimus sacchari* was found in what was probably a causal connection with the disease. It is said to be propagated by spores, underground mycelium, diseased cuttings, etc.

Control measures include drainage and cultivation for increased vigor, abandonment of ratooning, change of crops, isolation by means of trenches, sanitary measures (as the employment of lime), and the use of resistant varieties named.

Occurrence of Thielavia basicola as a root parasite of watermelons in the Salt Lake Valley, Utah, P. J. O'GARA (*Science, n. ser., 42* (*1915*), *No. 1079, p. 314*).—The author reports having observed *T. basicola* parasitic on roots of watermelons. He believes that this is the first case in which it has been found as an active parasite in any part of the United States west of the Mississippi River.

Bitter pit, its cause and cure, D. MCALPINE (*Fruit World Austral., 15* (*1914*), *Nos. 5, pp. 143–153, figs. 21; 6, pp. 179–187, figs. 10; 7, pp. 215–222, figs. 7*).—A summary is given of the second report on the bitter pit of apples (E. S. R., 31, p. 244), dealing principally with the cause of bitter pit, factors that contribute to its development, and methods for its control.

Fluctuating conditions of temperature and humidity are said to be the principal contributing factors in the development of this disease. There is also said to be a distinct relation between the system of pruning and the prevalence of bitter pit. The transpiration of the fruit as affected by various factors, such as pruning, manuring, cultivation, etc., is discussed at length.

The control of bitter pit in the growing fruit, D. MCALPINE (*Prog. Rpt. Bitter Pit Invest.* [*Aust.*], *3* (*1913–14*), *pp. 176, pls. 43*).—This is the third progress report on bitter pit (see above). The investigation, which is still in progress, has now been extended to influences of many kinds affecting the trees and the fruit both before and after it is gathered, as related to bitter pit injury. The question as to whether bitter pit originates only while the fruit is yet on the tree is still unsettled.

It has been found that the increase of transpiration in the growing fruit is referable to the increase of its transpiring surface and the decrease in humidity of the air at this season of the year in this region. Fruit borne on laterals remained free from the disease even when the rest of the fruit on the tree was badly pitted.

Biochemical tests of growing fruit and X-ray studies of stored apples are being made to determine the inception and developmental conditions of bitter pit. It has been established that an excessive flow of sap toward the fruit causes a tendency to pit. This is lessened or neutralized by checking the sap flow, for which purpose constriction is being tested. Severe cutting back for grafting purposes resulted in one case in the pitting of 92 per cent of the apples borne on the remaining branches, while neighboring trees on which only the leaders were shortened, the laterals being left untouched, showed no bitter pit of the ordinary type.

At a temperature of 31 to 32° F. in storage, the development of bitter pit and the ripening process were both arrested.

Canker of fruit trees (*Inst. Phytopath. Wageningen, Vlugschr. 13 (1914), pp. 4*).—*Nectria ditissima* is discussed as a wound parasite of fruit trees (apple and pear), also of several forest trees, into which it finds entrance only at points of injury from hail, insects, etc. It is controlled by the employment of tree surgery after the cankers have developed, fungicidal sprays, as Bordeaux mixture, being of use only to prevent development from the spore stage.

The conditions determining the outbreak of vine mildew in Hungary, G. von Istvanffi (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1242–1245*).—A summary is given of studies on downy mildew conducted by F. Sávoly under the author's direction, and published in the fifth volume of the publications of the Royal Hungarian Central Ampelological Institute of Budapest.

It is believed that adequate study of the climatic conditions favorable to mildew will require investigations covering an extensive and varied territory for several years. Satisfactory results require a study of the weather before the first appearance of the mildew, at least as regards temperature and quantity and frequency of rainfall. Curves called isophanes have been mapped connecting points of simultaneous appearance of the disease. The successive isophanic belts between these show an increase in breadth, each being about 1.55 times as wide as the preceding one.

During 1910 to 1912 the earliest appearance in Hungary was on May 21, most appearances being between June 5 and 15 during the flowering period of the vines, and the infection occurring especially within the last ten days of May. Comparison of the mildew maps during four years shows that the mildew occurs in the same locality each year, and its spread follows usually the same routes, this constancy depending more upon orographic and soil relations than upon weather. The mildew generally proceeded more or less continuously from one locality to another, the speed being unequal in different directions, but the same in given directions every year.

The mildew starts from a definite area described as of triangular form, and advances for a time in approximately the direction of the angles. Independently of this first area, and one or two isophanes later, secondary centers are observed, one of which becomes the point of departure of an independent invasion.

The temperature of the month of April appears to have an influence on the outbreak of mildew. Regularity of temperature changes (with sufficient moisture in winter and spring) favors its early appearance, but repeated relapses in the normal rise of temperature may bring about a retardation of the appearance, both frequency and duration of the temperature relapses being apparently influential in this regard.

An attempt has been made to obtain and express in an equation a "bios" or biological value of the weather as related to mildew outbreak, and the calculated and actual appearance dates as given herein from 1910 to 1913 show a fair degree of correspondence, especially in case of the inner isophanes. A chief condition of complete success for the method is a network of stations in telegraphic communication.

According to these researches the districts in which mildew makes its first appearance in Hungary are determined by orographic and climatic conditions and especially by the nature of the soil and of the conditions of superficial hydrography. The weather influences only the date of the appearance. The disease appears first not in regions of greatest warmth and heaviest rainfall, but in those of extensive sandy areas and tracts liable to flooding. The disease appears later, however, on cold soils, despite abundance of superficial water and favorable weather. After an April with regular temperature and without white frosts the first outbreak occurs about May 15.

Resistance of hybrid direct-bearer vines to mildew, E. Pée-Laby (*Vie Agr. et Rurale, 3 (1914), No. 22, pp. 603–605; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, p. 962*).—Lists are given, based upon tests made, of grape hybrids which require for safety in moderate mildew years no spraying with copper sulphate. Mention is made of other desirable hybrids not yet conclusively tested but probably resistant to mildew.

Rose diseases (*Inst. Phytopath. Wageningen, Vlugschr. 12 (1914), pp. 1–3*).—In addition to some animal parasites, mildew (*Sphærotheca pannosa*), rust (*Phragmidium subcorticium*), and false mildew (*Peronospora sparsa*) of rose are discussed, with treatments as recommended.

Field studies on the dissemination and growth of the chestnut blight fungus, P. J. Anderson and D. C. Babcock (*Penn. Chestnut Tree Blight Com. Bul. 3 (1912), pp. 45, pls. 14*).—This report refers to work carried out chiefly at Charter Oak and Mt. Gretna, Pa.

Tests for infection gave positive results in all but three of eleven kinds of wounds. Inoculation of natural insect holes in no case to date produced a canker, but it is believed that any wound in the bark may furnish an entrance for the fungus.

Among the known or suspected means of dissemination are nursery shipments, grafts, shipments of timber and fire wood (moisture and shade assisting), dead leaves, burs, bark, tools, wind, and rain. The agency of birds has not been established. Ants may possibly carry the spores. Experiments indicate that a beetle (*Leptostylus maculata*) eats the spores, and that it may be really beneficial.

The fungus grows much more rapidly in dead than in living tissue. Spores are very long lived and quickly become active upon being wetted. Conidia can produce infection after being kept dry in the spore-horn stage for 19 weeks. The greatest rate of spread in the cankered spots was obtained during July and August.

A fungus, in all outward appearance the same as *Endothia parasitica*, is reported on *Quercus velutina*, *Q. alba*, *Q. prinus*, *Rhus typhina*, *Acer rubrum*, and *Carya ovata*, and it was isolated from all but *Q. prinus*. The chestnut blight fungus was repeatedly grown on sterilized twigs of all of the above and on *Castanea dentata*, *Q. macrocarpa*, *Q. rubra*, *Q. coccinea*, *Nyssa sylvatica*, *Liriodendron tulipifera*, and *Juglans nigra*, producing pycnidia regardless of the mode of inoculation. The growth on all oaks, on sour gum, and on sumac was as rapid and vigorous as on chestnut twigs. The fungus appears to be a weak parasite on white oak, chestnut oak, and sumac.

The anatomical and physiological conditions of chestnut branches attacked by the ink disease, L. Petri (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), I, No. 5, pp. 363–369; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, p. 964*).—The author has followed up previous observations on the part played by *Coryneum modonium* in producing black canker of chestnut (E. S. R., 29, p. 156; 30, p. 52).

In branches three to nine years old collected at the end of November, 1913, various differences were found between the healthy and the diseased branches. It seems that the earliest and most serious irregularity takes place in the mineral food, the destruction of chlorophyll and the disorganization of the chloroplasts in the cortical parenchyma being probably the consequences of assimilatory disturbances and reduced protoplasmic vitality, connected with high acidity, absence or reduction of calcium oxalate, and increase of gallic acid, these conditions permitting attack by weak parasites some time before any diseased condition is apparent.

Forest botany, R. N. Parker (*Ann. Rpt. Bd. Sci. Advice India, 1913–14, pp. 95–98*).—Besides brief notes regarding the progress of work on floras in preparation and lists of recent papers on forest botany, the results are given, so far as obtained, from a study of the wood of *Pinus excelsa* attacked by *Trametes pini*.

Mycelium was present in heartwood and in sapwood next to the cambium, while this was to all appearances sound. Trees apparently sound showed, on microscopical examination, the presence of hyphæ in the tracheids and the medullary rays. Roots, both small and large, also contained mycelium in wood otherwise free from rot. In case of natural root grafts, fungal hyphæ were found in the grafted roots on both sides of the union, this fact showing the possibility of infection in this manner. The fungus appeared to cause little or no rot except in the heartwood of the stem and larger roots.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Economic entomology in the United States of America, I. V. Emelîanov (*Selskokhozîaĭstvennaîa Entomologiîa v Soedinennykh Shtatakh Sîevernoĭ Ameriki. Petrograd: Govt., 1914, pp. 275, pls. 3, figs. 128; rev. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 1, p. 42*).—A report upon economic entomology in this country, based upon the author's visits during 1910–11 and 1912.

Some present needs in economic entomology, H. T. Fernald (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 30–40*).—In this paper the author points out some important phases of economic entomology that need investigation.

A new air-conditioning apparatus, G. A. Dean and R. K. Nabours (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 107–113, pls. 3, fig. 1*).—The authors here describe the general arrangement, principle of operation, and moisture and temperature records maintained in the breeding chamber by an air-conditioning machine which has been manufactured for and installed at the Kansas Experiment Station.

Cages and methods of studying underground insects, J. J. Davis (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 135–139, pls. 3*).—The author here describes and illustrates the methods made use of in investigations carried on by agents of the Bureau of Entomology of this Department.

The conditions of the resistance of internal parasitic insects in the organism of their hosts, W. R. Thompson (*Compt. Rend. Soc. Biol. [Paris], 77 (1915), No. 23, pp. 562–564; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, pp. 251, 252*).—It is pointed out that the resistance offered by internal parasitic larvæ, both dipterous and hymenopterous, to the toxic and digestive diastases which the author here discusses is an aspect of the adaptation of parasite to host which entomologists appear to have hitherto neglected.

The toxicity of insecticides, C. W. Woodworth (*Science, n. ser., 41 (1915), No. 1053, pp. 367–369*).—The author describes the methods employed in determining the effect of hydrocyanic acid gas on scale insect eggs in closed glass containers. The results of one series of tests with the European fruit scale on Christmas berry are presented in tabular form.

Some recent insect importations into New Jersey, H. B. Weiss (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 133–135*).—The author describes briefly the discovery of numerous important insect pests from abroad which have been intercepted during the course of inspection work in New Jersey.

A review of the spread in Russia of the chief injurious animals in 1913, I. A. PORTCHINSKY (*Ezheg. Dept. Zeml.* [*Russia*], *1913, pp. 14, figs. 4; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 3, pp. 111, 112*).—Notes on the more important pests of the year.

[Philippine insects] (*Philippine Jour. Sci., Sect. D, 9 (1914), No. 5, pp. 409–464, pls. 2, figs. 11*).—The papers here presented deal with Studies in Philippine Jassoidea: I, Some Remarkable Tettigoniellidæ, by C. F. Baker (pp. 409–421); Philippine Histeridæ, by H. Bickhardt (pp. 423–431); New Fulgoridæ of the Philippines, II, by L. Melichar (pp. 433–439); Elateridæ of the Philippine Islands, by E. Fleutiaux (pp 441–449); Catalogue of the Pselaphidæ (Coleoptera) of the Philippine Islands, by A. Raffray (pp. 451–455); and New Philippine Hymenoptera, by J. C. Crawford (pp. 457–464).

Annual report of the officer in charge of the insectary for the year ended June 30, 1914, L. J. NEWMAN (*Dept. Agr. and Indus. West. Aust. Ann. Rpt. 1914, pp. 60–66*).—An account is here given of the occurrence of and work with the more important insects of the year.

Division of entomology, annual report, 1913–14, C. P. LOUNSBURY (*Union So. Africa Dept. Agr. Rpt., 1913–14, pp. 199–216*).—This, the usual annual report (E. S. R., 31, p. 548), deals with the work of the year, including nursery and port inspection; the work with locusts, to which a considerable part of the report is devoted; investigations by the Cape entomologist, C. W. Mally; wattle insect investigations, by C. B. Hardenberg; etc.

The enemies of the Jerusalem artichoke, P. NOEL (*Bul. Trimest. Lab. Ent. Agr. Seine-Infér., No. 3 (1914), pp. 15, 16; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 1, p. 33*).—A list of the more important artichoke pests.

The principal enemies of rice in Indo-China, L. DUPORT (*Jour. Agr. Trop., 14 (1914), No. 157, pp. 204–207; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, pp. 1380, 1381*).—Among the more important insects mentioned are *Sesamia inferens, Schœnobius bipunctiferus, Cnaphalocrocis medinalis, Artona walkeri, Sitotroga cerealella*, and *Leptocorisa varicornis.*

A short text-book on the control of insect pests of orchards, S. TSESHEVSKAGO (*Kratkoe Rukovodstvo po Bor'bie s Vreditelīami Plodovago Sada iz Klassa Nasīekomykh. Petrograd: Imp. Russ. Obshch. Plodovodstva, 1914, pp. 44, figs. 61; rev. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, p. 183*).—A popular handbook arranged by seasons for the use of orchardists in Russia.

Insects and man, C. A. EALAND (*New York: The Century Co., 1915, pp. 343, pls. 68*).—An account of the more important harmful and beneficial insects, their habits and life histories, etc. The subject is dealt with under the headings of insects and plants, insects and human disease, insect enemies of live stock, beneficial insects, household insects, some human parasites, and insect control. A classified bibliography covering ten pages, and subject and authorities indexes are included.

A preliminary list of insects which have wilt, with a comparative study of their polyhedra, J. W. CHAPMAN and R. W. GLASER (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 140–149, fig. 1*).—The summary and conclusions drawn from the investigations here reported are as follows:

"Wilt occurs in many widely different species of insects. The clinical aspects of wilt are very similar in all the species of caterpillars studied by us. Wilt first appears in a chronic form, as conditions become more unfavorable it becomes acute, and finally terminates in a general epidemic. There is a striking similarity in shape between the polyhedra of the different species of caterpillars given in Group A. The polyhedra in the different species vary greatly in size. The great difference in size which exists between polyhedra in the same caterpillar tends to strengthen our view that the polyhedra are reaction bodies."

A bibliography of 11 titles is included.

An illustrated catalogue of American insect galls, M. T. THOMPSON (*Nassau, N. Y.: Rhode Island Hospital Trust Co., 1915, pp. 72, pls. 21*).—The first part (pp. 5–46) of this posthumous work consists of a catalogue of the gall-making Cynipidæ of North America, with the classification arranged by galls and by genera, and includes a bibliography of species descriptions (pp. 47–49). A supplemental list of American gall-making insects (pp. 50–66), and an index to the genera and species are included.

The first part of this catalogue is published practically as left by the late author, while the second part, or supplemental catalogue, was assembled from his original notes by the author's father, the late S. M. Thompson, who is also responsible for the selection and grouping of the illustrations on the plates. The numerous plates, consisting of 246 separate figures, reproduce photographs of galls taken by the late author. The work as a whole is edited by E. P. Felt.

The transmission of exanthematous typhus to man and monkey by lice, E. SERGENT, H. FOLEY, and C. VIALATTE (*Compt. Rend. Acad. Sci.* [*Paris*], *158* (*1914*), *No. 13, pp. 964, 965*).—This is a report of results obtained during the course of experiments with recurrent fever conducted in Algeria, in continuation of those previously noted (E. S. R., 24, p. 82).

The authors call attention to the fact that Nicolle and his collaborators (E. S. R., 22, p. 552) succeeded in four cases in transmitting exanthematous typhus in monkeys through the bites of infected lice, and that Ricketts and Wilder (E. S. R., 23, p. 559) have furnished indirect proof of this rôle of lice. The authors' experiments confirm the above-mentioned results. They show that exanthematous typhus may be transmitted to man through the bite of adult infected lice and that lice taken from an individual thus infected may in turn transmit the disease to monkeys. In addition it was found that the infection acquired by a louse is hereditary and that individuals arising from eggs laid by an infected louse may transmit the disease.

The application of iron sulphate in orchards (*Sad, Ogorod i Bakhcha, No. 5* (*1914*), *pp. 307, 308; abs. in Rev. Appl. Ent., 2* (*1914*), *Ser. A, No. 8, pp. 515, 516*).—The application of iron sulphate is recommended to destroy moss and lichens on trees and as a remedy for *Psylla mali*. A 3 per cent solution should be applied before the buds swell, but since it does not destroy all the eggs of this psyllid, a further spray consisting of 0.5 or 0.75 lb. of tobacco extract in 11 qt. of water immediately after the larvæ have hatched is recommended.

Notes on some Colorado aphids having alternate food habits, C. P. GILLETTE and L. C. BRAGG (*Jour. Econ. Ent., 8* (*1915*), *No. 1, pp. 97–103*).—Notes are here presented on 31 species, among which mention may be made of *Chermes cooleyi, Pemphigus betæ, Schizoneura americana, S. rileyi, S. cratægi, S. lanigera*, etc.

The brown grape aphid, A. C. BAKER and W. F. TURNER (*Science, n. ser., 41* (*1915*), *No. 1066, p. 834*).—The authors report upon observations at Vienna, Va., of the life cycle of *Macrosiphum viticola*. The eggs are deposited in the axils of leaves of *Viburnum prunifolium* in late October or November and the young hatch out in the spring before the leaves open and feed on the bursting flower buds. The second generation matures late in April or in early May and nearly all become alate. The alate forms are unable to subsist on Viburnum and migrate to the grape where they produce a third generation and where the species lives throughout the summer, producing apterous and alate forms.

The emergence from the soil of the first young of the grape phylloxera in Italy, B. GRASSI (*Atti. R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), II, No. 2, pp. 19–30; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, p. 1377*).—The emergence of the young from the soil is more or less abundant throughout the year, except during hibernation and the period preceding the birth of the first daughter generation of the hibernating females. In southern Italy they do not appear so frequently from the second half of July to the end of August, the period corresponding with the partial estivation of the insect.

The use of the fungus Isaria for the control of the black scale, H. J. QUAYLE and A. R. TYLOR (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 7, pp. 333–338, figs. 2*).—The experiments here outlined and the general observations made in the groves treated have been summarized by the authors as follows:

"The Isaria fungus growing under suitable conditions in a moist chamber, either in the laboratory or the field, was found to kill a fair percentage of the black scale. The results in attempting to disseminate the fungus artificially under natural conditions in the field, at least at the season indicated, have been wholly negative. From observations made in the various groves where the fungus has been disseminated commercially, there is absolutely no evidence, thus far, to show that the fungus has been of any importance whatever in checking the scales. Where natural conditions are favorable for the development of the fungus, as in the district contiguous to the coast in Santa Barbara County, the Isaria will kill more or less of the black scale, but the field where it would thrive can not be greatly enlarged, if at all, by attempts at artificial dissemination. From our recent experiments and observations as well as general observations made on this fungus since 1908, the writers feel justified in extending to citrus growers no hope that this fungus will keep their trees free from the black scale."

