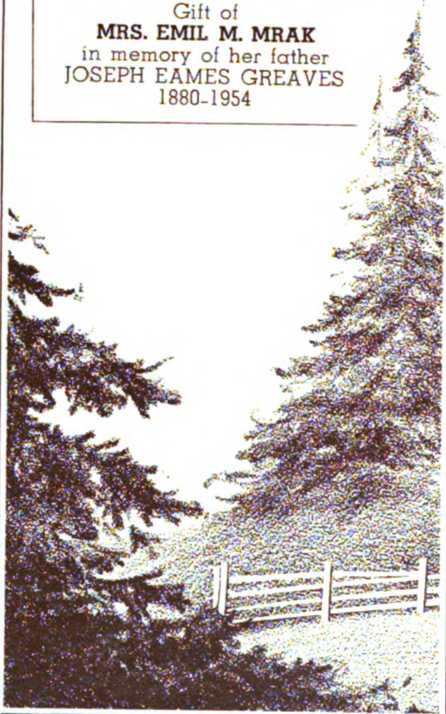

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

VOLUME XL

JANUARY-JUNE, 1919

WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

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EXPERIMENT STATION RECORD.

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EXPERIMENT STATION RECORD.

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There was a perceptible vein of foreboding at the recent Baltimore meeting of the association over the position and future outlook of the experiment stations. It was especially noticeable in the station section, where certain conditions and tendencies were discussed. The question was frankly raised whether the stations would be able to maintain their accustomed position and standards unless there is a change. A variety of circumstances have contributed to bring about this situation, most of which have been in operation in greater or less degree for some time but have gradually come to assume the proportions of a tendency which is looked upon as threatening.

Some of this misapprehension rests in the financial condition in which the stations find themselves. With no general increase in revenues, while the cost of supplies and all other expenses have gradually increased, they now have to meet a shortage of funds which not only precludes desirable expansion but often makes necessary a restriction of lines already established. Even more serious than the decreased purchasing power of their funds is the tendency to impose fiscal regulations and other restrictions which hamper the free use of funds and affect the progress of station work. This has become a source of much annoyance, if not indeed a menace in some instances.

The difficulty of attracting and holding men of sufficient training and ability for research in the stations is likewise a handicap which is being felt in many institutions, especially in connection with advanced lines of research. There is also a feeling on the part of some that the importance of the station is being overshadowed in some degree by other rapidly growing agencies of large means.

While there is no real ground to question the future security and continued progress of the experiment stations, it can not be denied that there are some features in the situation which give cause for apprehension. They need to be frankly recognized, and to be faced and overcome or modified as far as possible. They do not represent an antagonism to the station or a lack of general appreciation; rather they represent a failure to take special account of it and its requirements. But they are nevertheless to be taken account of and need to be corrected in the interest of the welfare of the whole agricultural system.

The general movement started several years ago looking to the standardization of public business on a new basis of economy and efficiency has become one of the sources of difficulty in several States. The legislation enacted as a result of this movement has been general in character and thus has applied to all classes of institutions, penal, charitable, educational, and administrative alike. In some cases it has evidently been drawn with little or no consideration of the peculiar requirements of educational institutions. While not directed specifically at the stations, in some respects the requirements rest particularly hard on them because of the nature and conditions of their work.

These control measures take the form of requiring a rigid budget system, the fixing of salaries by statutory enactment, the purchasing of supplies on State contracts, the securing of requisitions and authorizations through sources outside the station organization, the installing of standard methods of accounting with frequent reports and returns to officers at the State capitol, and the like. They frequently involve the personnel of the station, including their appointment and removal as well as promotion and salary. A result is to subject certain important features of the station administration to boards or officers not connected with the station organization who are unfamiliar with its requirements, and thus to divide the responsibility of the governing board for the general management of the station.

In some cases easements have been provided the stations in such matters as strict application of State civil-service laws, while in others conditions have made it quite difficult to secure the type of men they need for their special work or to hold them against offers of larger salaries from the outside. The latter has been true regardless of how indispensable the services of such employees had become to the progress of special lines of inquiry. The disadvantage of the station is freely admitted when a case arises, but the laws or regulations are inflexible and stand in the way of making any adjustment of funds to meet the difficulty.

This, of course, is diametrically opposed to true economy, for the best use a station can make of its funds is to develop a strong, thoroughly trained and experienced staff of workers and to hold them to their problems. As the investigation becomes more highly specialized its success depends increasingly upon such continuity. A change of investigator not only delays the progress of study but it very often results in loss of ground and frequently may cause the temporary suspension or abandonment of the line of work because it can not be profitably carried on. Such a result may come from inability to make relatively small advances in salary. A case in point is a station which has had special apparatus constructed and installed at much expense for an advanced line of investigation, but has been obliged to let this equipment lie idle for two years and defer entering upon the study because of the loss of its specialist in that line on account of a matter of a few hundred dollars salary. The director and the board were willing to make the advance and the specialist was willing to remain for considerably less than offered elsewhere, but limitations of the budget system blocked the way.

One thing which is not always fully appreciated, even among higher administrative officers, is that in the advanced grades of investigation the result is an individual product. It is an outcome of the ability, the insight, and the acumen of the man who is guiding it. He acquires a knowledge of the problem, theories and ideas for its study, and an understanding in interpreting the results which are a part of himself and are not passed on to another. Investigators are not interchangeable, as teachers may be or workers of lower grade. Individuality is the prime essential to continuous research; and a large proportion of the real problems are now of the kind that are continuous over a considerable period, the study leading on from point to point in the same general field. From the standpoint of both the worker and the station a change is ordinarily disadvantageous, at least temporarily, and there should be every reasonable encouragement and opportunity for assuring continuity and permanence.

On the other hand, institutions may find their powers limited in making changes believed to be in the interest of the station. In one State an attempt at dismissal was followed by an appeal to the State civil service commission, with a hearing participated in by counsel for the discharged man, and a published report reflecting upon the station and ordering reinstatement. This precipitated a situation which has become a serious one for a research institution, leading to appeals to the commission by employees not recommended for salary increases, and even a resort to injunction proceedings to prevent the station from carrying out its plan of organization.

The inevitable effect upon the station of such a disturbance in its administration, extending over nearly a year and not yet concluded, can be imagined. It illustrates how far control may pass beyond the governing board into the hands of other State agencies if there is not a sympathetic appreciation of the difference between the conditions and requirements of an experiment station and those of other classes of public institutions.

The above is an extreme case, for fortunately those stations affected have generally been relieved from the strict operations of the State civil service laws, or the way made easy by cooperation to secure men of the type needed. Many men of advanced position are, of course, reluctant to take competitive examinations, as they are to become candidates or applicants for positions, so that as far as such are concerned the stations may be placed at a disadvantage. In any event, the selection of persons for special lines of investigation involves qualities not brought out in the ordinary examination.

Everything considered, there is a quite widespread feeling of doubt whether the experiment stations are attracting to themselves in sufficient numbers the highest type of investigators, commensurate with the nature of the station requirements and the general opportunity offered for research. The operations of the regulations and restrictions mentioned above are in some measure against this, but internal conditions and financial rewards are looked upon as the greatest drawbacks and the most potent cause of shifting.

The opportunity for a research career in the stations has steadily improved, especially for persons freed of administrative duties. There is a far larger and more attractive place than ever before for the specialist who is thoroughly trained and wishes to devote himself mainly to a definite and restricted field of inquiry. He no longer has to do farmers' institute work, participates in extension work to only a limited and incidental extent, if at all, and he may even be entirely relieved of teaching. He is protected from a time-consuming correspondence on general information topics, and is not called upon to compile popular bulletins or information circulars. He is relieved of routine work and inspection duties, and is left free to follow his particular lines of investigation.

In other words, the work of the stations has been organized; it has been more sharply differentiated from other college functions, and it has more largely taken shape as a department for experiment and investigation. There are still many combination men, but there are far more workers than formerly who are devoting themselves principally to the station activities, and there are an increasing number whose duties are limited to their investigations. Much progress has been made in this respect, as there has been also in providing facilities for investigation, which are now often of a high order rarely surpassed elsewhere. A larger belief in investigation has been developed on the part of the public, and patience with that which is not seen to be immediately applicable. These things have given greater freedom, greater opportunity for the exercise of individual initiative and choice, greater security, and a larger measure of the elements which go to make satisfaction with one's work. The result is heartening to those who are in the work and who remember the change from the past, but the failure to build up the station staff more rapidly on the basis of genuine research ability indicates that there is still something lacking.

The rewards in the more advanced research positions have hardly kept pace with the requirements of the positions, especially when the rapid advance in all living expenses is considered. In many cases the salaries have not kept abreast of those in extension work, for example, where the qualifications usually call for less rigid training and no greater skill, although of different kind. Neither are the salaries as attractive as in administrative positions. The impression is often acquired by workers after a few years that salary advancement beyond a certain point can only be looked for in the administrative field, as head of a large department or a division of the agricultural work, or as dean. The realization of this situation is felt to limit the opportunity and may deter men from entering the field, or else it diverts them from their research after a few years by leading them to strive for the administrative positions. If they attain these their opportunity as investigators is almost inevitably restricted if not eliminated.

Furthermore, positions of authority are not only a step to salary but to standing in the organization. The matter of rank is one of importance to a mature specialist, as it carries the suggestion of success and advancement. In some instances, however, existing college organizations subordinate the station specialist in relationship and authority to a degree which is out of harmony with the grade and high requirements of his duties and indirectly reflects upon his standing. There seems often to be no provision in the scheme of college departments and divisions for recognizing the advanced character of his work or the position it entitles him to.

The more comprehensive the organization the more likely this is unless the station has a quite definite organization of its own with positions of recognized grade. It may happen, for example, that a station specialist is not only subordinate to the head of the department in which his work lies, as horticulture, but is also under a division head of that department, e. g., pomology, thus grouping him in that respect along with assistants and instructors. This is not attractive to the type of trained investigators the stations need, and even a generous salary does not overcome the disadvantage.

Another factor in the situation is the standard or grade of requirements maintained by some of the stations as indicated by their appointments. Through various considerations they are led to appoint men to positions of rank because of practical ability or some other qualifications than advanced training and success in investigation. Such persons, while they may be useful to the institution as a whole, are capable of doing only an ordinary grade of experimental work and are not suited to advance beyond a certain point because of their limitations. Appointments of this kind, if common, affect the desirability and general standing of positions in an institution. They determine the associations of station work, and to a considerable extent they affect its atmosphere.

The tendency to combine the directorship of the station with the office of dean of the college of agriculture likewise has had its effect in this connection. Such a combination does not necessarily insure the selection of a director who is qualified by training or temperament to exercise leadership in research or to develop the ideals of research in the station activity. The kind of administration a station needs is that which gives aim and direction to its work as a whole, supplies counsel and support to individual workers, encourages deliberation and thoroughness, exercises restraint where necessary, and justifies the station work and needs to those higher in authority and to the public. Appreciation, encouragement, and the feeling that their efforts are understood mean very much to most station workers. With many deans there is little time for this, or at least for its expression. The interests of the office are too diverse and insistent, and very frequently leave little time for station matters beyond those of routine nature.