Scurfy scale on Norway maple (Leucaspis japonica), E. P. FELT (*Jour. Econ. Ent., 8 (1915), No. 1, p. 160*).—The author records a severe infestation of the twigs and leaves of Norway maple and privet at Stamford, Conn., by *L. japonica*.

The crisis in Italian sericulture and the measures for averting it, O. BORDIGA (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, pp. 1263–1270*).—A discussion of the conditions that have brought about a crisis in sericulture in Italy.

State moth work, plan and progress of work, 1913–14, W. C. O'KANE (*N. H. Dept. Agr., State Moth Work Circ. 6 [1915], pp. 22, pls. 7*).—A report of the status of the work carried on in New Hampshire.

On the biology of Bupalus piniarius and some of its parasites, V. PLOTNIKOV (*Reprint from Rev. Russe Ent., 14 (1914), No. 1, pp. 21, figs. 8; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 1, pp. 48, 49*).—The author reports that among 372 caterpillars examined, 14 per cent were infested with Campoplex, 12 per cent with *Lydella nigripes*, 4 per cent with both of the above-mentioned parasites, and 2 per cent with *Platylabus cothurnatus*.

A mechanical protector for preventing injury by the peach borer, E. B. BLAKESLEE (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 103–107*).—This abstract of a paper presented at the annual meeting of the American Association of Economic Entomologists describes a cone-shaped tarred paper protector which, when placed at the crown of the tree, forms an impenetrable barrier, and not only prevents the deposition of eggs at that point but prevents the larvæ from working downward on the trunk and attacking the crown. When an impenetrable barrier was placed at the crown of the tree, the larvæ made no attempt to enter above it.

Experiments with lime-sulphur spray against the larch moth (Coleophora laricella), I. TRÄGÅRDH (*Centralanst. Jordbruksförsök Flygbl. 49* (*1914*), *pp. 3*; *abs. in Rev. Appl. Ent.*, *3* (*1915*), *Ser. A*, *No. 4*, *p. 191*).—The author's experiments confirm the results obtained by Herrick (E. S. R., 28, p. 857), showing that lime-sulphur spray is an excellent remedy for the larch moth.

The burdock gelechiid, an insect seed destroyer, A. GIBSON (*Ottawa Nat.*, *28* (*1914*), *No. 7*, *p. 96*; *abs. in Rev. Appl. Ent.*, *3* (*1915*), *Ser. A*, *No. 2*, *p. 72*).—The author reports that nearly every seed head of the lesser burdock (*Arctium minus*) in the Ottawa district is found to harbor one or more larvæ of *Metzneria lappella* through the autumn and winter. In this way the lepidopteran becomes a useful insect. So abundant has the insect become that it is the exception to find a seed head in which the small caterpillar is not wintering.

Fumigation for the box leaf miner, E. P. FELT (*Jour. Econ. Ent.*, *8* (*1915*), *No. 1*, *pp. 94–96*).—A brief report of experiments with *Monarthropalpus buxi*, which has become well established on Long Island, where it is seriously injuring ornamental box hedges.

Preliminary experiments indicate that fumigation with one teaspoonful of carbon bisulphid to 5 qt. of space for a period of at least one hour will kill the larvæ without injury to the plant. Tests of carbon tetrachlorid, C. P. ammonia, and naphthalin flakes were made with less favorable results. Fumigation for 15 minutes with potassium cyanid at the rate of 1 dram to 27 cu. ft. of space or about one-half the strength recommended for fumigating nursery stock destroyed some of the larvæ and did not injure the foliage.

A caterpillar (Oria musculosa) injuring grain crops and methods of combating it, N. VITKOVSKY (*Abs. in Rev. Appl. Ent.*, *2* (*1914*), *Ser. A*, *No. 12*, *p. 712*).—A popular account of this most serious pest of grain crops in south Russia and means for its control. In one district in the Province of Don 2,700 acres of crops were damaged, of which 810 acres were totally destroyed.

The question of fighting Oria musculosa, A. O. FABRIKANT (*Zeml. Ghaz.*, *No. 35* (*1914*), *pp. 1137*, *1138*; *abs. in Rev. Appl. Ent.*, *3* (*1915*), *Ser. A*, *No. 1*, *p. 15*).—The author reviews the work of a special conference on the control of *O.* (*Tapinostola*) *musculosa*. During 1912 its damage to crops in the Government of Ekaterinoslaf amounted to as high as $1,289,622.50, as many as 54,000 acres of crops being totally destroyed and 67,000 acres damaged in only five districts of the Government.

Oria musculosa in the Government of Ekaterinoslaf according to the data for 1914.—Distribution, biology, and method of control, N. N. VITKOVSKY (*Abs. in Rev. Appl. Ent.*, *3* (*1915*), *Ser. A*, *No. 3*, *pp. 110*, *111*).—An account of the life history of this noctuid which was the source of considerable injury during 1914. See also notes above.

Mycodiplosis macgregori n. sp., E. P. FELT (*Jour. Econ. Ent.*, *8* (*1915*); *No. 1*, *p. 149*).—This itonidid was reared from red spider on cotton at Batesburg, S. C.

Malaria in the Philippine Islands.—I, Experiments on the transmission of malaria with Anopheles (Myzomyia) febrifer sp. nov., A. (Pseudomyzomyia) rossii, A. (Myzorhynchus barbirostris, A. (Myzorhynchus) sinensis, and A. (Nyssorhynchus) maculatus, E. L. WALKER and M. A. BARBER (*Philippine Jour. Sci.*, *Sect. B*, *9* (*1914*), *No. 5*, *pp. 381–439*).—The authors' experiments show that among the anopheline mosquitoes in the Philippine Islands *A. febrifer* is probably the most susceptible to infection with the parasites of subtertian malaria, and while the number of experiments with tertian and quartan malaria is insufficient to determine the fact, it is probable that this species is also an efficient carrier of these types of the disease. "This species is from three to four times as susceptible as *A. rossii*, which has hitherto been considered the malaria carrier of the Philippines, and eleven times as susceptible as *A. barbirostris*. The number of mosquitoes of the species *A. sinensis* and *A. maculatus* dissected, especially in the comparative experiments, is too small to give reliable percentages. It is possible that a larger series of experiments with *A. sinensis* would show that this species can be infected. . . .

"The rôle played by a species of Anopheles in the transmission of malaria in any country depends chiefly upon (1) its susceptibility and (2) its geographical distribution and prevalence; also, to some extent, upon (3) its avidity for human blood and (4) its domesticity."

A list of 21 references to the literature is included.

On the life history of the pipunculids, intracœlomic parasites of Typhlocyba, D. Keilin and W. Thompson (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 1, pp. 9–12, figs. 11; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p. 252*).—It is pointed out that, aside from the discovery by Boheman in 1854 of the parasitism of ciccadellids by a pipunculid larva, the discovery by Giard in 1889 of the parasitism of Typhlocyba by *Atelenevra spuria*, and the fact that they usually oviposit in the bodies of Homoptera and may be employed in controlling some species injurious to plants, such as sugar cane, very little is known of their bionomics.

The authors report upon studies of *Typhlocyba rosæ*, *T. hippocastani*, and *T. douglasi* attacked by *A. spuria* and what is thought to be another pipunculid.

A new Sarcophaga parasitic on Allorhina nitida, J. M. Aldrich (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 151, 152, fig. 1*).—A new dipteran reared from pupæ of *A. nitida* in Virginia, Indiana, Illinois, Michigan, Georgia, Florida, and Louisiana is described as *Sarcophaga utilis*.

Notes on certain points of economic importance in the biology of the house fly, F. C. Bishopp, W. E. Dove, and D. C. Parman (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 54–71*).—This report of studies of the biology of the house fly conducted in Texas includes tables which show in detail the preoviposition period, developmental periods, and longevity of the house fly at Dallas.

Note on the use of poisoned bait for controlling the house fly (Musca domestica), C. W. Mally (*So. African Jour. Sci., 11 (1915), No. 9, pp. 321–328*).—The author concludes that from the standpoint of expense the poison bait method is very much cheaper than any other that has come to his attention.

The effect of temperature on the life cycle of Musca domestica and Culex pipiens, S. D. Kramer (*Science, n. ser., 41 (1915), No. 1067, pp. 874–877*).—The results of studies of the average duration of the egg, larval, and pupal stages of the house fly at 20, 30, and 35° C. are presented in tabular form, as are studies of the immature stages of mosquitoes (*C. pipiens*) at 20°, room temperature, and 30°.

The celery fly (Acidia heraclei), J. Feytaud (*Bul. Soc. Étude et Vulg. Zool. Agr., 13 (1914), No. 7, pp. 109–114, figs. 2; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, p. 188*).—This dipteran is a source of injury to celery in southwest France through its mining in the leaves.

A new species of Ulidinae from Tucuman, J. Brèthes (*Bul. Soc. Ent. France, No. 2 (1914), pp. 87, 88, fig. 1*).—The new dipteran here described as *Euxesta chavannei* is said to cause the decomposition of the young shoots of the sugar cane, and the canes are then invaded by *Bacillus sacchari* which causes a disease known as "polvillo."

[Cycloneda (Neda) sanguinea, an important coccinellid in Brazil], F. Iglesias (*Chacaras e Quintaes, 10 (1914), No. 6, pp. 434, 435, figs. 3; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, p. 169*).—A brief account of a coccinellid which is of considerable importance through its clearing oranges and rose trees of aphids in Brazil.

Life history of Oberea tripunctata, A. G. Ruggles (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 79–85, figs. 6*).—The beetle here considered has become a pest in the parks of St. Paul, Minn. In June, 1911, all the trees along one of the finest avenues of that city were found by the author with numerous dead leaves hanging from the terminal twigs and the ground strewn with leaves. Studies have since been made of its life history and are here reported.

The eggs are inserted under the edge of the slit bark of twigs, below the completed girdles, many often being found in a single stem, although all between the complete girdling next the main stem and the end of the twig soon perish. Five larval instars have been observed and are here described. Pupæ were found only in the second year after the eggs, usually in May. It was estimated that in 1911–12 from 50 to 80 per cent of the larvæ were parasitized. The cutting out and burning of infested twigs was recommended and appears to have given satisfactory results in the control of this borer.

On the life history of Aleochara bilineata, a staphylinid parasite of Chortophila brassicæ, J. T. Wadsworth (*Jour. Econ. Biol., 10 (1915), No. 1–2, pp. 1–27, pls. 2, fig. 1*).—An account is here given of the life history of a staphylinid beetle, the larvæ of which parasitize the pupæ of the cabbage root fly (*C. brassicæ*), including technical descriptions of its stages.

"It is shown that the larvæ of this insect hatch from the ova in the form of typical, free-living, campodeiform, staphylinid larvæ. They enter the puparia of the cabbage fly, feed on the pupæ contained therein, and at the first ecdysis emerge as eruciform larvæ. They thus undergo a simple form of hypermetamorphosis as the result of their parasitic mode of life. Three ecdyses occur during larval life. Previous observers believed that ova or larvæ of the beetle enter the fly larvæ; this view, however, is shown to be erroneous. After the first ecdysis the larvæ feed rapidly; pupation takes place within the puparium of the host, and the adult beetle, after gnawing a hole in the wall of the puparium, emerges therefrom.

"Two generations of these staphylinids are produced annually in the Manchester district, and it is suggested that in warmer climates three or more generations may be produced in a year. Adults of the first generation emerge in May and June; as larvæ they entered the host puparia in late autumn of the previous year. Apparently eight or nine months elapse while the individuals of this generation undergo their metamorphoses. Adults of the second generation emerge from the host puparia in August and September. Six or seven weeks only are occupied by this generation in completing the developmental cycle. The rate of development of larvæ obtained in winter may be greatly increased by placing them in warm surroundings. Adults, which would normally emerge in May or June, may be thus obtained in midwinter. It is suggested that other members of the genus Aleochara will be found to have similar life histories, possibly with modifications. It is also probable that the larvæ of *A. bilineata* parasitize other dipterous hosts than *C. brassicæ*.

"Two hundred and thirty-nine cabbage fly puparia infested by staphylinid larvæ were obtained from 2,189 puparia examined, equivalent to 10.9 per cent. The puparia collected during the summer months showed a higher percentage of parasites, viz, 26.9 per cent. It is estimated that at least 20 per cent of the larvæ and pupæ of *C. brassicæ* are destroyed by coleopterous and hymenopterous parasites in the district where the material for this investigation was obtained.

"In view of the marked destructiveness of the cabbage fly and of the fact that practical methods of reducing it in numbers do not appear yet to have been devised, it is suggested that the increase in numbers and utilization of its natural enemies is worthy of consideration."

A bibliography of 21 titles is included.

Notes on some hymenopterous parasites bred from the pupæ of Chortophila brassicæ and Acidia heraclei, J. T. WADSWORTH (*Ann. Appl. Biol., 2 (1915), No. 2–3, pp. 158–161*).—During the course of an investigation of the life histories of parasites which attack soil insects, and particularly of the life history of a staphylinid (*Aleochara bilineata*) the larvæ of which attack the pupæ of the cabbage root fly (*C. brassicæ*), the author reared *Phygadeuon fumator*, *Atractodes tenebricosus*, and *Cothonaspis* (*Eucoila*) *rapæ* from pupæ of *C. brassicæ*, and *Hemiteles crassicornis* and *Adelura apii* from pupæ of the celery fly (*A. heraclei*).

A simple record system for apiary inspection, W. E. BRITTON (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 121–123*).—The author describes a system that has been used in Connecticut.

The spotted fever tick (Dermacentor venustus) and its control in the Bitter Root Valley, Montana—a review, R. A. COOLEY (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 47–54*).—A review of the Rocky Mountain spotted fever situation in Montana, including control work now under way and a summary of the biology of the spotted fever tick.

Some insect flagellates introduced into vertebrates, H. B. FANTHAM and ANNIE PORTER (*Proc. Cambridge Phil. Soc., 18 (1915), No. 2, pp. 39–50, pl. 1*).—The investigations here reported have led to the following conclusions:

"Insect flagellates, e. g., *Herpetomonas jaculum* from *Nepa cinerea* and *H. ctenocephali* parasitic in the dog flea, *Ctenocephalus canis*, can live inside certain vertebrates (e. g., mouse and dog, respectively) and can multiply therein. This we have shown experimentally.

"If such flagellates be inoculated intraperitoneally or are fed by the mouth in food, the flagellates can find their way into the blood stream and internal organs (e. g., liver, spleen, bone marrow) of the vertebrate host. The insect flagellates are pathogenic to the vertebrates experimented upon, producing symptoms like those of leishmaniasis (kala-azar). The oval post-flagellate forms appear to be more capable of developing in vertebrate hosts than are other stages of the herpetomonad parasite of the insect. It may be expected that the various leishmaniases, occurring in different parts of the world, will prove to be insect-borne herpetomoniases."

A list of 15 references is included.

Further experimental researches on insect flagellates introduced into vertebrates, H. B. FANTHAM and ANNIE PORTER (*Proc. Cambridge Phil. Soc., 18 (1915), No. 3, pp. 137–148*).—"Herpetomoniasis can be induced in various warm- and cold-blooded vertebrates when the latter are inoculated or fed with herpetomonads occurring in the digestive tract of various insects. The infection produced and the protozoal parasites found in the vertebrates resemble those of human and canine leishmaniases. An infection can also be induced in certain vertebrates when they are fed or inoculated with *Crithidia gerridis*, and both flagellate and nonflagellate stages occur therein, but no transition to a trypanosome was found.

"The following Flagellata have proved pathogenic to warm-blooded mammals when the latter have been fed, or inoculated subcutaneously or intraperitoneally with them: *Herpetomonas jaculum*, *H. stratiomyiæ*, *H. pediculi*, and *C. gerridis*. The hosts used were mice of various ages. That *H. ctenocephali* can infect dogs has already been shown by us. *H. jaculum* and *C. gerridis* have also been successfully fed or inoculated into cold-blooded hosts, namely, fishes

(*Gasterosteus aculeatus*), frogs, toads, lizards (*Lacerta vivipara*), and grass snakes (*Tropidonotus natrix*).

"As we have previously stated we believe that leishmaniases are arthropod-borne herpetomoniases, and that these maladies have been evolved from flagellates of invertebrates (especially herpetomonads of insects), which have been able to adopt themselves to life in vertebrates.

"In areas where leishmaniases are endemic, an examination should be made of all insects and other invertebrates likely to come into contact with men or dogs or rats and mice, in order to ascertain if these invertebrates harbor herpetomonads. Preventive measures should be directed against such invertebrates, especially arthropods. Further, it is likely that certain vertebrates, such as reptiles and amphibia (especially those that are insectivorous), may serve as reservoirs for leishmaniases or, as they should preferably be termed, herpetomoniases. From such reservoirs the herpetomonads may reach man by the agency of ectoparasites or flies, especially such as are sanguivorous."

A list of 18 references is included.

Parasites of the American muskrat (Fiber zibethicus), F. D. BARKER (*Jour. Parasitology, 1 (1915), No. 4, pp. 184–197, pls. 2, figs. 4*).—In continuation of work previously noted (E. S. R., 29, p. 484), the author describes a number of new parasites, including 8 trematodes, 2 cestodes, and 3 nematodes.

Sarcosporidia encountered in Panama, S. T. DARLING (*Jour. Parasitology, 1 (1915), No. 3, pp. 113–120, pls. 4*).—During the routine examination of nearly 1,000 animals, sporidia were detected in three new hosts—namely, the opossum, hawk, and sloth.

Larval trematodes from North American fresh water snails, W. W. CORT (*Jour. Parasitology, 1 (1914), No. 2, pp. 65–84, figs. 15*).—This is a preliminary report which deals with 14 new cercariæ found in 6 species of fresh-water snails obtained from 7 localities. A list of 8 references to the literature is included.

Some North American larval trematodes, W. W. CORT (*Ill. Biol. Monographs, 1 (1915), No. 4, pp. 86, pls. 8*).—It is pointed out that practically nothing is known of the life history of the trematodes of North America, and even in Europe, where many new adults are being described each year, only a few developmental cycles are completely known. A list of references given of literature on larval trematodes from North American molluscs includes but 11 species. The present paper adds 14 new species of cercariæ from North American fresh-water snails. A preliminary report, taking up briefly the structure and activity of these cercariæ, is noted above.

A bibliography of 36 titles is included.

Trematode parasites and the relationships and distribution of their hosts, S. J. JOHNSTON (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 272–278*).—This paper is based upon studies conducted by the author in Australia.

Studies on the cestode family Anoplocephalidæ, H. DOUTHITT (*Ill. Biol. Monographs, 1 (1915), No. 3, pp. 96, pls. 6*).—A comparative anatomical study of this family, including a key to the known species and descriptions of 8 new species.

"The cestodes of the subfamily Anoplocephalidæ are in some way dependent upon rich soils for their existence, and they thrive best in wet lowlands. The evidence points to the conclusion that the intermediate hosts are some group of insects which is confined to such regions; and since the hosts of the Anoplocephalidæ are almost exclusively herbivorous, it would seem as if this host were a small, plant-feeding insect."

A four-page bibliography is included.

Tænia saginata.—A case presenting structural abnormalities and associated with spurious parasitism in an infant, M. C. HALL (*Jour. Amer. Med. Assoc., 64 (1915), No. 24, pp. 1972, 1973, fig. 1*).—The author records the occurrence of the unarmed or beef tapeworm in a child said to be from 14 to 18 months old.

FOODS—HUMAN NUTRITION.

The feeding of school children, MILDRED BULKLEY (*London: G. Bell & Sons, Ltd., 1914, pp. XVI+278*).—This book is based upon a study, carried out in the year 1913, of the practical workings of the Act of Parliament of 1906 providing for the use of public funds, under certain restrictions, for the serving of meals in schools.

Owing to discretionary powers vested in local authorities marked differences were found in the spirit with which the work was carried on in different districts, as well as in the method of supervision, the selection of beneficiaries, the time and place of serving meals, and the wholesomeness of the food provided. As a result of the investigation, the author suggests that the act should make it obligatory to provide for underfed children; that meals should not be discontinued during holidays; that the half-penny limit should be removed; that the meals should be a part of the regular school system; and that they should be so prepared and served as to be of educational value. In rural schools, where, as a rule, the number of children is small, the serving of meals should be combined with the teaching of home economics.