Despite the obstacles arising from State laws, budget systems, and outside regulation, these internal conditions may prove in the long run to be quite as serious a danger to the maintenance of the high position and ideals of the stations. In the development of the system of agricultural education and research the research department frequently is not receiving proportionate attention. Within the institution as well as outside, other branches like the extension work are being given major attention; and there is a danger that the public, in its satisfaction with these branches and carried away with the idea that the great aim and effort should be the dissemination of what is already known, may overlook the source of this knowledge and may neglect the agency which makes these efforts possible and gives them effectiveness. Evidently some steps will need to be taken to avoid this. The means for it lie first of all in the institutions. There should be no indication of failure to recognize the fundamental position of the station, or to impress upon those going out from it and its representatives in the field a proper realization of the fact that but for the work which has been done in agricultural investigation and experiment in the past, their own opportunity would be relatively small and their chance for growth would soon come to an end.

In how large a measure the teachings of experiment are responsible for the success of the recent food production campaigns may be illustrated by the efforts to meet the world's deficiency in bread. The securing of a largely increased wheat crop was not merely the result of seeding a larger area to that crop. It was not simply a question of land and machinery and labor, vital as these were. The degree of success attained did not follow simply because people had been growing wheat for generations, but because the practice had been steadily improved through experiment and investigation, and the greater skill thus developed was ready for wider application when an emergency came.

The question of varieties, their adaptation to localities, the value of improved sorts, the relative safety of spring and winter grain, the treatment of seed for smut, the amount to be sown to the acre, the time when it should be planted in different localities to avoid the Hessian fly, the advantage of thorough seed bed preparation, the kind of fertilizers for certain sections—all these things had been worked out to a practical point through years of patient study and experiment After the crop was harvested there was the question of protecting it from loss by proper storage and control of insects, and finally its conservation by the use of substitutes and admixtures. It is impossible to estimate how much this knowledge of ways and means counted for. But if wheat growing had not been placed on this efficient basis by the incorporation of results of inquiry into practice it is not reasonable to suppose the country could have made the contribution it did. No amount of stimulation could have accomplished it.

At one time there might have been a tendency, when the supply of a great staple commodity was in danger, to encourage farmers to grow it to the utmost extent without due regard to the effects. But a conspicuous feature of the recent programs and campaigns for production was an intelligent consideration of the welfare of agriculture as a whole and a safeguarding of its various interests in maintaining a proper balance. These programs recognized that more scientifically planned systems of farming are now in operation which take account of the production of food for man and beast, the maintenance of fertility of the land, the economy and adjustment of labor, and many other considerations which must not be unduly disturbed. They were therefore allowed for in making the plans, allotting the areas, and conducting the campaigns. This made the effort something more than a patriotic movement, for it was guided and directed by intelligence. The latter rested, of course, in considerable measure on accumulated experience, but this had been weighed and tested and was correlated with the results of thorough-going fundamental study.

Next to bread the greatest need and the most urgent call was for animal products, and for these this country was very largely looked to. Pork production constitutes more than half of all the meat production in the United States, and such large increases were made that the emergency was fully met, the export of pork products being nearly doubled. This again is an indirect result of investigation which has in many respects revolutionized the practice of hog raising.

There is hardly a phase of pork production that has not been subjected to extensive and long continued experiments covering the type of hog, the value of different feeds, the place of supplements in addition to corn, the use of hog pastures to supply a succession of feed, the size at which the pig should be profitably marketed, and many other practical and economic points. Disease had become the great bane of hog production on a large scale, but the long and searching investigations, resulting in successful methods of inoculation, enabled extensive campaigns to be conducted in the interest of greater security. The organization and instruction of pig clubs was one of the means for extending pork production, and in these clubs the fund of information resulting from experiment found especially wide application.

No new crop or line of production can be suggested for a locality without at once raising the questions of how and when and why. In such cases the influence of experimental inquiry stands out with special clarity. This is illustrated by the case of the grain sorghums, soy bean, velvet bean, peanuts, and many other crops.

The spread of the grain sorghums in the regions to which they are particularly adapted is a direct result of years of experiment in which different kinds were tested as to their adaptation to localities, were improved as to yield, drought resistance and other qualities, their culture studied, their feeding value determined and their utilization as food developed. They are not native but are introduced species, and without this background of experiment there is little reason to believe that farmers or seedsmen would have introduced them and given them an important place in the agriculture of large regions; and without this fund of information on which to rest their teachings the extension forces would not have had the basis for advising their wider culture. The same is true of the other crops mentioned, which have long been the subject of extensive experiments and have become features of cropping and feeding systems.

The first silos for experimental purposes in this country were constructed in 1881, soon after the idea was introduced. From this beginning followed an uninterrupted chain of experiments and intensive investigations which have resulted in the development of an intelligent system of preserving and using green feeds, now a factor of vast importance in American agriculture. Throughout this development the American stations have led the way, concerning themselves with every phase of the theory and practice of silage production, its value as feed for different classes of live stock, and its economic importance.

These are only a few examples drawn from the common things, but they show how largely dependent agricultural development and teaching have been on the results of investigation, principally under the Department of Agriculture and the experiment stations, which has extended to every agricultural section of the country. And they point to the underlying source of success in extension teaching. This source will be just as essential to future growth and success.

The stations will need and require more ample funds for investigation, and in preparing the way for these they need the support which comes of a full realization and acknowledgment of the part they have played and must continue to play in no undiminished degree. Their task has increased with the phenomenally rapid application of their teachings in the past few years. This in itself will make enlarged demands upon them, and the status which has been reached makes the present problems more complex and difficult.