The book considers the history of the movement for the provision of school meals, the extent and causes of malnutrition, and the effect of school meals upon the children and upon the parents. An appendix contains sample menus and information regarding the provision of meals in Scotland and abroad, this information being based on a review of the literature.

Economy in food during war, A. K. CHALMERS (*Lancet [London], 1915, II, No. 10, pp. 561–564*).—Several ways in which economy in the use of food may be secured are considered.

Sprouted wheat, R. HARCOURT (*Canad. Miller and Cerealist, 7 (1915), No. 10, pp. 239, 246*).—The author reports baking tests to determine the usefulness of the sprouted wheat which resulted from the warm, wet weather at harvest time. His work indicates that a wheat containing 10 per cent of slightly sprouted grain may still produce a flour that will make good bread. Slightly sprouted grain is defined as that in which the sprout is from $\frac{1}{4}$ to $\frac{1}{2}$ the length of the kernel. Badly sprouted wheats are considered practically useless for milling purposes.

Commercial value of flour, B. R. JACOBS (*Canad. Miller and Cerealist, 7 (1915), No. 10, pp. 245, 246*).—A score-card system is described by which the commercial value of flour may be computed. Moisture, ash, gluten quality, acidity, color value, loaves per barrel, fermentation value, loaf volume, loaf color and texture, and the length of the fermentation period are the factors upon which the ratings are based.

Better breads by means of natural lactic acid, A. WAHL (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, pp. 773–775*).—A preliminary report of an investigation of the quality of bread as influenced by the addition to the dough of lactic acid produced by *Bacillus delbruecki* (an organism found in germinated barley). The results of the investigation may be summarized briefly as follows:

The addition of bacterial lactic acid to the dough resulted in an improved general appearance of the loaf and a larger loaf per weight of bread. The bloom and color of the crust were improved and a greater whiteness of crumb resulted, with better texture, "consisting of a more uniform distribution of the fermentation gas cells which are of smaller size in augmented number, with avoidance of large holes, thus eliminating crumbliness and producing a more velvety crumb. . . .

"Finer flavor and increased palatableness in the bread by virtue of a chemical combination with the phosphates of the flour" resulted.

"By using bacterial lactic acid produced by propagating *B. delbruecki* in a bran mash, all the highly nutritious extractive substances of the bran are thus incorporated into the dough, while the lactic acid renders soluble the proteins and basic phosphates of the flour, which results in a more wholesome product by reason of its increased digestibility."

It is stated that "the 'microbi-cidal' tendencies of lactic acid check the growth of those undesirable micro-organisms which tend to cause a disagreeable taste, bad odor, ropiness, and other bread diseases.

"Bacterial lactic acid extracts of malted cereals at low temperatures contain in addition the activated proteolytic and diastatic enzyms, peptase, and diastase, which act during dough fermentation to effect a partial digestion of the dough, the resulting soluble proteins, phosphates, and carbohydrates serving as a most desirable nourishment for the yeast.

"Milk, whey, buttermilk, and similar milk products containing either added or developed bacterial lactic acid, when added to the dough, also effect a similar improvement in the bread.

"Commercial lactic acid may be used with improved results, but bacterial lactic acid is preferable, and that bacterial lactic acid which is produced by the organism *B. delbruecki* is the most desirable, since this lactic acid with the extractive substances in it contains a much greater concentration of hydrogen ions upon which the effectiveness of this acid largely depends."

Westphalian blood bread, O. RAMMSTEDT (*Ztschr. Angew. Chem., 28 (1915), No. 38, Aufsatzteil, pp. 236–238*).—Analytical data are given showing the chemical composition of rye, wheat, and army breads, and Westphalian blood bread, which is prepared with the addition of blood obtained from slaughter-houses to increase the nutritive value of the bread and to save in the amount of flour used.

Blood bread, R. KOBERT (*Chem. Ztg., 39 (1915), No. 12, p. 69*).—The author advocates the addition of 10 per cent of the blood of slaughtered animals to all flour used in bread making during the war, as this blood contains nearly 18 per cent of protein, some lecithin and cholesterin, and valuable inorganic salts. Bread prepared in this way, when freshly baked, has an agreeable taste. The danger from infectious diseases is held to be negligible, as any bacteria present are killed by the baking process.

Decision of the German Imperial Health Bureau on the use of potato products in bread (*Arb. K. Gsndhtsamt., 48 (1915), No. 4, pp. 595–606*).—Baking experiments are described in which various proportions of potato starch, potato flakes, and whole potato flour were used in admixture with rye flour and baked in the usual way. The bread was subsequently analyzed to determine principally the amounts of water and total nitrogen present.

The total energy value of the potato bread was found to be only inconsiderably less than that of pure rye bread. The products containing as much as 20 per cent of potato flour were judged not inferior to rye bread in general appearance, color, odor, and taste.

The protein content of the potato bread is held to be the only quantity that varies considerably from that of pure rye bread, but when 20 per cent of potato starch or flour is used in the bread the percentage of protein present is much smaller than when only 5 per cent is used. It is maintained that sufficient protein from other sources is supplied by the ordinary mixed diet, of which either pure rye or potato flour forms only a part. While the amount of water contained in the bread may be increased by the use of potatoes, this factor is easily regulated. The proportions of potato products recommended for use are equal parts of flakes and starch, or of the whole potato flour and starch.

The use of sugar beets for food, HERZFELD (*Deut. Zuckerindus.*, *39* (*1914*), *No. 43*, *pp. 885*, *886*).—In studying methods of preparing sugar beets for human food, the author conducted experiments to reduce the excessive sweetness, to produce an easily digestible product, and to overcome the disagreeable flavor. The method recommended is as follows: Cut the beets into small pieces (size of a hazelnut), cover with water, add 1 gm. of crystallized sodium carbonate for each 100 gm. of beets, and boil from 20 to 30 minutes. (This treatment is said to soften the beets and to remove the biting taste.) Finally pour off half the water and acidify with vinegar.

Chemical examination of ghee, K. H. VAKIL (*Jour. Soc. Chem. Indus.*, *34* (*1915*), *No. 7*, *p. 320*).—The author defines Indian ghee as a form of clarified butter obtained from cow's milk or from buffalo's milk. Analytical data regarding a number of samples are given.

Heather tea, a substitute for black tea (*Schweiz. Apoth. Ztg.*, *53* (*1915*), *No. 12*, *pp. 173*, *174*).—It is noted that the flowering sprigs of *Calluna vulgaris* furnish a passable substitute for black tea, the infusion having a pale yellow color, a faint odor, and a weakly astringent taste. As the blossoms are visited by the honey-bee, the herb is best gathered after flowering.

The nutritive value of wood, W. RASCH (*Ztschr. Gesam. Getreidew.*, *7* (*1915*), *No. 5*, *pp. 130–135*).—Comparative analytical data are given regarding beech and birch wood, and rye, wheat, and oat straw. The possibility of their use as food is also discussed somewhat at length.

Hydrocyanic acid from haricot beans, H. BLAIR (*Pharm. Jour.* [*London*], *4. ser.*, *40* (*1915*), *No. 2689*, *p. 586*).—The presence of hydrocyanic acid in haricot beans was detected from the odor evident upon opening a covered pan in which the beans had been steeped overnight. Laboratory tests, in which 1 gm. of ground beans was macerated in water at 45° C. and the acid washed out by a current of hydrogen and absorbed in potassium hydroxid solution, showed for periods of 27, 49, 87, 117, 198, and 358 minutes 0.025, 0.050, 0.080, 0.100, 0.120, and 0.160 mg. of hydrocyanic acid, respectively.

Botulism, an experimental study, E. C. DICKSON (*Jour. Amer. Med. Assoc.*, *65* (*1915*), *No. 6*, *pp. 492–496*, *figs. 2*).—This is a preliminary report of a laboratory investigation which was suggested by an epidemic of botulism apparently caused by eating home-canned string beans. It was desired to determine experimentally whether a medium containing animal protein is necessary for the growth of *Bacillus botulinus* and the development of its toxin (as is generally believed), and in addition to obtain more information regarding the lesions produced in the body by the toxin. Although botulism is generally spoken of as a type of meat poisoning, the author cites a number of cases of this disease which were caused apparently by eating spoiled vegetables or fruits.

To determine whether the toxin of *B botulinus* would be developed in a vegetable medium, about 1 cc. of a suspension of the organism in normal salt solution was injected into a number of cans of high-grade commercial string beans. The cans were then resealed and allowed to incubate at room temperature for periods varying from 3 to 12 months. After incubation of the cans, aerobic and anaerobic cultures of their contents were made on various media and portions of the fluid contents were injected into laboratory animals (guinea pigs, rabbits, and cats). Pure cultures of *B. botulinus* were obtained from 6 of the 12 cans of beans inoculated. Of the 45 animals injected with the contents of the cans, 16 died and a number of others showed symptoms of botulism. Infusions of canned string beans, canned peas, pork, and beef were also inoculated with the same strain of *B. botulinus* and with another strain as a control and all incubated at 22 to 28° C. Inoculations of other animals were made from these infusions and, although all the data of this series are not complete, 22 of the animals inoculated died.

It is pointed out that since *B. botulinus* is an anaerobic organism which develops and produces its toxin best in the dark and at a temperature of 22 to 28°, canned goods afford a favorable medium for its growth. In view of the results of these experiments and the fact that spores of *B. botulinus* withstand a temperature of 85° for nearly a half hour, the author emphasizes the fact that great pains should be taken to secure the sterilization of canned fruits and vegetables, as well as meats. This is especially true in home canning, as in commercial canning practice the high temperatures and times employed in processing are generally sufficient to kill these spores.

The general conclusions drawn from the investigation are in part as follows:

"The presence of animal protein is not essential for the development of the toxin of botulism. The toxin may be produced in a medium made from string beans or from peas. An acid reaction of as much as 3.2 per cent to phenolphthalein does not prevent the formation of the toxin."

A case of fatal poisoning by the American water hemlock (*Pub. Health Bul.* [*Mass.*], *2* (*1915*), *No. 2, pp. 50–52, fig. 1*).—In one case death and in another case severe illness resulted from eating the roots of this plant which is often mistaken for parsnips, artichokes, sweet cicely, horse-radish, or other edible roots. Analyses of samples of the roots showed the presence of a poison of the picrotoxin or cicutoxin group.

The harmful effect of a vegetable diet, C. Voegtlin (*Amer. Jour. Physiol.*, *36* (*1915*), *No. 4, p. 367*).—In the experiments reported laboratory animals (monkeys, white mice and rats, hogs, and cows) were given exclusive diets of natural vegetable foods. The following conclusions are drawn:

An exclusive diet of such cereals as wheat, corn, barley, oats, millet, etc., was injurious to some mammals and led eventually to death. This was also true of an exclusive diet of some fresh vegetables such as carrots, sweet potatoes, and Irish potatoes. When forming the only diet of mice and rats, legumes like beans and peas were insufficient for maintaining life. It was found that fresh beef, cow's liver, eggs, and milk, if added in sufficient quantities to vegetable food, would protect the health of the animals. It was also found that a mixed vegetable diet composed of cereals, legumes, and fresh vegetables was inadequate for maintaining the life of mice and some other animals. Fowls lived in good health and for a long time when given an exclusive diet of corn, wheat, and other cereals. The addition of certain inorganic salts to the corn resulted in prolonging the life of mice.

Some products of hydrolysis of gliadin, lactalbumin, and the protein of the rice kernel, T. B. Osborne, D. D. Van Slyke, C. S. Leavenworth, and M. Vinograd (*Jour. Biol. Chem.*, *22* (*1915*), *No. 2, pp. 259–280*).—Analytical methods are described for determining the quantity of amino acids in several proteins which form important constituents of human food.

The lysin content of gliadin was found to be 0.93±0.28 per cent. The composition of lactalbumin was as follows: Lysin, 9.16±0.68 per cent; histidin, 2.06±0.54 per cent; arginin, 3.23±0.23 per cent. Lactalbumin is exceptionally rich in lysin. "This fact is particularly interesting in view of the ability of lactalbumin to stimulate the growth of rats when used to supplement a ration low in lysin. . . .

"Compared with the endosperm proteins of wheat or maize, the protein of rice yields relatively much of each of the basic amino acids, arginin, histidin, and lysin, and comparatively little ammonia and nonamino nitrogen. In its general amino acid make-up it more nearly resembles the majority of the proteins of animal tissues than do the proteins of maize or wheat. This may explain the extensive use of rice as an almost exclusive diet in spite of its low protein content."

Protein minima for maintenance, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem., 22 (1915), No. 2, pp. 241–257, fig. 1*).—In continuation of previous work (E. S. R., 33, p. 262), the authors report the results of feeding experiments with laboratory animals (rats) to determine the minimum amounts of protein required for maintenance. By altering the protein content of the food—including different proportions of lactalbumin, casein, edestin, milk proteins, and gliadin in a basal ration supplying an abundance of total calories—it was possible to note how the rats actually responded to the different diets.

Additional experiments, as yet incomplete, are described in which a limited, weighed amount of food was supplied daily and eaten completely. The effect of the different proteins was studied comparatively by reducing the amount of protein in the ration until growth ceased, or a gradual decline in body weight occurred. The conclusions drawn are in part as follows:

"Ranges of 7 to 15 mg. of lactalbumin per gram of rat per week represent minima lower than those found for casein, edestin, milk proteins, or gliadin, not to mention the impossibility of maintenance with zein. . . .

"The different proteins are, with a few exceptions, not so widely divergent in their general amino acid make-up as to lead us to expect wide differences of protein minimum requirement, aside from a few striking examples. In the case of growth with its greater need of protein units, the divergencies of the proteins may manifest themselves more conspicuously than in mere maintenance. The apparently greater efficiency of lactalbumin, in contrast with the other proteins recorded above, is in harmony with the observation of the apparent economy of this protein as a supplement to deficient rations."

The need of protein under different conditions, E. ABDERHALDEN, G. EWALD, A. FODOR, and C. RÖSE (*Pflügers Arch. Physiol., 160 (1915), No. 9–10, pp. 511–521; abs. in Zentbl. Physiol., 30 (1915), No. 4, p. 181*).—Nitrogen metabolism experiments are described with diets consisting exclusively of potatoes or bread with the addition of fat or sugar. The experimental periods were of 5 to 8 days' duration. The apparent results of these tests were as follows:

With a ration of potatoes an ingestion of 4.5 gm. of nitrogen sufficed to attain a nitrogen equilibrium. The consumption of 5.9 gm. of the nitrogen supplied by a ration of Swedish bread was necessary. The amount of available nitrogen thus required was approximately 4 gm.

The metabolic relationship of the proteins to glucose.—II, Glucose formation from body proteins, N. W. JANNEY and F. A. CSONKA (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 203–213*).—The experiments here reported, which are a continuation of earlier work (E. S. R., 33, p. 261), deal with glucose originating in the metabolism of body protein with special reference to the relative amounts of glucose and nitrogen appearing in the urine of fasting diabetic laboratory animals, i. e., the G : N ratio. The results of the experimental data are summarized by the authors as follows:

"The average urinary G : N ratio in the fasting phlorizin diabetic dog is found to be 3.4 : 1, rather than 3.67 : 1. The body proteins of the dog collectively yield in metabolism about 57.5 per cent of glucose corresponding to the protein G : N ratio 3.6 : 1; body proteins of the rabbit about 60 per cent glucose, protein

G:N ratio 3.8:1. Body proteins of the other higher animals, including man, very probably yield nearly the same amounts of metabolic glucose as the dog and rabbit.

"The calculated yield of 45 per cent glucose, as a maximum from body protein, based on the urinary G:N ratio 2.8:1 in phlorizin and pancreas diabetes, is incorrect."

Animal calorimetry.—XII, The influence of the ingestion of fat, J. R. Murlin, G. Lusk, and J. A. Riche (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 15–29, figs. 3*).—The experiments reported in previous papers (E. S. R., 33, p. 755) have been extended to include a study of the metabolism of laboratory animals (dogs) after the ingestion of fat alone and combined with glucose and glycocoll. The experimental procedure was essentially the same as that described in the previous articles. The heat production of the dogs was observed after the ingestion of 75 gm. of emulsified fat, after the ingestion of 75 gm. of fat followed by 70 gm. of glucose, and after the ingestion of 50 gm. of glucose and 20 gm. of glycocoll 4 hours after 75 gm. of emulsified fat had been eaten. The fat emulsion used consisted of 1 per cent lecithin, 37 per cent peanut oil, 37 per cent lard oil, and 25 per cent water.

These experiments showd that "the administration of fat causes a relative increase in the metabolism of fat itself. . . .

"The increase in heat production is derived from the increased oxidation of incoming fat."

The respiratory quotient obtained in the animals to which glucose had been administered after the ingestion of fat showed that "with an ample influx of both fat and glucose at the same time, both food substances are simultaneously oxidized and with a large increase in the heat production."

It was also found that "after giving 20 gm. of glycocoll +50 gm. of glucose during the height of the absorption of 75 gm. of fat, the increase in metabolism is nearly the sum of the increases brought about by giving each substance separately."

In summarizing the results of these experiments the authors state that the influx of fat globules into the blood stream through the thoracic duct reaches its maximum during the sixth hour after the ingestion of fat.

"The heat production of the organism may gradually rise, reach its maximum during the sixth hour, and may fall to the basal level 10 hours after fat has been ingested. It appears that the ingestion of fat does not change the quantity of heat produced from protein and glycogen, but that the increased metabolism is at the expense of the fat ingested.

"If glucose be ingested at the time of the highest fat metabolism, the heat production undergoes a second increase by the same quota which glucose alone would have increased metabolism. At this level of higher metabolism the respiratory quotient is 0.93 or 0.94, instead of unity, which it would have been if glucose had been given alone."

ANIMAL PRODUCTION.

The mechanism of Mendelian heredity, T. H. Morgan, A. H. Sturtevant, H. J. Muller, and C. B. Bridges (*New York: Henry Holt & Co., 1915, pp. XIII+262, pl. 1, figs. 64*).—The chapters included in this book are Mendelian segregation and the chromosomes, types of Mendelian heredity, linkage, sex inheritance, the chromosomes as bearers of hereditary material, the correspondence between the distribution of the chromosomes and of the genetic factors, multiple allelomorphs, multiple factors, and the factorial hypothesis. A bibliography relating to the literature is appended.

The fundamentals of live stock judging and selection, R. S. CURTIS (*Philadelphia: Lea & Febiger, 1915, pp. X+17–455, figs. 180*).—A general treatise on methods of live stock judging.

The value of broom millet seed compared with sorghum (*Agr. Gaz. N. S. Wales, 26 (1915), No. 8, p. 698*).—Analyses of mature sorghum seed and broom millet seed are given as moisture 12.42 and 12.71 per cent, protein 7.1 and 9.06, ether extract 3.13 and 2.6, nitrogen-free extract 71.34 and 61.84, crude fiber 3.6 and 8.53, ash 2.41 and 5.26, nutritive ratio 1:11.4 and 1:7.4, and nutritive value 85.5 and 76.7, respectively.

Report of analyses of commercial feed stuffs (*La. Dept. Agr. and Immigr. Feed Stuffs Rpt. 1913–14, pp. 152*).—Analyses made by the Louisiana State Experiment Station are reported of cotton-seed meal, rice bran, rice polish, wheat bran, shorts, middlings, screenings, corn chops, molasses feed, unbolted corn meal, hominy feed, brewers' grains, meat scrap, alfalfa meal, and various mixed and proprietary feeds.

Feeding stuffs (*Landw. Jahrb. Bayern, 4 (1914), pp. 425–436, 512–517, 534–549, 783–791*).—Analyses are given of rape seed, rape seed cake and meal, sesame cake and meal, peanut cake and meal, linseed cake and meal, sunflower seed meal, palm nut cake and meal, soy bean meal, coco cake and meal, rice feed meal, brewers' grains, malt sprouts, fish meal, blood meal, ground malt polish dust, germ oil meal, cacao shell, and turf molasses.

The starch equivalent theory, J. A. MURRAY (*Jour. Agr. Sci.* [*England*], *7 (1915), No. 2, pp. 154–162, fig. 1*).—In this article the author points out the imperfections of the starch equivalent theory and comments upon the efforts of Wood and Yule (E. S. R., 32, p. 166) to correct the Kellner standard. He proposes that the feeding standards be superseded by formulas. These should be in terms of "total digestible nutrients" with given protein ratios for maintenance, growth, work, fattening, and milk production.

The maintenance ration of oxen and the starch equivalent theory, E. T. HALNAN (*Jour. Agr. Sci.* [*England*], *7 (1915), No. 2, pp. 163–174*).—The author takes exception to the suggestions offered in the paper noted above and advocates the continued use of the Kellner system of starch equivalents. A very complete discussion is given of the development and application of the starch equivalent theory.

The mineral content of feed stuffs in relation to the weather and the mineral requirements in cattle feeding, E. KUNZE (*Mitt. Landw. Inst. Leipzig, No. 12 (1914), pp. 61–96*).—Analyses of the P_2O_5, CaO, and K_2O contents of the grain, straw, and chaff of oats during different seasons of the year and under various methods of fertilization are reported. A résumé of literature on the subject of the effect of the mineral content of plants on the animal framework is also given.

The improvement of native cattle in Jamaica, H. H. COUSINS (*Bul. Dept. Agr. Jamaica, n. ser., 2 (1915), No. 8, pp. 338–345, pls. 10*).—It is stated that an element of zebu blood or of the Indian breeds of cattle is necessary if European breeds are to be hardened sufficiently to do well under tropical conditions in Jamaica. The Shorthorn and the Hereford have a tender white skin which is very susceptible to the influence of the tropical sun. The zebus on the other hand, even when externally light colored or white, have a black sun-resistant skin. The influence of the zebu blood is so marked that one-eighth of it is enough to give a short-haired character and a darkening of the skin to a composite animal while preserving in a marked degree the beef qualities inherent in the other introduced breed.

Caracul sheep, R. WALLACE (*Jour. Bd. Agr.* [*London*], *22* (*1915*), *No. 5, pp. 434–447, pls. 4, figs. 4*).—An account of the origin, development, breed characteristics, and utility value of this breed of sheep, and of attempts in the United States and in Europe to introduce the breed.

On ovariotomy in sows, with observations on the mammary glands and the internal genital organs, IV, L. J. J. MACKENZIE and F. H. A. MARSHALL (*Jour. Agr. Sci.* [*England*], 7 (*1915*), *No. 2, pp. 243–245*).—In continuation of work previously noted (E. S. R., 31, p. 870) examinations were made of the mammary pigment of four sows of colored varieties, three being Large Blacks and one a Berkshire. It was clearly proved that the dark pigment which so frequently occurs in the mammary tissue in pigs of colored breeds, and which has been found to exist even in the embryo, may be no longer present in sows which have been bred from. It is thought that the removal of this pigment takes place either during the progress of lactation or in the period of pregnancy when the mammary glands are being built up preparatory to the secretion of milk.

Harvesting crops with swine, C. E. THORNE (*Ohio Sta. Bul. 286* (*1915*), *pp. 244, 245*).—Three lots of pigs were fed 30 days as follows: Lot 1 ear corn and clover pasture, lot 2 allowed to hog down rye, and lot 3 ear corn and rape pasture. In addition all lots were fed approximately ¼ lb. of tankage daily per pig. The respective lots made average daily gains of 0.82, 0.57, and 0.75 lb. per pig and consumed, aside from pasture, 2.66, 6.34, and 2.91 lbs. of feed per pound of gain. Lot 2 was then put in with lot 1 on clover and lot 3 remained on the rape, where the pigs were fed for 26 days. The pigs on clover made an average daily gain per pig of 0.75 lb., consuming 3.64 lbs. of feed aside from pasture per pound of gain, and the lot on clover, 0.87 lb. gain, consuming 3.16 lbs. of feed per pound of gain.

Two 3-acre plats of corn were hogged down with 33 pigs, an average daily gain of 1.76 lbs. being made. The pigs showed a return of 77 cts. per bushel, or $36.95 per acre for the standing corn, with hogs at 7 cts. per pound and no charge for labor.

[Report on animal husbandry work], B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1914, pp. 6–8, fig. 1*).—In experiments conducted in 1914 it was demonstrated that in pasturing alfalfa with fall and spring pigs $11.23 per ton of alfalfa produced could be realized, whereas the market price of alfalfa hay was $4.50 per ton. The average live weight kept on the alfalfa pasture during the season was at the rate of 1,815 lbs. per acre.

In hogging down corn, pigs increased in value in 20 days at the rate of $40.72 per acre, bringing $1.17 per bushel of corn consumed.

Probable error in pig feeding trials, C. CROWTHER (*Jour. Agr. Sci.* [*England*], 7 (*1915*), *No. 2, pp. 137–141*).—A pig-feeding experiment is reported in which ten 8-week-old pigs were fed for 24 weeks in identically the same manner a ration consisting of bran, middlings, pea meal, and barley meal. It was found that the probable error of one pig expressed as percentage of average gain was for 3-week periods, beginning with the fourth week, as follows: Seven and five-tenths per cent, 7.9, 5.8, 7.9, 5.4, 8.4, and 5.7, and the average for the whole period was about 3.5 per cent. Attention is called to the extremely low degree of variability between the individual records and the absence of any marked tendency for the probable error (relative to increase) to fall as the feeding progressed.

These results are contrasted with those of other investigators (E. S. R., 30, p. 369), and the desirability of a closer study of the possibilities of the pig as an instrument for the measurement of small differences in nutritive value is suggested.

Missouri poultry shows and associations, T. W. QUISENBERRY and C. T. PATTERSON (*Missouri Poultry Sta. Bul. 9 [1915], pp. 48, fig. 1*).—Suggestions are given for the organization of poultry shows and associations and their management.

Egg-laying contests, M. PURVIS (*Breeder's Gaz., 68 (1915), No. 10, pp. 335, 336, figs. 3*).—An account of recent egg-laying contests held in New South Wales and at various state experiment stations in this country.

It is said that the most important thing learned from the results of these competitions is the fact that a large egg record does not always mean the greatest profit. Often the pens which led in egg production were fourth or fifth, or even lower in rank, when the value of the eggs produced was considered. The most profitable hen lays steadily at that time in the year when eggs are most valuable. It has also been found that, all things considered, there is actually very little difference in the egg-laying ability of different breeds.

The production and handling of market eggs, T. E. QUISENBERRY (*Missouri Poultry Sta. Bul. 5 [1915], pp. 1–69, figs. 44*).—Methods of handling eggs for market are described. An article on why the egg dealer should buy on a quality basis, by H. L. Kempster, is included.

Squab raising, A. R. LEE (*U. S. Dept. Agr., Farmers' Bul. 684 (1915), pp. 16 figs. 9*).—This discusses the general management of pigeons for the production of squabs and also contains a summary of data secured from pigeon breeders throughout the United States.

DAIRY FARMING—DAIRYING.

Economic feeding for milk production in New Mexico, L. FOSTER and R. W. LATTA (*New Mexico Sta. Bul. 98 (1915), pp. 34, figs. 5*).—In trials to determine whether it pays to feed grain to cows on good pasture in New Mexico, it was found that feeding 6 lbs. of grain (bran, cotton-seed meal, and corn meal in various proportions) daily to cows on good pasture increased the milk and milk-fat production 6.5 and 9 per cent, respectively, in two experiments. In a third experiment the average grain feed was 4 lbs., and this increased the milk and milk fat only 1.5 and 2 per cent. Averaging all three experiments, the lots fed grain produced milk at a cost for feed of 0.79 cts. per pound and milk fat at a cost of 18 cts. per pound. The lots on pasture alone produced milk at a cost of 0.41 cts. per pound and milk fat at 10 cts. per pound.

In trials to determine whether it pays to feed grain in addition to first-class alfalfa hay it was found that feeding 6 to 8 lbs. of grain (corn meal and bran) per cow daily in addition to all the first-class alfalfa hay they would clean up, decreased the amount of alfalfa eaten, increased the milk and milk-fat production 12 per cent, increased the cost of milk production 25 per cent, and decreased the returns for the hay fed 20 per cent. Averaging the results of the two experiments the grain-fed cows consumed a daily average of 25.6 lbs. of alfalfa and 6.7 lbs. of grain, produced milk at 1.54 cts. per pound, and milk fat at 32.4 cts. per pound, and gained in weight 29 lbs. per month. The cows fed alfalfa alone consumed 31.2 lbs. of hay daily, produced milk at 1.195 cts. per pound and milk fat at 24.5 cts. per pound, and gained in weight 2 lbs. per month.

In a comparison of different kinds and proportions of feeds to be fed with cotton-seed meal it was found in one experiment, where 1.5 lbs. of cotton-seed meal and 1 lb. of bran per day were compared with ½ lb. of cotton-seed meal and 3 lbs. of bran, with a basal ration of alfalfa hay and corn meal, that the ration with more cotton-seed meal and less bran produced 3 per cent more milk at 1 per cent less cost for feed. The cows receiving the larger amount of grain ate 2.4 lbs. less alfalfa per day.

In a second experiment, cows on pasture receiving a daily grain feed of 2 lbs. of cotton-seed meal and 1 lb. of bran produced 3 per cent more milk and 5 per cent more milk fat than cows receiving only the 2 lbs. of cotton-seed meal. Several of the cows were off feed considerable of the time when fed cotton-seed meal alone, but ate their feed more regularly when fed bran with the meal. When fed cotton-seed meal alone the cows produced milk at a cost for feed, including a pasture charge of $2.50 per month, of 0.72 ct. per pound, and milk fat at 17.5 cts. per pound. When fed 1 lb. of bran daily with the cotton-seed meal they produced milk at 0.81 ct. per pound and milk fat at 19.2 cts. per pound. Cows on the bran ration gained 235 lbs. more in body weight than when on the cotton-seed meal alone. The cows which went off feed on the cotton-seed meal alone usually lost considerable weight, as well as falling off in milk.

In a third experiment chopped alfalfa was compared with bran as a filler in a grain ration. Each mixture was fed at the rate of 1 lb. for 5 lbs. of milk. The mixture consisting of bran, cotton-seed meal, and ground Kafir corn 2 : 1 : 3, produced milk at a cost, for feed, of 0.665 ct. per pound and milk fat at 15.4 cts. per pound. The mixture consisting of alfalfa, cotton-seed meal, and ground Kafir corn 2 : 1 : 3 produced milk at 0.578 ct. and milk fat at 14.1 cts. The mixture composed of cotton-seed meal and ground Kafir corn 1 : 3, without any filler, produced milk at 0.635 ct. and milk fat at 16 cts.

On the bran ration the cows gained 202 lbs. in weight and on the alfalfa ration 238 lbs., while on the cotton-seed meal and Kafir corn meal alone they lost 28 lbs.

In an experiment to determine the value of silage in the ration it was found that cows fed a daily ration of 15 lbs. of alfalfa, 30 lbs. of silage, and 1 lb. of grain for each 5 lbs. of milk, produced $121.38 worth of milk from feed costing $69.72. Cows fed all the alfalfa they would clean up, amounting to 35 lbs. per day, and grain at the rate of 1 lb. for each 5 lbs. of milk, produced $119.34 worth of milk from feed costing $88.87. The silage ration produced milk at a feed cost of 0.931 ct. per pound and milk fat at 19.6 cts. per pound. The ration without silage produced milk at 1.178 cts. per pound and milk fat at 25.5 cts. per pound. Crediting all of the profit to the alfalfa used, the silage-fed cows returned $28.32 worth of milk for each ton of alfalfa, and the cows receiving no silage, $14.64 worth of milk for each ton of alfalfa.

Black and white Ayrshires, A. H. KUHLMAN (*Jour. Heredity, 6 (1915), No. 7, pp. 314–322, figs. 4*).—The author comments on the probable origin of the Ayrshire and its purity of breed. The black and white colors are said to be as old as the breed. A comparison of the registration in 1886 and in 1913 showed a decrease of about 10 per cent in the number of white and brown cows. In 1913 there was shown to be a remarkable similarity in the percentage of cows and bulls of the different colors, which was not the case in 1886. In 1913 there were only about one-half as many black and white cows as either red or white.

There is at present a tendency to select sires with much white. Of almost 1,000 bulls registered in volume 36 of the Ayrshire Herd Book, published in 1913, 34 per cent were brown and white, 41.93 per cent were white and brown, and 12.64 per cent had the brown restricted to the head and neck.

On the inheritance of an aural abnormality in the Ayrshire cattle, J. YAMANE (*Jour. Col. Agr. Tohoku Imp. Univ., 6 (1915), No. 7, pp. 165–170, pl. 1, figs. 3*).—The author gives an account of the abnormal peculiarity, nicked or notched ears, frequently found in some families of the Ayrshire breed of cattle. This peculiarity is said to have originated in Scotland over 50 years ago, and can be clearly traced in the succeeding generations. This aural abnormality is transmitted in full accord with Mendelian principles, and is a pure dominant as to the well-nicked type but heterozygous as to the slightly nicked type.

Report of committee on legislation and legal limits for the control of milk and cream, A. N. HENDERSON (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 3 (1914), pp. 85–94*).—In a study of the ordinances of 32 cities of a population of 100,000 or more it was found that all these cities require certain milk fat standards, the standard varying considerably in different parts of the country. Twenty-eight of the cities require a minimum temperature standard; 18 require that milk be stored and delivered in the country at the same temperature as in the city, while 10 allow a different temperature.

A bacterial standard is specified by ordinance in 20 cities. These standards vary greatly. A separate standard in six of these cities is specified for pasteurized milk, one city specifying 100,000 and five 50,000 per cubic centimeter. Of those ordinances examined 12 require that all milk sold in the city be produced by animals free from tuberculosis, while four of the cities require that the milk sold be produced from animals free from tuberculosis or the milk pasteurized in accordance with certain regulations.

Eleven cities are regulating pasteurization by requiring certain degrees of temperature to which milk must be subjected and specifying the length of time and the degree of heat to be maintained. The period of heating in all but two ordinances is based upon a sliding scale of degrees of heat applied and length of heating period, this scale ranging from 160° F. and 2 minutes exposure to 145° and 30 minutes exposure. Of the other 2 ordinances, one requires a temperature of 145° for 20 minutes, the other of 145° for 30 minutes. Six cities require all pasteurizing apparatus to have attached a recording thermometer. Five cities require that pasteurized milk be delivered to the consumer within a specified time, one city allowing 36 hours and the remainder 24 hours within which to deliver. Eleven of the ordinances examined require all pasteurized milk to be labeled. Six cities prohibit repasteurization. One city requires that milk be put through a clarification process before pasteurization.

Six cities specify a minimum score which a farm may receive and be allowed to dispose of milk, one city requiring a 65 per cent score, three 60 per cent, one 50 per cent, and one 40 per cent. Three of the cities are using the score card adopted by the Dairy Division of the U. S. Department of Agriculture, while three are using score cards presumably arranged in part by their respective departments. Four cities specify the lowest score a milk plant may receive, three taking 70 per cent as a minimum, and one 60 per cent. Seven cities require sediment tests, and state in the ordinance the amount of sediment allowed upon a specific cotton disk. Seventeen cities prohibit the sale of dipped milk.

Eighty per cent of the ordinances in cities which have made a reduction of over 40 per cent in the last two years in the death rate from diarrhea and enteritis among children under two years of age are regarded as clear, explicit, and in conformity with advanced methods of dairy sanitation, while only 54 per cent of the ordinances of cities which have made a reduction of less than 40 per cent in the death rate are of this kind. Twenty per cent of the cities in the first group and 31 per cent of those in the second group classify their milk supply. Eighty per cent of the cities in group 1 and 50 per cent in group 2 have a bacterial standard for raw milk, the prevailing standard in group 1 being 200,000 and in group 2 500,000. Forty per cent of the cities in group 1 have a bacterial standard for pasteurized milk, and 18 per cent in group 2, the prevailing standard in both being 50,000 per cubic centimeter.

Sixty per cent of the cities in group 1 and 45 per cent in group 2 require the tuberculin testing of cows supplying milk, or that the milk shall either come from tuberculin tested animals or be pasteurized. Fifty per cent of the cities in group 1 control pasteurization by ordinance, while only 25 per cent of the cities in group 2 do so. Thirty per cent of the cities in group 1 and 4 per cent in group 2 require milk to be delivered within a specified time, the prevailing time limit in group 1 being 24 hours. Thirty per cent of the cities in group 1 and 9 per cent in group 2 prohibit repasteurization. Forty per cent of the cities in group 1 and 18 per cent in group 2 have a minimum score below which no dairy may sell milk. Eighty per cent of the cities in group 1 and 34 per cent in group 2 prohibit the sale of dipped milk.

The iron content of cow milk, F. E. Nottbohm and G. Dörr (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28 (1914), No 9, pp. 417–424*).—Analytical data are given which showed the iron content of the samples tested (determined as Fe_2O_3) to be from 0.03 to 0.13 mg. per 100 cc.

The presence of Bacillus abortus in milk, Alice C. Evans (*Abs. in Science, n. ser., 42 (1915), No 1080, p. 352*).—It has been found that the bacillus of contagious abortion occurs commonly in certified milk in the vicinity of Washington, D. C., and Chicago, Ill. The organism grows profusely on serum agar plates. About 30 per cent of the samples of milk from two certified dairies near Chicago which were plated on serum agar showed this organism to be present in milk at the time of drawing from the udder in numbers varying from 110 to 4,300 per cubic centimeter. In one sample taken from a herd which does not produce certified milk, 50,000 of the *B. abortus* were found per cubic centimeter. This organism grows abundantly in the cream layer, with the formation of acid, but sparingly in milk from which the cream has been removed. Four per cent of lactic acid in the milk does not check the multiplication of *B. abortus* in the cream layer.

A simple test for Bacillus sporogenes in milk and water, J. Weinzirl (*Abs. in Science, n. ser., 42 (1915), No. 1080, p. 353*).—The sample of milk to be tested is placed in a sterile test tube, enough solid paraffin is added to make when melted a layer one-eighth of an inch in thickness, and the tubes are heated at 80° C. for ten minutes. After heating, they are cooled rapidly; this causes the melted paraffin to solidify and form a cover which effectively excludes atmospheric oxygen. The cultures are then incubated at 37° for 24 hours. If *B. sporogenes* is present, it digests the lactose and forms a gas which lifts the paraffin plug.

The test is deemed simple, cheap, and easy of application. When applied to market milk it gave the following results: Ninety samples of 5 cc. of milk each gave 28 per cent positive; 112 samples of 10 cc. of milk each gave 37.5 per cent positive; and 34 samples of 15 cc. of milk each gave 50 per cent positive.

Numbers and efficiency of Bacillus bulgaricus organisms in commercial preparations examined during the period January to June, 1914, Ruth C. Greathouse (*Abs. in Science, n. ser., 42 (1915), No. 1080, p. 352*).—Samples of commercial preparations of *B. bulgaricus*, containing in the case of dry cultures from none to 250,000 living *B. bulgaricus* per gram, in the case of liquid cultures from 2,300 to 320,000,000 per cubic centimeter, and in the case of sour milk drinks from 800 to 790,000,000, were examined.

The maximum acidity produced in milk by the *B. bulgaricus* in these preparations varied from 1.2 to 3.41 per cent of acid, calculated as lactic. The ability of the *B. bulgaricus* to produce acid was decreased in the old preparations. The amount of decreases averaged 38.5 per cent in the case of dry cultures kept on ice for two months and 26.4 per cent in the case of liquid preparations kept on ice for two weeks.

The determination of bacteria in milk, S. H. AYERS (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 3 (1914), pp. 137–143*).

Utensils as a source of bacterial contamination of milk, M. J. PRUCHA, H. A. HARDING, and H. M. WEETER (*Abs. in Science, n. ser., 42 (1915), No. 1080, p. 353*).—In studies to determine the amount of bacterial contamination received by the milk from the utensils in which it was handled between the cow and the milk bottle, the utensils being carefully washed in the ordinary way, it was found that where all the utensils were sterile, the milk leaving the barn contained 2,588 bacteria per cubic centimeter and the bottled milk 3,875. Where the utensils were washed and only the bottles were sterile there were increases due to pails of 57,077, up to the clarifier of 15,353, due to the clarifier of 172,763, due to the cooler of 19,841, and due to the bottler 247,611.