The proper development of the system of agricultural research and instruction must of necessity be symmetrical and proportioned. Contacts and organization need to be maintained to further this end, and within the institutions the attitude should be one fully recognizing and exemplifying the mutual dependence of the several parts.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Treatise on applied analytical chemistry, V. Villavecchia, trans. by T. H. Pope (*Philadelphia: P. Blakiston's Son & Co., 1918, vols. 1, pp. XVI+475, pl. 1, figs. 52; 2, pp. XIV+536, pls. 11, figs. 39*).—This treatise consists of two volumes. The first deals with the analysis of potable waters, chemical products, fertilizers, cement materials, metals and alloys, fuels, tar and its derivatives, and mineral oils and fatty substances and the industrial products derived therefrom. The second treats of flesh foods, milk products, flour and starches, sugars and saccharin products, beer, wine, spirits and liqueurs, essential oils, turpentine, varnishes, rubber, tanning materials, inks, leather, coloring matters, textile fibers, yarns, and fabrics.

A method for preparing a commercial grade of calcium arsenate, J. K. Haywood and C. M. Smith (*U. S. Dept. Agr. Bul. 750 (1918), pp. 10*).—The authors' studies have led to the conclusion that the most desirable procedure for making calcium arsenate from lime and arsenic acid is as follows:

"Use a good grade of lime, containing a high percentage of CaO. Slake the lime to as smooth a paste as possible, for upon this depends the smoothness of the final product, as well as the readiness with which the lime and acid react. Use from three to three and one-half times as much water, by weight, as lime, and have it, preferably, warm. Let stand for a while, then thoroughly mix, after which add twice as much hot water as used for slaking, and mix again.

"The lime and arsenic should be in such proportion that the weight of actual CaO used will equal that of the As_2O_5 used. This gives a product with a molecular ratio slightly over 4, which is necessary if the soluble As_2O_5 is to be kept down to desirable limits. Add the acid at room temperature to the lime as quickly as possible, and stir well until the liquid becomes alkaline to phenolphthalein. Filter to as dry a state as possible, do not wash, and if a dry product is desired dry directly in any suitable manner. Crush in a suitable disintegrator, or grind if necessary.

"To produce 100 lbs. of a commercial grade of calcium arsenate by this process will require 45 lbs. of CaO (approximately 50 lbs. of a high-grade lime) to be slaked with 18 gal. of water, the addition of 36 gal. more of water, and then 45 gal. of a solution containing 1 lb. of As_2O_5 per gallon. Slight departure from the figures given for water will probably have little effect."

Chemistry of sweet-clover silage in comparison with alfalfa silage, C. O. Swanson and E. L. Tague (*Jour. Agr. Research [U. S.], 15 (1918), No. 2, pp. 113–132, figs. 5*).—In continuation of investigations made at the Kansas Experiment Station, previously noted (E. S. R., 37, p. 709), a comparative study is reported of the chemistry of silage made from alfalfa alone, from sweet clover alone, and from sweet clover and corn meal. Quart milk bottles were used as containers for the silage. Several bottles of each kind of silage were made and opened at increasingly longer intervals of time, and the progressive chemical changes were thus traced. Determinations were made by the colorimetric and electrometric methods in the water and alcoholic extracts of the silage.

The acidity of the alcoholic extracts of the three kinds of silage was greater than that of the water extract when the titration was made to the point of color change for phenolphthalein. With the electrometric method there was no significant difference between the results obtained on the water extract and on the alcoholic extract. The differences in the colorimetric method are considered to be due to colored matter extracted by the alcohol which masks the end point. Most of the acidity was found to develop in the first 15 days. The maximum acidity was reached in from 40 to 60 days. The acidity of the alfalfa was greater than that of the sweet clover silage. The addition of corn meal to sweet clover increased the acidity of the silage.

The amount of amino nitrogen was found to be practically the same in the water and in the alcoholic extracts. The amount of amino nitrogen in silage made from alfalfa alone was larger than in that made from sweet clover alone. The addition of corn meal to sweet clover did not influence the amount of amino nitrogen developed. The amount of nitrogen in amid form as determined by Stutzer's method was slightly larger than the amount of nitrogen in amino form as determined by the formaldehyde method. The nitrogen in amid form was approximately one-half of the total nitrogen. Approximately two-thirds of the total nitrogen in silage was soluble in water and in 50 per cent alcohol, the solvent action of the two being nearly the same.

From the data reported the authors conclude that silage can be made from sweet clover alone with less difficulty than from alfalfa alone.

Cholesterol in milk, W. Denis and A. S. Minot (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 59–61; abs. in Chem. Abs., 12 (1918), No. 23, p. 2616*).—Determinations of cholesterol in cow's milk and in human milk by Bloor's colorimetric method are reported, together with corresponding fat determinations, using the Babcock method for cow's milk and Bloor's nephelometric method (E. S. R., 32, p. 312) for human milk.

The results show a direct and proportional variation of the cholesterol with the total fat content of cow's milk. This proportionality is also noted in human milk, but with many exceptions.

The authors suggest that the regular results obtained with cow's milk, in distinction to the variations occurring in human milk, are perhaps due to the fact that the samples of cow's milk were obtained from a single dairy and from animals fed on exactly the same ration, while the human milk was taken from women living under a great variety of conditions and with a corresponding lack of uniformity in food intake. It is pointed out that the higher level of cholesterol in the human milk may be attributed to the higher cholesterol content of the food of nursing mothers as compared with that of cows.

Influence of the preparation on the specific weight and refraction of milk serum, N. Schoorl (*Pharm. Weekbl., 55 (1918), No. 36, pp. 1222–1230; Chem. Weekbl., 15 (1918), No. 36, pp. 1089–1097*).—This is a criticism of the conclusions of Van der Harst and Koers previously noted (E. S. R., 39, p. 805), with a reply to the criticism by these authors.