Bottle washing costs (*Cream. and Milk Plant Mo., 3 (1915), No. 12, pp. 31, 32*).—From visits to 91 milk plants in five cities, the Dairy Division of the U. S. Department of Agriculture found that the cost of labor of washing bottles was on the average 1.9 cts. per 100 bottles for the automatic washing, 4.9 cts. for brush washing, and 9.7 cts. for hand washing. The number of bottles washed per man per hour was 1,044, 342, and 199, and the number of bottles washed per hour 4,196, 1,061, and 433 for the respective methods.

The Grana cheese-making society, J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream., 40 (1915), No. 13, p. 546*).—The methods of making Grana cheese prescribed by this society are given.

VETERINARY MEDICINE.

Animal experimentation and medical progress, W. W. KEEN (*Boston: Houghton Mifflin Co., 1914, pp. XXVI+312, figs. 12*).—The author here reviews the great advance in the knowledge of diseases of domestic animals and of man and means for their prevention and cure resulting from animal experimentation.

The hygiene and diseases of live stock, P. CAGNY and R. GOUIN (*Hygiène et Maladies du Bétail. Paris: J. B. Baillière & Sons, 1915, 2. ed., pp. 528, figs. 187*).—This semipopular work deals with the hygiene and diseases of the horse, ass, mule, ox, goat, sheep, hog, and dog.

Biological therapeutics, A. EICHHORN (*Amer. Vet. Rev., 47 (1915), No. 2, pp. 214–224*).—A succinct discussion of the topic.

A chapter in applied chemistry, A. A. BOON (*Pharm. Jour. [London], 4. ser., 39 (1914), No. 2670, pp. 836–838; Jour. Soc. Chem. Indus., 33 (1914), No. 24, pp. 1187–1190*).—A brief sketch of the manner in which the application of chemical science to the alilin-dye industry has opened up the way which led to the production of certain arsenicals, as salvarsan, of highly potent and therapeutic properties.

A study of the ninhydrin reaction in relation to the age and habits of individuals, J. TAKAMINE, JR. (*Jour. Amer. Chem. Soc., 37 (1915), No. 4, pp. 946–949*).—Numerous tests with the blood sera of human beings and animals showed the presence of a ferment which is in direct quantitative relation to the age and habits of individuals. The procedure employed was Abderhalden's protective ferment reaction, previously noted (E. S. R., 31, p. 278).

Duration of the infectiveness of virulent rinderpest blood in the water leech, Hirudo boyntoni, W. H. BOYNTON (*Philippine Bur. Agr. Bul. 29 (1914), pp. 14*).—The experiments here reported have shown that the large water leech (*H. boyrtoni*) can retain the virus of rinderpest alive in its body for at least 25 days in a virulent condition. It was found that water in which leeches have disgorged blood by mechanical stimulation or other means, after holding it for a period of five days, will cause rinderpest when drunk by a susceptible animal. Leeches which have died from mechanical or other cause after holding virulent blood for five days are able to transmit the disease when the blood is ingested by a susceptible animal. It was also found that leeches can not transmit the disease to a susceptible animal by feeding on it after they have fed upon an animal suffering from rinderpest. The trypanosome of surra does not remain alive for any length of time in the ingested blood of a leech, and the leech can not transmit the disease by biting. Thus it appears that a leech may be responsible for the appearance of recognizable rinderpest 40 days after imbibing virulent blood. In this period the leech can hold the blood 25 days, to which an incubation period of 10 days may be added.

The action of sodium sulphocyanate in tuberculosis.—XII, Studies on the biochemistry and chemotherapy of tuberculosis, H. J. Corper (*Jour. Infect. Diseases, 16 (1915), No. 1, pp. 38–46*).—"Sodium sulphocyanate is lethal to rabbits when given intravenously in amounts of 0.4–0.6 gm. per kilogram. Delayed death may occur even from smaller amounts.

"When injected intravenously (about 0.4 gm. per kilogram), it is found in the tuberculous tissues in concentration about equal to that in the blood (0.06–0.08 per cent). The concentration in the lungs, heart, kidneys, and testes is not far from that in the blood, the concentration in the liver is less, while it is practically absent from the muscles. It disappears from the tissues (normal and tuberculous) as speedily as it does from the blood (being absent about 5 days after injection). No evidence of a chemical affinity of the sodium sulphocyanate for any of the normal or tuberculous tissues was obtained. Tubercle bacilli, exposed to concentrations of sodium sulphocyanate up to 1 per cent for 48 hours at 37° C. and up to 0.1 per cent for 7 days at 37° were not killed. No evidence even of attenuation was observed."

Sodium tellurite as a rapid test for the viability of tubercle bacilli.—XIII, Studies on the biochemistry and chemotherapy of tuberculosis, H. J. Corper (*Jour. Infect. Diseases, 16 (1915), No. 1, pp. 47–53*).—"As a result of an attempt to use the Gosio vital reaction (sodium tellurite) as an index of life of virulent human tubercle bacilli in bactericidal experiments in connection with chemotherapeutic work, it may be stated that it was not found to be an available general reagent for this purpose, at least by the methods tested. Nevertheless, by its use a simple, rapid test was developed for determining the viability of cultures of tubercle bacilli, of value especially in eliminating such loss of time as may be occasioned by working with dead instead of viable cultures.

"A small lump of the culture to be tested is placed in the cup of a sterile, hollow glass slide and one or two small drops of sterile 0.2 per cent sodium tellurite in distilled water are added; it is covered with a sterile glass cover slip bordered with sterile vaseline and placed in the incubator at 37° C. Life of the organism is indicated by the blackening of the lump of culture, which occurs in from thirty minutes to two hours.

"Sodium tellurite is lethal to rabbits when it is given intravenously in amounts of about 0.8 mg. per kilogram. It does not kill the tubercle bacillus even when in 0.01 per cent concentration in salt solution or glycerol broth for forty-eight hours at 37° C., nor does it inhibit the growth in 0.001 per cent concentration on glycerol agar."

The tuberculin reaction in the pig, Lindner (*Arb. K. Gsndhtsamt., 48 (1914), No. 2, pp. 293–302; abs. in Berlin. Tierärztl. Wchnschr., 31 (1915), No. 14, pp. 162, 163*).—The body temperature of healthy pigs two to three months old is very irregular. Generally speaking, it is said to vary between 39 and

40° C., but at times it is some tenths over this figure. From the fourth month on the temperature gets more regular. It may be between 38.7 and 39.5°, but it never goes over 40° at this time.

Healthy pigs reacted to an injection of 0.1 and 0.3 cc. of old tuberculin (in 10 cc. of physiological salt solution). In 9 out of 48 animals the rise in temperature was more than 1°, but the temperature in no case went over 41°. Sixteen 4 to 6 months' old animals were given 0.02 to 0.05 mg. of the bovine tubercle bacillus culture, and after a lapse of 4 to 8 weeks the animals received either 0.15 cc. of human tuberculin or 0.3 cc. of bovine tuberculin. The animals showed a rise in temperature of 1.1°, and the increased temperature limit vacillated between 40.6 and 42°.

Consequently, a temperature which goes over 41°, that is, a temperature of 1° over that which was observed the night previous, is to be regarded as evidence of tuberculosis in 2 to 4 months' old pigs. In older animals (with a low normal temperature) a temperature over 40.5° is considered positive.

The intracutaneous test was tried on 20 tubercular and 37 nontubercular animals. These were given 0.2 to 0.4 cc. of tuberculin in salt solution, and on the opposite flank 0.2 to 0.4 cc. of glycerol in salt solution. The reaction was positive with 15 out of 20 tubercular animals and in 1 of 37 healthy pigs. The epicutaneous test was positive with 10 tubercular pigs. The ophthalmic test was negative in 16 tubercular pigs.

An attempt to immunize calves against tuberculosis by feeding them the milk of vaccinated cows, W. L. Moss (*Bul. Johns Hopkins Hosp., 26 (1915), No. 293, pp. 241–245; abs. in Jour. Amer. Med. Assoc., 65 (1915), No. 4, pp. 360, 361*).—The author concludes that a relative degree of immunity against tuberculosis may be conferred on calves by feeding the milk of immunized cows.

The presence of so-called "complement" in milk, R. T. Hewlett and C. Revis (*Jour. Hyg.* [*Cambridge*], *14* (*1914*), *No. 4, pp. 481–497; abs. in Jour. Chem. Soc.* [*London*], *108* (*1915*), *No. 628, I, p. 70*).—Milk always contains complementary substance, but this is especially true of colostral and mastitis milks. In the latter amboceptor is also present. No relation between the amount of complementary substance and cellular elements in milk could be found. The hemolytic system is very delicate.

Warble fly experiments, S. Hadwen (*Amer. Vet. Rev., 47 (1915), No. 4, pp. 453–457*).—The author corroborates the observations of Carpenter et al. (E. S. R., 32, p. 680) in finding that the warble-fly larva penetrates the skin of its host. Mention is made of a rash or eruption which is apparently caused by the penetration of the larva, for which the term "hypodermal rash" is proposed. "The eruption begins by an escape of serum which sticks the hair together, then the patch of hair dies and can be pulled off, leaving a raw spot usually about the size of a 10-cent piece, but often larger. In other cases a little pus can be seen in the superficial layers of the skin; again in other cases, edematous swelling occur as large as one's fist, sometimes hard, sometimes soft and diffuse."

Hog cholera and the veterinarian's relation to same, F. B. Whitfield (*Amer. Vet. Rev., 47 (1915), No. 2, pp. 203–213*).—After discussing the channels whereby hog cholera is disseminated, the symptoms of and the methods in vogue for preventing and curing hog cholera are considered. The dosages employed in the simultaneous method are stated.

Some observations on hog cholera and the use of serum, H. P. Hoskins (*Amer. Vet. Rev., 47 (1915), Nos. 1, pp. 46–56; 2, pp. 188–196*).—A discussion of mooted questions in regard to hog cholera and its treatment by the single, double, and follow-up methods. The procedure employed at the Minnesota Experiment Station is described in detail.

Inoculation experiment with pure culture of Spirochæta hyos: Studies on hog cholera, W. E. KING and R. H. DRAKE (*Jour. Infect. Diseases, 16 (1915), No. 1, pp. 54–57, figs. 4*).—As a continuation of previous work (E. S. R., 32, p. 378) it is now reported that some of the difficulties encountered in attempting to obtain pure culture of *S. hyos* have been overcome. By painstaking efforts a pure culture of the Spirochœta was obtained, and when injected into hogs produced typical hog cholera of the acute type.

Protective and curative vaccination tests for hog cholera with shoats, and utilizing the vaccine of Dr. Doyen of Paris, W. PFEILER (*Mitt. Ver. Deut. Schweinezüchter, 22 (1915), Nos. 1, pp. 2–5; 2, pp. 14–16; abs. in Berlin. Tierärztl. Wchnschr., 31 (1915), No. 8, pp. 91, 92*).—According to Doyen, his vaccine can be used for treating "pneumoenterite" (a disease affecting 2 to 3 months' old pigs in France), hog erysipelas, and hog cholera, as well as other infectious diseases. The vaccine was administered in laboratory tests to 8 pigs affected with hog cholera or shoat typhoid, but in no case did it alter the course of the disease, and all the animals died. In addition 54 swine of different sexes and kinds were treated in practice, and here also the results were unsatisfactory. A number (53) of the slaughtered animals showed abscesses at the site of injection.

A preliminary report on the investigation into equine abortion existing in the Province of Ontario, F. W. SCHOFIELD (*Amer. Vet. Rev., 47 (1915), Nos. 3, pp. 310–324; 5, pp. 547–557*).—The objects of this investigation were to determine whether the abortion occurring among the mares in certain parts of Ontario is true contagious abortion, the result of an infection with a specific organism; if contagious abortion, what were the factors involved in the spreading of it from one district to another; and how the disease, when once established, can be controlled and finally eradicated.

Bacillus abortivus equinus was isolated from the uterine discharge of aborting animals. Fixation of complement occurred with *B. abortivus equinus* but not with allied strains, as *B. coli communis* or *B. choleræ suis*. In all districts where abortions have occurred the blood samples indicate that in the majority of cases they were due to *B. abortivus equinus*. Between 70 and 80 per cent of the abortions occurred during the last month of pregnancy. There were five cases in which positive fixation reactions were obtained but in which no abortions occurred.

"The agglutination and complement-fixation reactions parallel each other with great accuracy. In almost all cases of fixation the agglutination titer is high and vice versa. However, a combination of both should be employed to insure greater accuracy. In most cases where the reaction failed to show up the abortion had occurred many weeks and occasionally months previously. . . . Antibodies may still be found in the blood serum of a mare as late as seven months after the abortion.

"Investigation of the outbreaks in this Province seems to indicate that the stallion plays an important part in the spread of the disease. However, further research is necessary in order to justify any of the existing theories of natural infection."

Mixed infection vaccine in one hundred and seventy cases of joint ill, F. W. SCHOFIELD (*Amer. Vet. Rev., 47 (1915), No. 3, pp. 348, 349*).—Bacteriological examinations were made at the Ontario Veterinary College of the synovial fluid of 23 cases of joint ill. From five, all of which occurred in an abortion-infected district, a pure culture of *Bacillus abortivus equinus* was obtained. Ten others gave an almost pure culture of a Gram positive hemolytic streptococcus, while the remaining eight were mixed infections of *B. coli*, *Staphylococcus aureus*, and *S. albus*.

"From these organisms a mixed infection vaccine was made containing approximately the following dosage per cubic centimeter: Streptococcus 50,000,000, *S. aureus* 100,000,000, and *B. abortivus equinus* 100,000,000. The initial dose varied from 0.5 to 1 cc. according to the age and condition of the foal. The dosage rarely produced any local and never any general reaction. The results obtained were very satisfactory."

The vaccine was distributed free to veterinarians, and a total of 170 case reports were received. The mortality in this group was 25 per cent, whereas the average mortality in the Province of Ontario is 66 per cent.

Forage poisoning in horses and mules, R. GRAHAM, L. R. HIMMELBERGER, and R. L. PONTINS (*Wallaces' Farmer, 40 (1915), No. 36, p. 1147, figs. 4*).—The authors report upon investigations conducted during the course of a serious outbreak of forage poisoning in Kentucky. Experimental animals were placed upon a farm where a total loss of $2,000 in horses and mules that had fed on corn and oat hay had occurred. One of two horses was fed upon nothing but suspected corn, the other nothing but suspected oat hay. The horse which was fed upon oat hay contracted and died from the disease. The disease was also produced by feeding oat grain from the oat hay in question and by feeding the oat straw.

The authors state that they have been unable to transmit the disease from sick to healthy animals by blood injections, but they were able to produce it at will by feeding the oat hay.

Diseases of poultry, B. F. KAUPP (*North Carolina Sta. Bul. 233 (1915), pp. 3–27, figs. 9*).—A popular discussion in which the subject is dealt with under the headings of external parasites, internal parasites, and contagious diseases. This is followed by an account of the internal anatomy of the fowl, including a description of the proper way to open and examine the fowl after death.

RURAL ENGINEERING.

The place and field of the agricultural engineer, R. S. SHAW (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 11–18*).—The author is of the opinion that the agricultural engineer should be in close cooperation with the agriculturist so that the engineering principles involved in the work of the former may be made of practical value to the latter. "Agriculture and engineering have always been interdependent, the latter paving the way for the development of the former, which in turn continues to stimulate and sustain the development of the latter."

The place and field of the agricultural engineer, A. MARSTON (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 19–26*).—The author feels that in addition to the fields of salaried and consulting agricultural engineering there is a broader field for the agricultural engineer in contracting for agricultural structures and in the invention, manufacture, and sale of farm machinery and general agricultural equipment.

Surface water supply of Snake River basin, 1912 (*U. S. Geol. Survey, Water-Supply Paper 332–B (1915), pp. 278*).—This report, prepared in cooperation with the States of Idaho and Oregon, presents the results of measurements of flow made on streams in the Snake River basin in 1912.

Surface water supply of lower Columbia River and Rogue, Umpqua, Wilson, and Nehalem rivers, 1913 (*U. S. Geol. Survey Water-Supply Paper 362–C (1915), pp. 246*).—This report, prepared in cooperation with the States of Oregon and Washington, presents the results of measurements of flow made on these rivers in 1913.

Deschutes project, J. T. WHISTLER, E. G. HOPSON, and J. H. LEWIS (*Oreg. Cooper. Work, Dept. Int. U. S. Reclamation Serv., 1914, Dec., pp. 147, pls. 69*).—

This report deals with cooperative work by the U. S. Reclamation Service and the State of Oregon, the purpose of which was to provide detailed surveys and investigations of the water resources of the State, with particular reference to irrigation and power possibilities. The report deals only with the upper Deschutes River basin.

The normal summer minimum flow of the Deschutes River at Bend is approximately 1,600 second-feet. The mean annual run-off at Benham Falls for a period of ten years is 1,210,000 acre-feet, of which approximately 20 per cent is from Crane Prairie. The area now irrigated, or to be irrigated under the Carey Act, north of Benham Falls is approximately 115,000 acres, for which there is available from the summer flow of the Deschutes River, without storage, not to exceed 450,000 acre-feet of water. In addition it is proposed to irrigate under the Carey Act about 30,000 acres of land south of Benham Falls for which storage is planned in Crescent Lake. It is stated that full irrigation development in this basin will require storage of the greater part of the entire remaining supply of over 750,000 acre-feet. Further irrigable areas considered in this investigation are a west side unit of approximately 20,000 acres north of the present State Tumalo project, with an alternative area of approximately 15,000 acres; a north unit of approximately 100,000 acres east of Deschutes River and north of Crooked River; a south unit of approximately 48,000 acres south of the present Central Oregon canal and extending north to Powell Buttes; and an east side unit of 35,000 acres, consisting of the north canal unit of the Central Oregon Irrigation Company.

The duty of water is estimated at from 2 to 2½ acre-feet per acre at the land, and the irrigation season has been estimated to be from early May to early September, with a maximum use of water during July. Storage is proposed of approximately 100,000 acre-feet in Crane Prairie and 400,000 acre-feet in Benham Falls reservoir.

A survey of the soils of the irrigable areas showed them to be generally 16 in. or more in depth. Their physical character with reference to irrigation and cultivation is generally good, but it is stated that their plant food content, particularly with reference to nitrogen, is frequently small. It is estimated that the water supply is adequate for the irrigable areas in question.

It is stated in conclusion that there is a fall in the river between Benham Falls and Bend of nearly 400 ft. available for power development in four separate falls of from 65 to 110 ft. each; that with the domestic water supply of 330 second-feet estimated, it is feasible to develop at these falls 20,000 horsepower continuously throughout the year, with a load factor of 50 per cent; and that with the full irrigation development it will be possible to develop approximately 100,000 horsepower, limited to the period of the irrigating season.

A number of maps and charts accompany the report.

Memorandum on the geology of the ground waters of the island of Antigua, British West Indies, T. W. VAUGHAN (*West Indian Bul., 14 (1914), No. 4, pp. 276–279*).—The geology of the island with reference to the groundwater resources is outlined, and it is concluded that the geologic conditions do not satisfy the requisites for procuring an artesian water supply. It is stated that the only water-bearing formation of importance is the limestone of the limestone district. "The development of an adequate supply may be expected from three sources, viz, (1) shallow wells in the limestone district, (2) shallow wells in the alluvial fillings along stream ways and at the foot of talus slopes in the southwest volcanic district, [and] (3) impounding water, especially in the volcanic district, where it appears there are valleys adapted for damming."

The ground waters of Antigua, H. A. Tempany (*West Indian Bul., 14 (1914), No. 4, pp. 280–303, fig. 1*).—This article summarizes the existing information regarding the chemical and other characteristics of waters from the various sources on the island of Antigua.

It is stated that in the limestone district there are good prospects of obtaining supplies of underground water at suitable points. "The localities at which wells are sunk should be selected with due regard to the following points: (1) They should be situated at not too great a height above sea level so as to avoid having to penetrate unnecessary thickness of rock, (2) they should be situated a sufficient distance within the limestone outcrop to insure that at the point selected the rocks to be penetrated are of adequate thickness and afford a large enough gathering ground, [and] (3) they should be situated at a sufficient distance from the sea to obviate the risk of the supply being contaminated by percolation of sea water. In addition care must be exercised in conducting boring operations to avoid passing through the limestone strata and penetrating the underlying rocks which contain the saliniferous deposits.

"In the southern district of the island there is good prospect of obtaining moderate supplies of water from wells sunk in the alluvial fillings of the valley bottoms, but in choosing sites for such wells it is advisable to avoid approaching too near to the bases of the surrounding hills. In the central plain it is inadvisable to look for a supply of water either by wells or by means of dams erected for the purpose of impounding surface flood water in the region covered by the saline deposits. To the south of this region, however, there appear to be prospects of obtaining satisfactory supplies of water by the sinking of wells, or preferably by the erection of dams."

Measurement of the flow of streams by approved forms of weirs with new formulas and diagrams, R. R. Lyman (*Trans. Amer. Soc. Civ. Engin., 77 (1914), No. 1304, pp. 1189–1281, pls. 17, figs. 53*).—This paper gives the details and summaries of the results of experiments by Francis, Bazin, Fteley, and Stearns, and of experiments at the hydraulic laboratories of Cornell University and the University of Utah. The purpose of the report is "to present a more accurate method of measuring water than those generally used and to give formulas and diagrams for determining the discharge over the weirs recommended."

It is the author's opinion "that the sharp-crested weir without end contractions can certainly be used to best advantage in all irrigation projects, great and small, of the West."

Formulas of the form $Q = m\,h^n$ were prepared for four different classes of weirs without end contractions as follows: Sharp-crested weirs, broad-crested weirs, irregular weirs with cross sections of right lines, and irregular weirs with cross sections of right lines and curves. In this formula Q designates the quantity discharged over a weir in cubic feet per second per foot of length of weir, and h designates the observed head of water on a weir in feet. The values of the constants m and n as obtained by experiment are given in tabular form.

A large amount of other related data are also given.

Stream-gaging stations and publications relating to water resources, 1885–1913, Parts XI–XII, compiled by B. D. Wood (*U. S. Geol. Survey, Water-Supply Paper 340 (1915), K, pp. XXIV+131–146; L, pp. XVIII+147–195*).—These are the last two numbers of this series (E. S. R., 33, p. 89). Part XI deals with Pacific coast basins in California and Part XII with the north Pacific slope drainage basins.

Experiments with the divining rod, H. Metzger (*Gsndhts. Ingen., 38 (1915), No. 2, pp. 13–15*).—A test of the use of the divining rod for determining the location and depth of underground water supplies is described. Seven wells were located, and the depths predicted by the operator of the divining rod varied only slightly from the actual depths to water. The operator was the only one who was able to obtain results with the rod, and while the author admits that in this case its use was not only successful but economical he expresses some doubt as to the safety of depending in general upon such means for locating water.

Investigations on the filtration of drinking water.—I, On the theory of slow sand filtration, K. Kisskalt (*Ztschr. Hyg. u. Infektionskrank., 80 (1915), No. 1, pp. 57–64, fig. 1*).—Experiments to determine the cause of the purifying effect of slow sand filtration on water are reported.

The results indicate that this effect can not be entirely attributed to the mechanical removal of dangerous organisms and contaminating matter by the filter and the surface scum. The use of disinfectants, such as potassium cyanid, which destroy protozoa and do not injure the bacteria almost completely destroyed the effect of a filter. It is thought, therefore, that much of the purifying effect of slow sand filtration can be attributed to the protozoa.

Sterilization of water by chlorin, J. J. H. Nelson (*Brit. Med. Jour., No. 2836 (1915), pp. 789–793, figs. 2*).—The methods and apparatus used for the sterilization of small drinking water supplies by the use of chlorin are described and experiments with this method using artificially contaminated water and natural water are reported.

The chlorin was obtained from potassium chlorate and concentrated hydrochloric acid and was used in the experiments in the strengths of 1 part chlorin solution to about 500,000 parts water.

It was found that water artificially contaminated with *Bacillus typhosus*, *B. paratyphosus* A, and *B. choleræ* was rendered safe by this treatment after a contact of one-half hour. Natural waters were also successfully treated. The author advocates the use of the chlorin in a strength of, roughly, 1 in 500,000 parts of water and states that chlorin used in this strength does not impart any objectionable taste to the water.

This method is considered to be particularly adapted for domestic use and for camps and troops in the field. An apparatus for domestic use is described and illustrated.

Purification of drinking water by calcium hypochlorite, H. Vincent and Gaillard (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 15, pp. 483–486*).—This article states that calcium hypochlorite is effective, rapid, and safe for the purification of drinking water. Active chlorin to the amount of 3 mg. per liter of water is considered sufficient. This may be given in a mixture of 0.015 gm. of hypochlorite of calcium and 0.08 gm. of pure sodium chlorid. The addition of the sodium chlorid, it is stated, favors the rapid diffusion and dissolution of the active chlorin in the water to be purified.

Sterilization of drinking water with chlorid of lime in the field, G. Wesenberg (*Hyg. Rundschau, 25 (1915), No. 8, pp. 273–286, fig. 1*).—Experiments on the sterilization of drinking water in the field are reported.

It was found that chlorid of lime added in a quantity corresponding to 0.15 gm. of active chlorin per liter of water is sufficient to kill infectious organisms within ten minutes. The use of increased quantities of chlorid of lime is recommended for water with a high content of contaminating organic matter, but it is considered necessary in such cases to filter the water before treatment to remove the coarsest matter. The addition of substances setting free hydrogen peroxid was found to form harmless combinations with the chlorid of lime and to remove any disagreeable taste. The composition of the water, aside from a slight increase in turbidity and hardness, was not influenced by such treatment.

In chemical studies of the fixation of chlorin by mud in water, it was found that this power differed with different mud samples, but was mainly dependent on the concentration of the chlorid of lime solution. Large increases in the amounts of chlorid of lime used only slightly increased the fixation, and in greater dilutions the same quantity of mud fixed a smaller amount of chlorin from the same quantity of chlorid of lime. The soluble parts of the mud were as active in chlorin fixation as the insoluble parts.

Practical irrigation and pumping, B. P. FLEMING (*New York: John Wiley & Sons, 1915, pp. XVI+226, figs. 62*).—This is a semitechnical treatise on irrigation pumping, it being the author's purpose "to consider the irrigation problem chiefly from the pumping standpoint, treating of those matters which interest the man considering the installation of a small pumping plant from both the standpoints of design and operation."

Beginning with estimates of the water requirements of different crops on different soils and in different localities, the author takes up in turn the matter of wells and well sinking; pumps and pumping machinery suitable for different depths and volumes, together with typical designs for certain assumed conditions; prime movers, including a discussion of oil engines, gas producers, etc.; windmill irrigation, chiefly from the standpont of the co-relation between wind velocities and pump size; the question of cost and profit in pumping and a method of estimating the latter for certain conditions; and, finally, the central station plant and its possibilities.

Irrigation pumping in the coast States (*Elect. World, 65 (1915), No. 22, pp. 1399–1408, figs. 30*).—This article summarizes the progress made on the Pacific coast in the use of electricity for irrigation pumping.

Results of experiments with machine irrigation at the Bezenchuk and Kostychev experiment stations, I. BIELIAEV (*Selsk. Khoz. i Liesov., 245 (1914), June, pp. 247–260, figs. 2*).—Experiments with so-called machine irrigation in arid portions of southeast Russia are reported.

Two so-called irrigation wagons were used. The first consists of a pipe 6 meters long supported by two wheels which may be moved and fastened along the pipe according to the crop to be irrigated. At each side of the pipe are branches fitted with spray nozzles. As many as fifteen such wagons may be joined into one chain. The second device consists of a four-wheeled iron wagon with the water pipe fastened onto a platform. It branches into three pipes of smaller diameter which slant upward and are connected to a horizontal pipe 14 meters long. These pipes carry five spraying nozzles which irrigate about 200 square meters (about 2,153 square feet) from one position of the machine.

At the Bezenchuk experiment station spring wheat and alfalfa were irrigated. The wheat was given 10 and 20 irrigations of 5 mm. each at intervals of 8 and 4 days, respectively. The alfalfa was given 20 and 15 irrigations of 10 and 20 mm. of water at intervals of 4 and 6 days, respectively.

At the Kostychev experiment station the crops irrigated were wheat, oats, millet, flax, and potatoes. The first three crops received 16 and 8 irrigations at intervals of 5 and 10 days, respectively, the wheat receiving 5 mm., the oats 10 mm., and the millet 10 and 5 mm. of water at an irrigation. The flax received 16 irrigations of 10 and 5 mm. at intervals of 5 days, and the potatoes 16 and 8 irrigations of 10 and 5 mm. at intervals of 5 and 10 days, respectively.

The results of the experiments were positive in all cases, but it was shown that the application of small individual amounts of water (5 mm.) gave negligible increases in crop even at frequent intervals, while larger amounts of water (10 mm.) increased the yield of oats 22 per cent and millet 21 per cent.

It is stated with reference to this method of irrigation that the manipulation of movable irrigators requires much time, care, and power. This method of so-called "rain pouring" encounters a great obstacle in the wind, it being found that to limit irrigation to nonwindy days gives poor results, while on windy days the loss of water is about 30 per cent.

Conservation of water by storage, G. F. Swain (*New Haven, Conn.: Yale University Press, 1915, pp. XVII+384, pls. 2, figs. 89*).—This book presents a course of lectures on water conservation by storage. The first chapter is devoted to the general subject of conservation. The next four chapters are devoted to the relation of the conservation of water to the conservation of other resources and to a somewhat lengthy discussion of the water-power question, reference being made to questions of federal control of water powers. Succeeding chapters deal with the technical aspects of water power development, the relation of forests to stream flow, and floods and their prevention.

With reference to the relation between forests and stream flow, the author is of the opinion that forests act as equalizers of the flow of streams by diminishing in general the frequency and violence of the freshets and increasing the low-water flow. "We should exercise discrimination in the utilization of our lands, cultivating for growing crops those which are best suited therefor, and reserving for forests the steep slopes and mountain sides and other areas unsuited for cultivation of crops. . . . There seems no question that forests do regulate flow, and that upon steep mountain sides especially they exercise a restraining effect upon run-off, and that they also in such locations are of inestimable benefit in preventing erosion of the soil. . . . Forests undoubtedly do something in this direction, but even if the entire country were covered with forests, it is probable that at times there would be extreme floods which would do great damage."

Hints on irrigation: Small earthen storage reservoirs, W. M. Watt (*Rhodesia Agr. Jour., 12 (1915), No. 2, pp. 172–185, fig. 1*).—The author describes reservoir and dam construction and the use of weirs under Rhodesia conditions for the benefit of irrigation farmers.

Multiple-arch diversion dam at Three Miles Falls, Oregon, H. D. Newell (*Engin. News, 73 (1915), No. 21, pp. 1009–1012, figs. 4*).—This article describes the construction of a long, low multiple-arch reinforced concrete dam on the Umatilla Project of the U. S. Reclamation Service.

Tour of West discloses best practice in irrigation and power canal design, C. A. Farwell (*Engin. Rec., 71 (1915), No. 20, pp. 623, 624*).—This article reports an extended study of a number of irrigation and power projects in the West to learn costs and to determine the best practice in the design and construction of concrete linings for large canals.

It is pointed out that slopes and lining thicknesses should depend on the nature of local conditions and material encountered. Small deviations in alignment and cross section are considered immaterial. See also a previous note by Fortier (E. S. R., 32, p. 380).

Transmission losses in unlined irrigation channels, S. Fortier (*Engin. News, 73 (1915), No. 22, pp. 1060–1063, figs. 3*).—The author discusses the various factors influencing seepage, referring particularly to capillarity, depth of water in the canal, velocity, sedimentation, and temperature of soil and water. He disagrees with the opinion of Moritz (E. S. R., 30, p. 288) that the rate of percolation of water through canal banks varies directly as the depth of water in the canal, and briefly summarizes the results of a large number of seepage measurements on canals to substantiate his argument.

Capillarity is considered to be an important factor in connection with seepage, and the gradual deposition of silt is thought to reduce seepage materially.

"The influence of velocity is relatively small. This is chiefly due to the fact that sediment can not be deposited when the mean velocity exceeds a rather low limit. Of the two factors, sedimentation and velocity, the former exerts the greater influence in lessening seepage losses, so that any increase in velocity which tends to prevent sedimentation is detrimental rather than beneficial."

A report along similar lines by the author has been previously noted (E. S. R., 32, p. 380).

How to express seepage losses from irrigation canals, S. Fortier (*Engin. News, 73* (*1915*), *No. 23, pp. 1128, 1129*).—The author contends that seepage losses expressed in feet-depth over the wetted area in a given time should be confined to flooded areas on irrigated fields, reservoirs, checked-up water courses, and, in general, to water surfaces where the loss can be measured direcently, and not to water in motion. Instead, he advocates that seepage losses be expressed as percentage loss of flow.

In pursuing this course, it is stated that the engineer should carefully study all conditions which are likely to affect the escape of water from the canal. "These should include the amount of sedimentation per season and its effect on the character of the material, the tendency to scour under high velocities, fluctuations in depth, velocity and extent of wetted surface, inflow of seepage water from higher irrigated lands, evaporation from wet banks and water surfaces, transpiration from tree growths, leaks from structures, aquatic vegetation, the temperature of the water carried as well as that of the soil, and the location of the water table either beneath or adjacent to the canal. After a comprehensive study of existing and possible future conditions, together with all of the available data pertaining to the seepage losses from canals of like capacity traversing materials of like character as regards porosity, he will be in a position to estimate with reasonable accuracy the percentage of loss due to seepage, which may be expressed either in second-feet per mile or in percentage of the flow per mile."

Methods of plaster lining irrigation canals and laterals, Okanogan project, U. S. Reclamation Service (*Engin. and Contract., 43* (*1915*), *No. 20, pp. 441–443*).—This paper discusses methods of construction, cost, and efficiency of plaster lining for irrigation canals and laterals. From observations of the lining done on the Okanogan project, it is stated that the seepage loss in lined sections has been very small. The lining has cost from 5.1 to 6.4 cts. per square foot.

The use, design, construction, cost, and durability of wooden stave pipe, A. Swickard (*Engin. and Contract., 42* (*1914*), *Nos. 19, pp. 422–424, figs. 2; 23, pp. 516–519; 43* (*1915*), *Nos. 1, pp. 10–14, figs. 2; 7, pp. 146–148, figs. 4; 22, pp. 483–486, figs. 9*).—This article, in five parts, deals with the uses and misuses, durability, design, and cost of wooden stave pipe, and with construction, organization, and methods. Considerable working data for use in design and construction are given.

Tests of submerged orifice head gates for the measurement of irrigation water, F. L. Bixby (*New Mexico Sta. Bul. 97* (*1915*), *pp. 3–55, figs. 12*).—This bulletin, based on work done under a cooperative agreement between the station and the Office of Experiment Stations of the U. S. Department of Agriculture, reports investigations the main purpose of which was to calibrate a submerged orifice and prepare tables for its use in measuring water for irrigation.

The submerged orifice used in the tests was an ordinary sliding head gate, the opening of which was entirely submerged. The orifice box consisted of a wooden flume 7 ft. long, 3 ft. wide, and 2.5 ft. deep, with one side so constructed as to be readily moved, thus facilitating the regulation of the width of orifice. The gate was located 2.5 ft. from the upstream end of the flume.

The orifice opening had the contraction suppressed on three sides, the bottom edge of the gate giving complete contraction.

Two sets of tests were conducted, one in which there was velocity of approach and another in which the velocity of approach was eliminated. Three hook gages were used. In the first series of tests gage G_2 was placed 1.75 ft. upstream from the plane of the orifice gate. The second gage, G_3, was placed on the downstream side of the gate, but outside of the flume. In the second series of tests the velocity of approach was eliminated from the observation by placing a third gage, G_1, in a stilling basin attached to the side of the flume. Three widths of opening, 1.5, 2, and 3 ft., were tested, and the height of opening varied for each width from 0.1 to 0.5 ft. From the data obtained in the first series the following standard equations were deduced for velocity of approach:

Equations for velocity of approach, series G_2–G_3.

	Opening.	Equations as obtained.	Standard form.
1.5 ft. orifice	0.1 ft.	$H=1.5910\,Q^{1.9992}$	$Q=0.658A\sqrt[1.999]{2gh}$
Do	.2 ft.	$H=.3557\,Q^{2.0277}$	$Q=.712A\sqrt[2.0277]{2gh}$
Do	.3 ft.	$H=.1332\,Q^{2.0217}$	$Q=.768A\sqrt[2.0217]{2gh}$
Do	.4 ft.	$H=.0569\,Q^{2.1688}$	$Q=.916A\sqrt[2.1688]{2gh}$
Do	.5 ft.	$H=.0310\,Q^{2.1874}$	$Q=.972A\sqrt[2.1874]{2gh}$
2 ft. orifice	.1 ft.	$H=.8512\,Q^{2.0100}$	$Q=.682A\sqrt[2.0100]{2gh}$
Do	.2 ft.	$H=.1941\,Q^{2.0580}$	$Q=.733A\sqrt[2.0580]{2gh}$
Do	.3 ft.	$H=.0771\,Q^{2.1370}$	$Q=.788A\sqrt[2.1370]{2gh}$
Do	.4 ft.	$H=.0293\,Q^{2.2900}$	$Q=.947A\sqrt[2.2900]{2gh}$
Do	.5 ft.	$H=.0157\,Q^{2.2040}$	$Q=.996A\sqrt[2.2040]{2gh}$
3 ft. orifice	.1 ft.	$H=.4250\,Q^{1.9875}$	$Q=.631A\sqrt[1.0875]{2gh}$
Do	.2 ft.	$H=.0925\,Q^{2.0347}$	$Q=.694A\sqrt[2.0347]{2gh}$
Do	.3 ft.	$H=.0350\,Q^{2.0824}$	$Q=.752A\sqrt[2.0824]{2gh}$

From the data obtained in the second series of tests the following standard equations of flow were deduced:

Equations for no velocity of approach, series G_1–G_3.

	Opening.	Equation as obtained.	Standard form.
1.5 ft. orifice	0.1 ft.	$H=1.5911Q^2$	$Q=0.659A\sqrt{2gh}$
Do	.2 ft.	$H=.3630Q^2$	$Q=.690A\sqrt{2gh}$
Do	.3 ft.	$H=.1412Q^2$	$Q=.738A\sqrt{2gh}$
Do	.4 ft.	$H=.0715Q^2$	$Q=.780A\sqrt{2gh}$
Do	.5 ft.	$H=.0434Q^2$	$Q=.798A\sqrt{2gh}$
2 ft. orifice	.1 ft.	$H=.8406Q^2$	$Q=.680A\sqrt{2gh}$
Do	.2 ft.	$H=.2108Q^2$	$Q=.679A\sqrt{2gh}$
Do	.3 ft.	$H=.0877Q^2$	$Q=.702A\sqrt{2gh}$
Do	.4 ft.	$H=.0389Q^2$	$Q=.805A\sqrt{2gh}$
Do	.5 ft.	$H=.0203Q^2$	$Q=.875A\sqrt{2gh}$
3 ft. orifice	.1 ft.	$H=.4260Q^2$	$Q=.638A\sqrt{2gh}$
Do	.2 ft.	$H=.0948Q^2$	$Q=.676A\sqrt{2gh}$
Do	.3 ft.	$H=.0380Q^2$	$Q=.710A\sqrt{2gh}$

A value of $\sqrt{2g}=8.02$ was used in all computations. Q=discharge in cubic feet per second, h=effective head in feet, and A=area of opening in square feet.

Discharge tables for both conditions computed from these formulas are included and a working drawing with bills of materials for the submerged orifice adapted to field use is given.