The acidity of milk and whey, W. van Dam (*Verslag. Landbouwk. Ondersoek. Rijkslandbouwproefstat. [Netherlands], No. 22 (1918), pp. 1–24, fig. 1*).—The apparent difference in the acidity of the milk serum from spontaneously soured milk and of sour whey is explained by the buffer action of the constituents of the milk and whey. A table is given of the hydrogen-ion concentration of whey, peptonized whey, and peptonized milk at different dilutions.

The influence of the acidity of milk on the velocity of the inactivation of peroxidase by heat, A. Bouma and W. van Dam (*Verslag. Landbouwk. Onder-*

zoek. Rijkslandbouwproefstat. [*Netherlands*], *No. 22* (*1918*), *pp. 186–198, fig. 1*).—A study of the influence of hydrogen and hydroxyl ions on the speed of inactivation of peroxidase in milk showed that the addition of a small amount of acid had almost no effect, while the addition of so small an amount of sodium hydroxid that phenolphthalein still remained colorless increased to a marked degree the rate of inactivation of the enzym.

A delicate method of determining invert activity, C. K. Watanabe and V. C. Myers (*Proc. Soc. Expt. Biol. and Med.*, *15* (*1918*), *No. 8, pp. 142, 143*).—The technique of the method is as follows:

To 8 cc. of water in a 50-cc. centrifuge tube is added 1 cc. of the extract to be examined and the solution warmed to just 40° C. in a water bath with thermostat attachment. One cc. of 1 per cent cane sugar is added and incubation carried out for 30 minutes. This solution is rapidly cooled in cold water and 0.5 to 1 gm. of dry picric acid added, thoroughly mixed, centrifuged, and filtered. The inverted sugar is then estimated colorimetrically in 3 cc. portions.

The rôle of oxidases and of iron in the color changes of sugar cane juice, F. W. Zerban (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 10, pp. 814–817; La. Planter*, *61* (*1918*), *No. 19, pp. 299, 300*).—Experiments are reported from the Louisiana Sugar Experiment Station which prove the presence in young cane shoots of a laccase, of tyrosinase, and of peroxidase. The color of raw juice is shown to depend on the presence or absence of oxidizing enzyms, the presence or absence of iron salts, and the nature of the latter if present. The dark brown color of cane juice obtained in the absence of iron is considered to be due to the action of laccase, the polyphenols present in the cane, and to a small extent to that of the tyrosinase upon the tyrosin of the cane. The dark green color of the cane juice from the factory mill is due to the interaction of the laccase, the polyphenols of the cane, and the ferrous salts formed by the action of the organic acids of the cane upon the iron of the mill.

On the preparation of an active decolorizing carbon from kelp, F. W. Zerban and E. C. Freeland (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 10, pp. 812–814*).—Experiments conducted at the Louisiana Sugar Experiment Station are reported which show that a carbon which has a much greater decolorizing power than Norit can be prepared in the laboratory by quickly carbonizing dried Pacific coast kelp in such a way that the fumes can freely escape, after which the char is transferred to a closed iron receptacle and heated to red heat for about two hours. The carbon is boiled with successive portions of water, dilute hydrochloric acid, and water and then dried.

The authors consider that the decolorizing power of the kelp carbon is largely due to its nitrogen content.

Russia's production of platinum, A. R. Merz (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 11, pp. 920–925, figs. 3*).—A statistical report.

An automatic pipette for the tubing of culture media, H. Cardot and H. Vigreux (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 3, pp. 140–142, fig. 1*).—An all-glass automatic pipette suitable for use in tubing culture media is described and illustrated. The apparatus can be readily sterilized and is said to be of easy manipulation.

An automatic distributor for neutral solution of chlorinated soda (Dakin's solution), L. J. Strong (*Jour. Amer. Med. Assoc.*, *71* (*1918*), *No. 19, p. 1556*).—The apparatus, which is described and illustrated, consists of an irrigating can, with a rubber delivery tube provided with a screw clamp so that the rate of flow through the dripping apparatus can be controlled, and a drop tube connected by a U tube with a large inverted test tube serving as a reservoir to collect the solution. This is connected by means of rubber tubing with a second U tube, which can be raised or lowered and thus act as a siphon to discharge the proper amount of fluid into the tubes planted in the infected wound. The apparatus is said to be easily made and to operate with uniform regularity.

Preparation of Dakin's solution from liquid chlorin by the gravimetric method, S. R. BENEDICT (*Surg., Gynecol., and Obstet., 27 (1918), No. 4, pp. 386, 387*).—Weighing the chlorin used in the preparation of Dakin's solution is said to be preferable to measuring its volume on account of greater accuracy, cheaper and less complicated apparatus, and more rapid manipulation. The procedure for the preparation of 10 liters of the solution by the gravimetric method is described in detail.

The manufacture of chloramin-T, J. K. H. INGLIS (*Jour. Soc. Chem. Indus., 37 (1918), No. 18, pp. 288T, 289T; abs. in Chem. Abs., 12 (1918), No. 23, pp. 2653, 2654*).—A method for the preparation of chloramin-T from the starting point of toluene is described in detail.

Preparation of perchloric acid from perchlorates, A. VÜRTHEIM (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat.* [*Netherlands*], *No. 22 (1918), pp. 171-175*).—The following method is described for the preparation of perchloric acid from alcoholic perchlorate residues consisting principally of calcium, magnesium, and sodium perchlorate:

After removal of the alcohol by distillation, the calcium and magnesium are precipitated as carbonates by sodium carbonate and removed by filtration. The filtrate is dried and an excess of hydrochloric acid added which precipitates most of the sodium as sodium chlorid, leaving in solution a mixture of perchloric acid, sodium perchlorate, and hydrochloric acid. After the hydrochloric acid is removed by evaporation, the perchloric acid which remains is considered satisfactory for potash determinations.

Sulphuric acid determination in the presence of phosphoric acid, T. VON FELLENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 6 (1915), No. 4-5, pp. 191-195*).—Experimental evidence is given to prove that in the presence of phosphates the determination of sulphuric acid gives too high results. It is stated that this error can be reduced to a minimum by adding the hot barium chlorid solution drop by drop to the boiling, weakly acid solution (about 0.13 cc. concentrated hydrochloric acid or 13 to 14 cc. N. hydrochloric acid in 100 cc.).

The identification of acids of agricultural products, J. B. RATHER and E. E. REID (*Arkansas Sta. Bul. 156 (1918), pp. 3-32*).—A method is described for the identification of acids of agricultural products, both singly and in mixtures, by melting-point determinations of the phenacyl esters formed by the action of bromacetophenone on the alkali salts of the acids in dilute alcoholic solution. Many of these esters were found to be solids easily purified by recrystallization from alcohol and with convenient melting points. Formic, butyric, valeric, and oleic acids gave liquid phenacyl esters, and asparaginic and gallic acids gave gummy products with no definite melting points. Attempts to form satisfactory solid derivatives of the liquid phenacyl esters were unsuccessful in the case of the phenylhydrazones and oximes. The reagent has been successfully applied in the identification of many acids in mixtures with other acids. Tables are given of the results obtained.

The authors conclude that the use of bromacetophenone as a reagent for the identification of acids should prove especially valuable in the study of the acids of fruits and other agricultural products.

Determination of acidity in flour, T. VON FELLENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 6 (1915), No. 3, pp. 145-150*).—A modification of the Kreis-Aragon method (E. S. R., 12, p. 823) is described, which differs from the original method as follows: (1) The titration is conducted in the cold to prevent the action of acid-forming enzyms, (2) calcium chlorid is added to completely change the phosphates to triphosphate, and (3) sodium hydroxid is added in excess and the excess titrated back with hydrochloric acid.

The determination of cellulose in wheat, V. Hasenfratz (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 9, pp. 457, 458*).—It is shown that the determination of cellulose should be made with acids and bases accurately standardized and under precisely determined conditions. The results obtained are comparable only when the same acids or bases are employed, thus avoiding variation in the volume of the reagents used.

The bacteriology of peanut butter and the germicidal action of arachis oil, I. C. Hall and Juanita van Meter (*Amer. Food Jour.*, *13* (*1918*), *No. 9, pp. 463–467*).—Examination of commercial peanut butter manufactured and packed under poor sanitary conditions showed a surprising absence of colon bacilli. The explanation advanced by the authors as a result of bacteriological studies is that the germicidal property resides in the oil of the peanut, the organisms dying out merely because the oil makes the proteins and carbohydrates suspended in it inaccessible for bacterial growth. Moistened peanut meal from which the oil has been extracted is said to permit *Bacillus coli* and other organisms to multiply rapidly, as does also peanut butter to which more than from 10 to 20 per cent of water has been added.

A contribution to the examination of honey by the precipitin method, H. Kreis (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt.*, *6* (*1915*), *No. 2, pp. 53–62*).—The precipitin method for the detection of adulteration in honey, previously noted (E. S. R., 28, p. 22), is discussed, and the results are reported of the examination of samples of honey adulterated in various ways.

The author concludes that the precipitin method, if used in conjunction with other tests, gives in most cases a clear proof as to whether the honey has been adulterated, overheated, or spoiled. It is not considered to give conclusive proof as to the detection of sugar feeding of the bees.

Determination of lactose and sucrose in milk chocolate, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt.*, *6* (*1915*), *No. 2, pp. 45–52*).—A method is described for the quantitative determination of lactose and sucrose in milk chocolate by reduction of Fehling's solution before and after inversion. The limits of error for the lactose by this method are said to be within ± 0.6 per cent. Analyses of several brands of milk chocolate are reported.

Microscopic examination of tomato pulp, W. D. Bigelow and P. J. Donk (*Canner*, *47* (*1918*), *No. 14, pp. 36, 38, 40, 42, 44*).—This is a general discussion of the value of a microscopic count in the examination of tomato pulp, together with a description of the microscopic equipment required for the Howard method and a reprint of this method from the bulletin previously noted (E. S. R., 38, p. 166).

Contribution to the study of commercial teas, I. Pierotti (*An. Soc. Quim. Argentina*, *6* (*1918*), *No. 26, pp. 329–343*).—As the result of analyses of 41 samples of tea the following limiting percentage values for unadulterated tea are given: Moisture 6.699 to 9.974, ash 5.421 to 6.091, water extract 24.046 to 38.993, total nitrogen 3.501 to 4.399, substances soluble in carbon tetrachlorid 0.502 to 2.546, substances soluble in chloroform 1.11 to 5.881, substances soluble in ethyl alcohol 3.314 to 15.186, thein 2.071 to 3.646, dextrins and gums 4.044 to 6.967, protein material 22.568 to 27.493, cellulose 11.944 to 14.933, and tannin 9.092 to 14.553.

The author states that in order to judge a tea fully the chemical analyses should be supplemented by histological studies.

Cinnamon of inferior quality.—A colorimetric method for the determination of cinnamic aldehyde in cinnamon, T. VON FELLENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 6 (1915), No. 6, pp. 254–266*).—True cinnamon of inferior quality has been found to be lacking in cinnamic aldehyde. A colorimetric method for determining cinnamic aldehyde is described which depends upon the color which the aldehyde produces with isobutyl alcohol and concentrated sulphuric acid.