"In order that the results derived from this investigation, however, be put into practical use it is necessary to follow instructions as to proper installation of the orifice head gate or erroneous results will be obtained. . . . In making a field installation the head gate must be installed in such a manner as to provide a stilling pond above the flume. This can be best accomplished by making the ditch wider at this point and the bottom of the ditch slightly below grade. The orifice flume must be leveled in both directions and it should be well puddled into place to prevent leakages along the sides of the flume and consequent washouts. Cut-off walls are placed on the upstream end of the flume and an apron placed on the downstream end to assist in preventing the undermining of the flume."

Irrigation in Nebraska, H. C. Diesem (*Bien. Rpt. Bd. Irrig. Nebr., 10 (1913-14), pp. 24-204*).—This report deals with the present status of irrigation in Nebraska, discussing particularly the physical and financial condition of the various irrigation enterprises in the State.

Topographically the State is divided into three regions, namely, the loess, sand hill, and high plains regions. Most of the irrigation practice occurs in the high plains region. "The rainfall in the eastern half of the State is usually sufficient to produce crops and irrigation is not practiced, but in the western third or possibly half of the State, farming without irrigation is a hazardous undertaking. Generally the direct flow during the spring and early summer months of the streams located in the western part of the State greatly exceeds the demand for irrigation, but in the later summer months it rapidly diminishes and is inadequate for the acreage now under irrigation canals. . . .

"Approximately 2,000,000 acre-feet of water flow from the semiarid portions of the State each year as follows: Hat Creek 50,000, White River 100,000, Niobrara River 500,000, Plate River, less 1,070,000 acre-feet stored in Pathfinder dam, 930,000, [and] Republican River 400,000 acre-feet. . . .

"A good water supply can be obtained in all of the valleys of the different streams in the western portion of the State at depths ranging from a few feet to about 40 feet. The depth of the water is fairly uniform in each valley, but increases rapidly upon ascending the table lands, where it may be found to vary in the same locality. . . .

"There is no Carey Act project within the State, and with the exception of the Interstate Canal, built and operated by the U. S. Reclamation Service, all the canals in the State are operated under the following organizations: (1) Individual or partnership ownership, (2) mutual irrigation companies, . . . (3) stock companies, . . . [and] (4) irrigation districts."

Tenth biennial report of the state board of irrigation, highways, and drainage to the governor of Nebraska (*Bien. Rpt. Bd. Irrig. Nebr., 10 (1913-14), pp. 356, pls. 34, fig. 1*).—This report covers the operations of the board for the two years ended September 1, 1914. The section on irrigation in Nebraska, by H. C. Diesem, is noted above.

Fifth biennial report of the state engineer, J. H. Lewis (*Bien. Rpt. State Engin. Oreg., 5 (1913-14), pp. 88, pls. 5, figs. 16*).—This report deals with the activities of the state engineer's office during the biennial period ended with November, 1914, which consisted, among other things, of water power and irrigation development.

Report of the Desert Land Board (*Bien. Rpt. Desert Land Bd.* [*Oreg.*], *3* (*1913–14*), *pp. 43, figs. 11*).—This report covers the reclamation of arid lands granted to the State of Oregon under the Carey Act, and includes a brief account of the activities of the board, together with a statement of the progress and condition of each project segregated by the State.

Report of commissioner for water conservation and irrigation, L. A. B. WADE (*Rpt. Comr. Water Conserv. and Irrig.* [*N. S. Wales*], *1913–14, pp. 188, pls. 13*).—The work and expenditures on water conservation and irrigation during the year ended June 30, 1914, are reported.

Notes on the design of drainage ditches, with diagrams, W. H. POE (*Engin. and Contract., 43* (*1915*), *No. 20, pp. 439–441, figs. 2*).—The author outlines the method used by him in the design of open ditches and gives several related suggestions gained from personal experience.

Construction and maintenance of roads and bridges from July 1, 1913, to December 31, 1914 (*U. S. Dept. Agr. Bul. 284* (*1915*), *pp. 64*).—This bulletin reports in detail the field work of the divisions of construction, maintenance, and national park and forest roads of the Office of Public Roads for the past fiscal year, and is a continuation of the report for the previous year (E. S. R., 30, p. 386).

The first section reports on the construction of sections of cement concrete, bituminous macadam, bituminous resurfaced, macadam, chert macadam, gravel, sand, clay, topsoil, and earth roads, and on the superintendence of construction of brick, gravel, earth, bituminous concrete, macadam with bituminous surface, macadam, and gravel roads. This section also includes brief reports on experimental work with limestone macadam resurfacing, post-road work, and bridge work.

The second section reports on road survey and construction work in national parks and forests done in cooperation with the Forest Service of this Department and with the Department of the Interior.

The third section reports projects for the study of the details of road maintenance as carried out by state authorities in representative States and of county maintenance in selected counties, the inauguration of mainenance of post roads constructed under the act of Congress of August 24, 1912, and the supervision of maintenance on a road from Washington, D. C., to Atlanta, Ga., in Alexandria County, Va., and on the United States experimental roads in Montgomery County, Md.

First annual report of the State Highway Commission of the State of Maine (*Ann. Rpt. Highway Com. Maine, 1913, pp. 138, pls. 13, figs. 5*).—This contains a report of the work of the commission during 1913 in addition to the ninth annual report of the commissioner of highways from January 1 to July 12, 1913.

Economical highway design, W. G. HARGER (*Engin. News, 73* (*1915*), *No. 24, pp. 1156–1158*).—Data on the first cost and maintenance of 600 miles of New York State roads are given. Conclusions based on these data with reference to economy in highway design are as follows:

"Justifiable economy in grading is limited to the treatment of intermediate grades and to variations in cross section to fit local conditions. Economy in foundation is properly secured by a variation in design utilizing the local sources of supply with short hauls. Economy in widths of hard paving is attained by the selection of varying widths that will serve each road or part of a road satisfactorily, and by special shoulder treatment. Economy in top courses results from a selection of the minimum thickness and the type of surface that will serve satisfactorily the class of traffic to which it is subjected. Economy of maintenance is attained by preventing damage rather than repairing damage."

Some maintenance costs, P. MACY (*Cornell Civ. Engin., 23 (1915), No. 8, pp. 506–512*).—This article gives maintenance cost data for several types of roads in New York.

Treated wood-block paving, W. G. MITCHELL (*Dept. Int. Canada, Forestry Branch Bul. 49 (1915), pp. 40, pls. 2, figs. 18*).—This is a compilation of the information at present available from researches made in different countries in regard to the use of wood for paving. A bibliography is appended.

Concrete highways, G. W. MYERS (*Cornell Civ. Engin., 23 (1915), No. 8, pp. 486–492*).—The author presents certain observations based upon recently acquired personal experience in the construction of concrete roads. A table giving comparative cost data on the construction and maintenance of concrete and macadam roads shows the concrete to be considerably the cheaper.

Economy of small farm gas engines, D. P. DAVIES (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 73–80, figs. 7*).—Experiments with three farm internal combustion engines, rated at 1½, 6, and 10 horsepower, with reference to fuel consumption at varying loads, are reported. All three engines were horizontal hopper-cooled, the two larger sizes being identical in design, while the smaller differed in form of combustion chamber and location and type of ignition.

It was found that all the engines developed the best fuel economy not at maximum load, but at a load approximately 67 per cent of the maximum. All the engines carried the maximum load without signs of distress. The point of greatest fuel economy coincided with the load where the governor cut out every other explosion stroke. "It is possible that this condition has a scavenging effect on every explosion stroke taking place, resulting in a higher mean effective pressure for a given amount of fuel."

Internal-combustion engine dimensions, H. L. WATSON (*Power, 41 (1915), No. 20, pp. 672–674, fig. 1*).—A chart for graphically determining the speed, bore, and stroke for a given type and size of internal-combustion engine according to American practice is given.

Electricity as a factor in progressive agriculture, E. P. EDWARDS (*Trans. N. Y. Elect. Soc., No 14 (1912), pp. 24, figs. 51*).—The object of this paper is "to point out the possible, as well as the probable, advantages that will accrue to the farmer and the country at large through the comprehensive use of electricity by the agricultural community."

Tabular data are given of tests on electrically operated farm machines, showing, among other things, the operating cost, including interest, depreciation, and labor, with the cost of electricity at from 1 to 10 cents per kilowatt-hour.

Draft of wagons, E. B. MCCORMICK (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 84–110, figs. 28; Engin. Rec., 71 (1915), No. 9, pp. 265, 266*).—In this article the traction dynamometer designed by the author for the Office of Public Roads of this Department is described and illustrated, and results and conclusions drawn from data obtained from its experimental use are reported.

A brief description of the instrument and its operation is as follows: The instrument is attached to a standard city dray equipped with eight sets of wheels having tires varying from 1⅝ to 6 in. in width. The frame of the instrument is suspended rigidly from the bed of the wagon. Two coil springs, through which the power is transmitted, are in the line of draft from the tongue. The tongue slides freely in its guides and is attached to the traction rod of the dynamometer. As this traction rod is moved forward by the pull on the tongue, the springs are compressed an amount corresponding to the draft exerted. This compression is transmitted through a rack and gear to a ribbon wheel, which through a steel ribbon, permits the record point to be moved by a coil spring which is in tension and which is attached to the other end of the guide carrying the needle point. A roll of sensitized paper 10 in. wide and some 100 yds. in length is fed through rolls which derive their motion from a sprocket wheel on the hub of one of the rear wheels. The reduction of motion is such that each inch of paper traveled represents 22 ft. of road travel, or 240 in. to the mile.

It is pointed out as a result obtained from the use of this instrument that light grades are of more importance for good hard roads than for those with a soft surface. Tests showed a greater proportional extra draft for starting a load on hard roads than on soft.

The tests from which the records shown in this article were taken gave the following drafts in pounds per ton on the different roadways: Hard dirt, 106.4; sheet asphalt, 50; block asphalt, 52; Belgian block, 47; and loose sand, 315.

With reference to the effect of tire width on the draft, the author is of the opinion "that there is a definite law by which the cumulative effect of the width of tire may be measured, and that this law is the equation of a true parabola, the constants of which vary with the road material. This variation may be sufficient to change the constants for a given width of tire to such an extent that the curve will be convex upward for one material and convex downward for the other." It was also found that the increase in draft on grades is about 20 lbs. per ton of load per cent of grade, irrespective of the road material or its condition or of the tire width.

"As the increased draft is a constant, and as the draft for the level varies with the road surface, it is evident that the importance of grade elimination depends upon the material of which the road is to be constructed. Referring to the figures previously given for drafts of a wagon on various materials, it will be seen that as 315 lbs. is necessary to haul a ton on a loose sand road, it will require a grade of over 15 per cent to double the draft; in the case of a hard dirt, a grade of over 5 per cent will be required, while in the case of sheet asphalt a grade of 2½ per cent will double the draft, while but slightly over 2 per cent is required on a road constructed of Belgian block."

Plowing investigations by the West of Scotland Agricultural College (*Impl. and Mach. Rev., 41 (1915), No. 481, p. 72*).—The results of tests of the relative merits of the swing and digger plow, as measured by the yield of oats grown on plats plowed by the two plows, were in favor of the swing plow. It is stated, however, that on account of the dry weather the results are inconclusive. In comparing the work of the two plows, it is stated that "from an economical point of view the digger plow is far ahead of the swing."

The rotary tiller or soil milling machine, M. PATITZ (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 57–69, figs. 4*).—A description is given of the mechanical details of the rotary tiller as it is being developed by manufacturing interests in this country.

Practical implements and machines for potato cultivation, STRECKER (*Maschinen Ztg., 13 (1915), No. 5, pp. 17–23, figs. 28*).—This article describes and illustrates several types of potato planting and cultivating implements.

Experiments with steel wires, A. J. WERTH (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 33 (1915), No. 5, pp. 76–80, figs. 2*).—Experiments on Schleswig-Holstein moors showed that steel wire frames were satisfactory for beans and peas.

A comparison of the King and Rutherford systems of barn ventilation, L. J. SMITH (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 42–54, figs. 3*).—The well-known King system of barn ventilation and the so-called Rutherford system which is extensively used in the Canadian Provinces are described and compared.

In contrast to the King system, the Rutherford system allows fresh air to enter at the floor and to leave at the ceiling or roof by means of flues. "The total area of the outlet flues in the Rutherford system is made twice the total area of the intake flues. In other words, 16 or more square inches of outtake flue is allowed for each cow, and 20 or more per horse, depending on the height of the flues. Thus it is figured that a good deal of the fresh air entering the stable comes in around the doors, windows, etc. . . .

"The size of outlets is of some importance; they must be neither too small nor too large. Two to 2½ sq. ft. area is about right."

It is stated that for Canadian Northwest conditions the Rutherford system has proved superior to all others.

A plan for a small dairy house, E. KELLY and K. E. PARKS (*U. S. Dept. Agr., Farmers' Bul. 689 (1915), pp. 4, figs. 4*).—This points out briefly the requirements of a dairy house and outlines the construction and equipment of a small dairy house 20 ft. long, 10 ft. wide, 8½ ft. high in front, and 6½ ft. high in the rear. Some of the routine work of the dairy house is also briefly discussed. See also a previous article along similar lines by Webster (E. S. R., 19, p. 977).

Concrete silos (*Assoc. Amer. Portland Cement Manfrs. Bul. 21, rev. (1915), pp. 64, figs. 36*).—This pamphlet gives general information and specific structural data for use in the planning and construction of concrete silos, much of which has been compiled from bulletins of this Department and the state experiment stations.

Architectural problems of the farmhouse, W. A. ETHERTON (*Trans. Amer. Soc. Agr. Engin., 8 (1914), pp. 111–139*).—The author discusses briefly the main architectural factors making for utility, stability, and beauty in the farmhouse.

Homemade septic tank for the disposal of farm sewage, J. W. STARK (*Brampton, Ont.: Dept. Agr. Peel Co. Branch, 1915, May, pp. 8, figs. 4*).—A brief description of a small septic tank for farm use is given in this circular.

Remodeling of septic tanks into Imhoff tanks eliminates odors from land irrigation (*Engin. Rec., 71 (1915), No. 24, pp. 747, 748, figs. 3*).—A nuisance caused by the irrigation of land with septic sewage from two shallow concrete septic tanks was abated by introducing the two-story feature of the Imhoff tank by providing two wooden flowing-through chambers, thus largely preventing septic action and subsequent unpleasant odors. The difficulty seems to have been produced not so much from the odors rising directly from the tanks as from the liberated sulphureted hydrogen gases released from the septicized sewage after the latter had been spread out over the adjoining farms.

Practical cold storage, M. COOPER (*Chicago: Nickerson & Collins Co., 1914, 2. ed., pp. 802, pl. 1, figs. 273*).—This is the second edition of this work (E. S. R., 17, p. 920). It is stated in the preface that "since the appearance of the first edition . . . comparatively few improvements and changes have been made in practical applications of refrigeration, and development has been largely along the lines of perfecting and improving methods and systems already introduced. Many new applications of refrigeration have been found, and it has been demonstrated that the use of refrigeration for preventing destructive deterioration of perishable goods, so-called, as well as the controlling of chemical and other processes by supplying the low temperatures often needed, is even at the present time in its infancy."

RURAL ECONOMICS.

The rural-credits movement—danger of drifting, M. T. HERRICK (*Kansas City, Mo.: Missouri Bankers' Assoc., 1915, pp. 20*).—The author criticises the various bills bearing on rural credits that have been before Congress, and suggests that the first legislative step should be to organize land credit by requiring standard licenses and bonds of brokers and real estate agents, and by amending and enacting laws relating to credit institutions. Cooperative credit is deemed a matter for the States and Territories. The new legislation should legalize for cooperative associations everything that may now be done by a corporation, but under such regulations and restrictions as would assure safety for members and all who deal with them. The greatest care should be exercised to establish uniformity among the laws of the different States.

A practical national marketing organization and rural credits system for the United States (*Washington: Govt., 1915, pp. 16*).—In this hearing before the State Department, there was pointed out the workings of the Landwirtschaftsrat, the German national marketing organization, and the Landschaft, the German credit system, and the possibilities of their adaptation and adoption in the United States. It was argued that by means of the former a more equitable distribution of agricultural products could be obtained, through the placing of the surplus crops in localities where they are needed at the least possible cost; by means of the latter the agricultural producer would have cheap and efficient credit.

Organization of cooperative marketing associations, F. C. HART (*Ontario Dept. Agr. Bul. 234 (1915), pp. 23*).—This bulletin is intended to give detailed information as to the organization of cooperative marketing associations, and outlines the procedure from the getting together of the prospective members to the completion of the organization and the closing of the year's business.

The agricultural bank, E. FRERS (*El banco Agricola. Buenos Aires: P. Gadola, 1915, pp. 92*).—There is presented in this book the text of a proposed bill for the establishment of an agricultural bank for Argentina, with a discussion concerning the difficulties of introducing agricultural credit, the necessity for an educational propaganda, the relation of this bank to the existing credit systems, and an outline of the organization of credit under the proposed new system.

Some experiences in farm accounting, CHARLOTTE P. GODDARD (*Agr. of Mass. 62 (1914), pp. 124–141*).—The author narrates how she was employed as a cooperative bookkeeper by a number of farmers, outlines the system used, and gives sample forms.

Farm accounts simplified, D. H. OTIS (*New York: Orange Judd Co., 1915, pp. 42*).—This book contains forms for keeping farm records, in which there is an attempt to make the accounting simple by means of its mechanical arrangement.

The use of land in common in the Daun and Prum districts of Eifel, M. BERTRAM (*Landw. Jahrb., 47 (1914), No. 2, pp. 153–237*).—This study of the use of land in common indicates that forest land can be used in common to advantage, and that a common pasture is feasible where there are a number of small farmers, but that the use of other land in common is not, as a rule, satisfactory, either from a social or an agricultural point of view. A brief bibliography is included.

Overcrowding and defective housing in the rural districts, H. B. BASHORE (*New York: John Wiley & Sons, Inc., 1915, pp. 92, pls. 15*).—The author illustrates bad housing conditions as found in rural districts by calling attention to the existence of solid blocks of houses constructed where there is plenty of land available at moderate prices; to the crowding of sleeping and living rooms to avoid extra expense for heating; to the lack of proper ventilation and lighting; to the lack of sanitary arrangements in connection with the rural schools; and to the occurrence of a large number of deaths in certain houses which appear to be infected with tuberculosis. The author believes that the ease with which pure air and sunshine can be admitted to the rural home should prevent much of the sickness and many of the deaths now occurring in rural communities.

[Trade in agricultural products] (*Ann. Rpt. Chamber Com. N. Y., 57 (1914–15), pt. 2, pp. 5–85*).—Among the special reports given in this volume are those relating to the trade in sugar, molasses, coffee, tea, wine and spirits, cotton, tobacco, butter, cheese, and eggs, showing the trade movement, sources of supply, consumption, and prices.

California resources and possibilities (*Ann. Rpt. Cal. Develop. Bd., 25 (1914), pp. 64, pl. 1, figs. 9*).—This report describes the industries of California and gives a large number of statistical tables indicating their importance.

Returns of produce of crops in England and Wales (*Bd. Agr. and Fisheries [London], Agr. Statis., 49 (1914), No. 2, pp. 121–184*).—Statistical data are given showing the total production, acreage, and average yields of the principal crops by divisions and counties, together with a brief summary of the weather conditions, duration of harvest, weight of grain per bushel, and comparisons of total harvest with previous years.

Acreage and live stock returns of Scotland (*Agr. Statis. Scotland 3 (1914), pt. 1, pp. 102*).—This report gives for 1913 and 1914 the acreage of the principal crops and the number of live stock for Scotland by counties and districts, and for England, Scotland, Wales, and Ireland as a whole. The number of holdings by sizes is given by counties for 1895, 1905, 1913, and 1914.

Among the striking changes taking place in the number of live stock in 1914 are the decrease in the number of horses used for agricultural purposes by 1.81 per cent, while the unbroken and other horses increased 3.42 and 28.4 per cent, respectively. Among the cattle there was an increase in the number of cows and heifers in milk and in calf and the number under one year of age, while the number of other cattle decreased. The number of sheep kept for breeding purposes, under one year of age, increased, while the number of sheep one year of age or more decreased. The number of swine of all classes increased.