A colorimetric method for the determination of vanillin in vanilla, T. VON FELLENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 6 (1915), No. 6, pp. 267–274*).—The method is similar to the one noted above for the determination of cinnamic aldehyde in cinnamon. It is suggested that the vanillin determination should be made separately in the inner and outer layers of the bean. Normal vanilla shows no great difference in the amounts of vanillin, inasmuch as the outer layer makes up about 30 per cent of the whole.

A simple and rapid method for the estimation of alcohol in spirituous liquors, NAGENDRA CHANDRA NAG and PANNA LAL (*Jour. Soc. Chem. Indus., 37 (1918), No. 18, p. 290T*).—The method consists of treating a known weight of the liquid to be examined in a glass tube graduated in tenths of a cubic centimeter with an excess of anhydrous potassium carbonate, adding about 5 to 10 per cent of water if the percentage of alcohol is above 90. The mixture is thoroughly shaken or centrifuged and allowed to settle. The volumes of the layer of saturated potassium carbonate and of the alcohol hydrate are read and the temperature taken. The percentage of alcohol is calculated from the following formula, the constants of which have been determined by experiment: Percentage of alcohol$=(V+v\times 0.00275)\ [1-0.001068\ (t-15.6)]\times 0.7936\times 94.06\div W$. V=the volume of alcohol hydrate, v=the volume of saturated potassium carbonate solution, t=temperature, and W=the weight of the sample in grams.

The method is said to be quite accurate, even though not more than 5 cc. of the liquor under examination be used, and to have the advantages that solids in solution do not affect the results, that loss by evaporation is prevented, and that ice is not required even if the temperature be high.

The detection of methyl alcohol by the Denigès method and its application in the quantitative determination of methyl alcohol in water solution, T. VON FELLENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt, 6 (1915), No. 1, pp. 1–24, figs. 3*).—An application of the Denigès test for methyl alcohol to a quantitative determination of the same is described.

The colorimetric estimation of cholesterol in blood, with a note on the estimation of coprosterol in feces, V. C. MYERS and EMMA L. WARDELL (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 147–156, fig. 1*).—A method is described for the colorimetric estimation of cholesterol in blood, in which the blood, plasma, or serum is dried with plaster of Paris and the cholesterol extracted from it with the solvent (chloroform) employed in the development of the color reaction. The extract of cholesterol treated as described by Bloor (E. S. R., 35, p. 13) is compared with a standardized aqueous solution of naphthol green B in a Duboscq or Kober colorimeter.

The plaster of Paris is considered by the authors to hold the blood in a finely divided and readily extractable condition and also to hold back substances which add to the color development with the Bloor technique. The aqueous naphthol green B is considered superior to chloroform solutions of cholesterol as a standard, as it is more stable than the cholesterol in chloroform and does not evaporate so readily. Data are given showing that estimations by this method agree closely with those by the Windaus gravimetric method, but are lower than those obtained by the Bloor method.

A modification of the method is described for determining the coprosterol in feces.

Methods for the determination of phosphoric acid in small amounts of blood, W. R. Bloor (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 33–48*).—The methods described consist of extensions of a method previously reported (E. S. R., 35, p. 166), and are based on the nephelometric use of Kober and Egerer's modification (E. S. R., 34, p. 409) of the strychnin molybdate reagent of Pouget and Chouchak. In the work reported this reagent is modified with the object of making it stronger and lessening the manipulation required for producing the precipitation. Detailed descriptions are given of the reagents employed and the manipulation of the method as applied to the determination of total phosphates, lipoid phosphoric acid (lecithin), and acid-soluble phosphoric acid in whole blood, plasma, and corpuscles.

A new volumetric method for the determination of uric acid in blood, L. J. Curtman and A. Lehrman (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 157–170*).—The method described consists essentially of the precipitation of the uric acid by means of nickel acetate in a solution made alkaline with sodium carbonate and the estimation of the uric acid in the precipitate by means of a dilute solution of iodin.

The method is said to have given good results with aqueous solutions of uric acid as well as with blood serum to which known amounts of uric acid were added. It is considered to be fully as accurate as the colorimetric method and to possess the advantage of requiring no special apparatus.

The color laboratory of the Bureau of Chemistry. A brief statement of its objects and problems, H. D. Gibbs (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 802, 803*).—A brief statement is given of the objects and problems of the color laboratory of the Bureau of Chemistry of the U. S. Department of Agriculture. The laboratory studies are divided into five classes—processes, dye intermediates, dyes, medicinals, and analytical methods. Plant operations include the development of a process of manufacture of phthalic anhydrid, the chlorination of toluene, and investigations for the manufacture of various alcohols and acetone.

Photographic sensitizing dyes: Their synthesis and absorption spectra, L. E. Wise and E. Q. Adams (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 801, 802*).

Natural dyestuffs: An important factor in the dyestuff situation, E. S. Chapin (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 795–798*).—This is a brief review of fundamental facts relating to natural dyestuffs, with particular reference to logwood.

The manufacture, use, and newer developments of the natural dyestuffs, C. R. Delaney (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 798–801*).—This is a general discussion of the subject.

Production of acid phosphate from creamery waste sulphuric acid, R. H. Carr (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 508–511*).—The author suggests the utilization of creamery waste sulphuric acid for the manufacture of acid phosphate. The waste acid from the mixture of cream and acid, after the completion of the tests and the removal of fat, had approximately the following composition by weight: Sulphuric acid (sp. gr. 1.2) 27.32 per cent, nitrogen (amino acids, peptones, etc.) 0.054, ash (potassium, calcium, etc.) 0.11, volatile organic matter 0.56, and sugar (lactose) 0.525. It is suggested that the acid be concentrated to 60 per cent acid and mixed with an equal weight of ground rock phosphate. An acid phosphate prepared in this way had the following percentage composition: Potassium sulphate 0.357, acid phosphate 14, and nitrogen as ammonia 0.232. The principal impurities present in the acid are compounds of nitrogen, calcium, potassium, and phosphorus which are in water-soluble form and are an advantage to the fertilizer. The carbon formed from the sugar in the concentration of the acid is also considered to be of advantage in that it tends to keep the mass granular and porous.