The data would seem to show an increased tendency in Scotland to develop the live-stock industry.

Returns of produce of crops in Scotland (*Agr. Statis. Scotland, 3 (1914), pt. 2, pp. 107–180, figs. 2*).—Data are given showing for Scotland, by counties and districts, the acreage, yield per acre, and total production for the principal agricultural products for 1914, and for Scotland, England, Wales, and Ireland as a whole for 1913–14. The monthly rainfall, mean temperature, and the daily duration of bright sunshine are also given.

Return of prices of crops, live stock, and other Irish agricultural products (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1914, pp. 81, pls. 16, fig. 1*).—Prices of the principal crops, live stock, meat, butter, eggs, and wool at the principal market centers are given. The annual averages are given from 1895 to 1914, the monthly average price for 1913–14, the annual highest and lowest price from 1895 to 1914, and the weekly average price for 1914.

[Agricultural statistics for the Netherlands] (*Jaarc. Konink. Nederlanden, Rijk Europa 1913, pp. 189–205*).—These pages continue information previously noted (E. S. R., 31, p. 391), adding data for 1913.

The agricultural industry in Russia (*Selsko-Khoziaĭstvennuii Promuisel v Rossii. Petrograd: Dept. Agr., 1914, pp. [352], pls. 7, figs. 234*).—This book contains a description of the population, soil, methods of cultivation, crops raised, and agricultural instruction and experimentation in Russia. The description is amplified by a large number of graphic representations.

A statement of the general agricultural conditions in Algeria for the crop year 1913–14 (*Bul. Agr. Algérie, Tunisie, Maroc, 21* (*1915*), *No. 6, pp. 133–157*).—A summary is given of the general crop conditions, the extent of the harvest, the foreign trade in the principal agricultural products, the condition of agricultural credit and cooperative associations, and experiments demonstrations, and regulations tending toward the improvement of agricultural conditions in Algeria.

Live stock and agriculture (*Census Union So. Africa, 1911, pt. 9, pp. 1208–1363*).—This part of the 1911 Census of the Union of South Africa gives returns regarding live stock, agriculture, and irrigation.

It was found that there were 5,796,949 head of cattle, of which 1,620,376 were oxen; 719,444 horses; 430,641 mules and asses; 746,736 ostriches; 30,656,659 sheep; 11,763,979 goats; 1,081,600 pigs; and 10,533,909 poultry.

The land under cultivation was 3,282,971 morgen (about 7,124,047 acres), that lying fallow 892,929, and that used for grazing 89,945,238, and of the above, 34,132,230 morgen were fenced in. Additional data are given concerning the extent of irrigation, production of various crops, the number of workers, and the different types of agricultural machines and implements used.

British India, with notes on Ceylon, Afghanistan, and Tibet, H. D. Baker et al. (*U. S. Dept. Com., Spec. Cons. Rpts., No. 72* (*1915*), *pp. 318–408, figs. 2*).—Among the subjects treated in this report are acreage and production of the principal crops; production and trade in dairy products, vegetable oils, fruits, nuts, and forest products; trade customs and conditions; and irrigation methods.

AGRICULTURAL EDUCATION.

The relation of the college curriculum to human life and work, A. C. True (*Educational Mo.* [*Ga.*], *1* (*1915*), *No. 5, pp. 157–162; Better Schools, 1* (*1915*), *No. 8, pp. 132–135*).—The author pleads for a broader consideration of the industrial element, i. e., agriculture and mechanic arts, commerce, and household arts, in the educational system of this country from the primary school to the university, not for vocational purpose but for general or cultural education. He suggests that the general college curriculum "be perfected not so much by the addition of subjects to give the student a broader range of choice as by the reorganization and redirecting of a limited number of fundamental subjects to make him a well-educated man prepared to live in the day of his own generation."

See also a previous note (E. S. R., 32, p. 799).

The importance of agricultural education to the Commonwealth, H. Pye (*Rpt. Austral. Assoc. Adv. Sci., 14* (*1913*), *pp. 675–694*).—In this address the author discusses the importance of agricultural education to the social, economic, and political welfare of the people of Australia, the metamorphoses and education of the farmer, the itinerant school of agriculture, the contrast between American and Australian conditions, the existing scheme of agricultural education in Australia, the functions of the elementary school and the agricultural high school, the linking of the work of the latter with that of the agricultural college, the mission of the agricultural college and the university school of agriculture, the scope and organization of the degree course in agriculture, the importance of physics and forestry in agriculture, and the commercial and economic aspect of agriculture. It is his belief that the education of agricultural students should not be wholly concerned with the material side of life if the agricultural community is to develop great leaders to represent it in the councils of the Commonwealth and to support it in a policy of development, and that with cooperation the farming community becomes a vital force. Hence, the university, if it is to carry out its mission, should insist that the men who are to become leaders of agricultural thought should have a knowledge of life as well as be practical, scientific agriculturists.

Memorandum on the curricula of ruralized secondary schools, W. N. Bruce (*Bd. Ed. [London] Circ. 883 (1914), pp. 21*).—The nature, organization, and content of a ruralized curriculum, together with the place of agriculture therein and outdoor work and the use of land are discussed.

It is held that the curriculum should be given a rural bias without attempting to make it purely agricultural or of emphasizing the vocational trend too strongly, and thus provide for the needs not only of those who intend to pursue rural industries, but also of the majority of those who do not. Agricultural and horticultural application of scientific principles should receive attention and be freely introduced, not with the object of teaching agriculture but of illustrating biological, chemical, and physical principles. Such technical subjects as farm implements and buildings, cultivation of various farm crops, breeds and management of live stock, etc., should be excluded as the time does not permit of their treatment concurrently with the necessary study of the fundamental sciences, their introduction will generally indicate a wrong attitude on the part of the teacher toward the course as a whole, and these subjects will not be so treated as to be of any great educational value.

The provision of a small plat of land is found highly desirable and should be used for the practical teaching of biology, chemistry, and physics through the cultivation of the soil and the growth of farm and garden plants. It should be divided into nature study plats to provide material for nature study lessons in the lower grades, a demonstration and experiment plat, a fruit plat, and separate plats of about 30 square yards for each boy of at least one of the forms, the boys doing all of the required work under the supervision of the teacher.

The training of teachers should include some practical acquaintance with the ordinary operations of a garden and a farm but need not include formal instruction in the theory and practice of agriculture as taught in the agricultural colleges.

Elementary school education as affecting the rural life problem, Mabel Carney (*Ann. Rpt. Conn. Bd. Agr., 46 (1913), pp. 130–142*).—In telling about her own work in the rural schools of Illinois the author indicates that the rural school is the best agency in building up community life.

Educational development in agriculture, L. S. Hawkins (*Science Conspectus, 5 (1915), No. 2, pp. 37–41, pl. 1, figs. 4*).—This is a brief survey of what is being done by the agricultural colleges and experiment stations, extension agencies, the U. S. Department of Agriculture, and the public schools to educate the farmer.

Present requirements in the United States in instruction in nature study and elementary agriculture, E. R. Downing (*Nature-Study Rev., 11 (1915), No. 6, pp. 297–299*).—This is a tabulation of requirements in nature study and elementary agriculture in the graded schools of the several States and Territories.

Agriculture in the schools of Mansfield and Lebanon, A. J. Brundage (*Ann. Rpt. Conn. Bd. Agr., 46 (1913), pp. 77–80*).—This is a brief report on an experiment in requiring instruction in agriculture in the public schools of Mansfield and Lebanon, Conn. The children above the fourth grade are taken into one class for the four-year agricultural work, directed by an agricultural supervisor. About 80 per cent of the children taking agriculture in the schools carry on some directed home work, and corn, potato, garden and canning, poultry, and dairy clubs have been organized. Some of the benefits of the home work are pointed out.

What the public schools of Indiana are doing in pre-vocational agricultural work (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 16 (1915), pp. 30, figs. 17*).—This is a report on the agricultural work that has been done by the public schools in general throughout the State, and on home problem work in several different communities, and its value, continuation work during the summer, agricultural teachers in Indiana, helps from the state department of public instruction, county agricultural agents, short courses and demonstrations, colleges and normal schools, and the Purdue University department of education.

Vocational agriculture, G. A. WORKS (*Agr. Student, 22 (1915), No. 1, pp. 49–52, fig. 1*).—The author describes the vocational agricultural instruction in the high schools of the State of New York, including individual and group project work.

Domestic science in the schools (*Agr. Gaz. Canada, 2 (1915), No. 4, pp. 362–371*).—Brief reports are given on the present status of instruction in domestic science in the public schools of Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia.

Credit for home work, E. B. WHALEY (*Proc. W. Va. Ed. Assoc., 44 (1914), pp. 101–108*).—This paper discusses credit for home work as it bears upon (1) the broadening of the curriculum so as to give every pupil a chance to discover his capacities, (2) the adaptation of the rural school to the community, and (3) a more vital cooperation between the school and the home. In connection with this paper the author submits the report of a committee on credit for home work which recommends that the farm home be made the laboratory of the rural schools, and suggests lists of laboratory work in agriculture, hygiene, manual training, and domestic science from which the required amount of work might be chosen.

The model school garden (*Agr. Gaz. Canada, 2 (1915), No. 3, pp. 268–283, figs. 8*).—This symposium comprises (1) a suggested diagram and planting plan of a school garden prepared by L. A. DeWolfe, director of elementary agricultural education for Nova Scotia; (2) a diagram of a school garden with suggestions on selection of site, size, fall preparation of soil, planning and cultivation of garden, by R. P. Steeves, director of elementary agricultural education of New Brunswick; (3) a brief account of the progress of schools gardens in Quebec, by J. A. Grenier, secretary of the Quebec Department of Agriculture; (4) a discussion of the meaning of school gardening, the relation of nature study and elementary agriculture, and of the chief features of the ideal school garden aimed at for Ontario schools, by S. B. McCready, director of elementary agricultural education of Ontario; (5) a brief statement of the nature and scope of gardening possible in a school, by H. W. Watson, director of elementary agricultural education of Manitoba; and (6) the essentials both as to the purposes or educational value of the school garden and as to the make up of the garden itself and how many of these features might reasonably be included in one garden, by J. W. Gibson, director of elementary agricultural education of British Columbia.

Why school gardens fail (*Agr. Gaz. Canada, 2 (1915), No. 7, pp. 682–686*).—Among the reasons given in this series of articles by educational authorities in the Provinces of Nova Scotia, Quebec, Saskatchewan, and British Columbia for the failure of school gardens are the following: The too frequent change of teachers; an attempt to undertake too much; the lack in teachers of preparation, enthusiasm, power of leadership, and understanding of the object of the school garden; the lack of cooperation between teachers and between trustees and teachers; the lack of care during the summer vacation; and the unsuitability of school grounds, either on account of condition or size, etc.

Boys' and girls' clubs, R. H. EMBERSON and G. W. REAVIS (*Mo. Col. Agr., Agr. Ext. Serv. Proj. Announcement 3* (*1915*), *pp. 24, figs. 8*).—This bulletin gives directions for organizing boys' and girls' clubs, lesson topics, and contests for corn, poultry, sewing, stock judging, pig, tomato, bread, and canning clubs. A list of Farmers' Bulletins of this Department classified according to the different club projects is included.

Boys' and girls' club work in New Mexico, W. T. CONWAY and DORA E. ROSS (*N. Mex. Col. Agr., Ext. Div. Bul. 1* (*1915*), *pp. 24*).—The authors outline the purpose and plan of work of boys' and girls' clubs in New Mexico.

Boys' and girls' industrial clubs of Oregon, E. F. CARLETON ([*Salem, Oreg.*]*: Dept. Ed., 1915, pp. 7, figs. 3*).—A brief survey is given of the organization of industrial club work of the boys and girls of Oregon conducted by the state department of education in cooperation with the Oregon Agricultural College and this Department. A list of 12 club projects which have been undertaken to adapt the work to the needs of different sections of the State is included.

Industrial club work of Oregon boys and girls, N. C. MARIS and L. P. HARRINGTON (*Salem, Oreg.: Dept. Ed., 1915, pp. 42, figs. 32*).—The authors give a review of the work of the past year, including stories and club project reports by some of the club members.

Organization of boys' pig clubs, W. H. BALIS (*La. Agr. Col., Ext. Div. Circ. 2* (*1915*), *pp. 8, figs. 6*).—Directions are given for organizing and conducting boys' pig clubs in Louisiana.

The farm in the work of the primary grades, GRACE RAIT (*Atlantic Ed. Jour., 10* (*1915*), *No. 10, pp. 15, 16*).—The author outlines work for the first grade based on the farm as a source of motive.

Soils and plant life as related to agriculture, J. C. CUNNINGHAM and W. H. LANCELOT (*New York: The Macmillan Co., 1915, pp. XX+348, pl. 1, figs. 154*).—The authors present a first study in agriculture dealing with soils and plants, including field, fruit, and vegetable crops, for rural, graded, and high schools. The text is interspersed with practical exercises and review questions, and lists of equipment and publications are added.

A course of practical work in the chemistry of the garden, D. R. EDWARDES-KER (*London: John Murray, 1914, pp. 40*).—This course for teachers and students of horticulture, gardening, and rural science consists of experiments in the chemistry of plants, soils, manures and fertilizers, and sprays and washes. An appendix gives directions for the preparation of solutions mentioned in the text.

Corn: A guide for judging varieties adapted to Oklahoma conditions, A. DAANE and F. F. FERGUSON (*Okla. Agr. Col., Ext. Div. Circ. 16* (*1915*), *pp. 13, figs. 4*).—This guide adopts variety standards comprising five groups, and gives descriptions of the varieties, rules for judging corn exhibits, directions for special seed selection and growing seed corn, and suggestions on plant qualifications in ear selection.

Seed corn testing, E. HOPT and F. D. KEIM (*Nebr. Col. Agr., Ext. Serv. Lesson 3, pp. 4, figs. 4*).—Directions for making a general test and individual ear test of corn are given.

Laboratory manual of horticulture, G. W. Hood (*Boston and London: Ginn & Co., 1915, pp. VI+234, figs. 52*).—The 78 exercises in this manual consist of studies of seeds, bulbs, corms, cuttings, buds, pruning, grafting and grafting waxes, fungicides and insecticides, and the apple, grape, peach, pear, and plum. Their aim is to assist the student in grasping some of the fundamental principles of horticulture and in learning by actual experimentation and observation the reasons for certain necessary horticultural operations. Blank pages for the student's notes and report are included, as well as a glossary of descriptive terms. These exercises have been given in connection with the work in general horticulture at the Ohio State University, Michigan Agricultural College, and the University of Nebraska.

A vegetable gardening syllabus for teachers, Ethel Gowans (*U. S. Bur. Ed.* [*Syllabus*], *1915, Apr., pp. 4*).—An outline is given of field and classroom work in vegetable gardening, the latter consisting of projects on the requirements for plant growth, management of the soil, and selection of seeds.

The principles of floriculture, E. A. White (*New York: The Macmillan Co., 1915, pp. XX+467, pl. 1, figs. 52*).—This book, which is an outgrowth of the author's experience and observations, has been prepared to meet the need for a classroom text on the principles that underlie the successful culture of ornamental plants. It treats of the importance and development of the flower industry in the United States and Canada; centers of the industry and the markets; factors which influence the selection of a location; glass structures and their arrangement, construction, heating, and management; plant structure and its relation to healthy plant growth; reproduction; soil for and diseases and insect pests of greenhouse plants; cut flower crops, potted flowering and fruiting plants, foliage plants, hardy plants and their adaptation for forcing, plants for outdoor bedding, window and veranda boxes, and packing and shipping plants and flowers.

Judging dairy cattle, G. Gusler (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *10 (1915), No. 10, pp. 23, figs. 15*).—Directions are given for judging dairy cattle.

Milk and milk products in the home, J. Michels (*Farmingdale, N. Y.: Author, 1915, pp. 100, pl. 1, figs. 19*).—This text for students in home economics and housekeepers in general treats of the composition, physical properties, and food value of milk and its products, the care of milk in the home, market classes of milk, and the production of clean wholesome milk, including a score card on equipment and method.

Farm-business arithmetic, C. J. Lewis (*Boston: D. C. Heath & Co., 1915, pp. XIII+199, pl. 1, figs. 2*).—This book of farm problems may be used as a course of daily lessons or as supplementary arithmetic work. Many of the subjects can be mastered by pupils between the ages of 12 and 15 years. Problems are given in farm accounting and business forms, farm and market values, harvesting, shipping, poultry keeping, dairying, farm feeding, planting, farm occupations, the business end of farm life, farm management, etc.

Agricultural collections for school laboratories (*Mo. Col. Agr., Agr. Ext. Serv. Proj. Announcement 2 (1915), pp. 29*).—The laboratory material listed in this bulletin has been prepared especially for the use of high schools in teaching field crops, horticulture, entomology, and soils and fertilizers. The collections, which can be used also in the home or graded rural schools, may be procured from the agricultural extension service of the University of Missouri at a nominal cost.

NOTES.

Arizona University and Station.—The new agricultural building has just been completed at a cost of $165,000. This building contains the offices of the president and business manager of the university, the dean and director of the college of agriculture and station, and the departments of agronomy, horticulture, animal husbandry, agricultural chemistry, plant breeding, home economics, agricultural extension, and archaeology.

P. W. Moore has been appointed fellow in agricultural chemistry and T. E. Schreiner, of Cornell University, to take charge of the poultry work.

Arkansas University and Station.—J. B. Rather, formerly of the Texas Station, has been appointed head of the department of agricultural chemistry in the university and station, with E. G. Will as assistant. H. E. Truax has resigned to accept a position with the States Relations Service of this Department in its studies of agricultural instruction and has been succeeded as assistant in horticulture by C. H. Hurd. F. H. Herzer has been appointed assistant in animal husbandry for special work in dairying, and Ruth A. Peck, head of the department of home economics to succeed Miss Sarah Pettit.

Kentucky Station.—D. D. Slade, superintendent of the poultry farm, has been transferred to extension work. N. R. Elliott has been appointed assistant in horticulture, and D. H. Wilkins, research assistant in poultry, beginning September 1.

Mississippi Station.—H. K. Gayle, a county agent in Kentucky, has been appointed animal husbandman.

New Jersey College and Stations.—Recent appointments include the following: Lloyd S. Riford, assistant dairy husbandman and instructor in dairy husbandry, vice A. S. Cook, resigned; Roy F. Irvin, instructor in poultry husbandry, vice C. E. Brett, resigned; Dr. John W. Shive, plant pathologist; J. Marshall Hunter, inspector for the Live Stock Commission; Carl R. Woodward, librarian and editor; William S. Porte, assistant in plant breeding; Orville C. Schultz, assistant in plant physiology; S. A. Waksman and Roland E. Curtis, assistants in soil fertility; William H. Martin, assistant in plant pathology, vice George W. Martin, resigned; W. S. Krout, assistant in plant pathology; A. C. Foster, seed analyst, vice Robert W. Schmidt, resigned; and Homer C. Carney, assistant seed analyst.

John H. Voorhees and Charles M. Arthur, extension specialists in agronomy and market methods respectively, have resigned, the latter to become instructor in agricultural extension in the Pennsylvania College.

Pennsylvania Institute of Animal Nutrition.—J. E. Mensching, J. E. Isenberg, and E. W. Schmidt have been appointed assistants in animal nutrition. F. C. Dosé has resigned.

Porto Rico College and Station.—Samuel D. Gray has been appointed professor of entomology in the college, vice R. I. Smith, who has assumed charge of the Boston office for the foreign cotton quarantine against the pink boll worm of Egypt and other countries. Policarpio González has been appointed assistant in agriculture. His work will include the instruction of rural teachers in agriculture.

Elmer W. Brandes has been appointed plant pathologist in the station.

Washington Station.—Dr. J. S. Caldwell, botanist of the Alabama College and Station, has been appointed in charge of the fruit by-products investigations.

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STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

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[a] Director. [b] Agronomist in charge. [c] Acting director.

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NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective state 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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