The preparation of xylose from corncobs, C. S. Hudson and T. S. Harding (*Jour. Amer. Chem. Soc., 40 (1918), No. 10, pp. 1601, 1602*).—A method for preparing xylose from corncobs is described which is similar to the method previously noted (E. S. R., 37, p. 410) for preparing xylose from cottonseed hulls. The corncobs are said to be a better source of xylose in that the yield (about 12 per cent) is higher and the solutions throughout the course of preparation are less colored.

The preparation of several useful substances from corncobs, F. B. LaForge and C. S. Hudson (*Jour. Indus. and Engin. Chem., 10 (1918), No. 11, pp. 925–927*).—Methods are described for the preparation from corncobs of adhesive gum, xylose (noted above), acetic acid, and glucose. The yields of the various products constitute the following percentages of the weight of the dry corncobs: Adhesive gum 30, crystalline xylose 5, acetic acid 2.5 to 3, and crystalline glucose 37.

The authors believe that these methods of utilizing corncobs may eventually render them a valuable source of raw material for manufacturing.

Wood waste as a source of ethyl alcohol, G. H. Tomlinson (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 859–861; abs. in Chem. Abs., 12 (1918), No. 22, p. 2437*).—Some of the problems involved in the commercial utilization of wood waste as a source of ethyl alcohol are discussed and suggestions given for extending the scope of the industry. On the basis of estimates at a manufacturing plant, the author states that every ton of wood waste is capable of yielding over 30 gal. of wood molasses, suitable for alcohol production, without disturbing existing methods of operation, and that, allowing 3 cts. per gallon profit on the molasses, this would represent an additional profit of almost $2 per 1,000 ft. of lumber.

Factory investigation on the manufacture of tomato pulp and paste, B. J. Howard (*Canner, 47 (1918), Nos. 11, pp. 36, 38, 40, 42; 12, pp. 34, 36, 38, 40, figs. 2*).—This is a report of studies at the Bureau of Chemistry of the U. S. Department of Agriculture of the influence of various technical processes on the character of tomato pulp and paste, including the influence of temperature on the color and flavor of the product, relation of temperature of processing and length of heating to the keeping power of the product, the rate of heat penetration, occurrence of copper in the paste, comparison of open kettle and vacuum pan products, efficiency tests on various outfits, and laboratory tests on the influence of size of mesh of sieve used on the consistency of the product.

Drying and serving fruits and vegetables in the home, C. C. Vincent and Jessie M. Hoover (*Idaho Sta. Bul. 110 (1918), pp. 28, figs. 17*).—This bulletin contains reports of investigations in regard to the successful drying of fruits and vegetables, with particular reference to conditions in Idaho. These include a study of the relative merits of sun drying and drying by means of cookstove, hot-air, and steam evaporators as determined by local conditions, by the time and temperature required to evaporate different products, and by the moisture content of the dried product.

A homemade sun drier of pyramidal form is described, three sides of which are of glass. The air enters through small holes at the base, passes up through a perforated frame of wooden slats containing the food to be dried, and together with the moisture from the evaporating fruit, passes out through a 1-in. hole in the apex. If placed in the sun the temperature in the drier can be maintained at a much higher degree than on the outside, and products of various kinds will dry in a shorter time than when exposed to the direct rays of the sun.

Directions for preparing fruits and vegetables for drying, and tested recipes in which dried products are employed, are given.

Preservation of food (*Agr. Col. Ext. Bul.* [*Ohio State Univ.*], *14* (*1918–19*), *No. 1, pp. 20, figs. 2*).—A detailed discussion of the preservation of food by storing, canning, drying, and fermentation.

METEOROLOGY.

Climate in relation to crop adaptation in New Mexico, C. E. Linney and F. Garcia (*New Mexico Sta. Bul. 113* (*1918*), *pp. 132, figs. 4*).—The available data for temperature and precipitation, secured in cooperation with the Weather Bureau of the U. S. Department of Agriculture, are given for different parts of the State, with brief accounts of the agricultural possibilities of each county.

There is great range in altitude and climatic conditions in the State. Agriculture is carried on under irrigation or by dry-farming methods, the latter being done at altitudes varying from 3,000 to 8,000 ft., under a normal precipitation varying from about 10 to 20 in., with a long growing season in the lower altitudes and a very short one in the high altitudes. There is a large portion of the State which can not be used for the growing of crops, but can be profitably utilized in the raising of live stock. Crops adapted to dry farming at any altitude are comparatively limited in number.

"The amount of moisture and length of the growing season are two important limiting factors for many crops in New Mexico. The 5,000-ft. elevation is probably about the limit in altitude for many of the sorghums, which are among the best crops for the dry farmers below this altitude; however, up to this altitude Sudan grass, beans, Indian corn, broom corn, and wheat are also dependable crops. In the higher dry-land districts short season corn, wheat, barley, oats, field peas, beans, and, in some districts, Irish potatoes are among the leading crops to grow. In the irrigated valleys, where the moisture factor is largely under the control of the farmer, a much larger variety of crops can be successfully raised under good farm management. In addition to a large variety of vegetables and fruits, practically all of the crops that can be raised by dry farming can be grown in these irrigated districts of lower altitude. In the high altitude, mountainous, irrigated districts, aside from the dry-farming crops that are grown under these conditions, alfalfa, many of the cool season vegetables, and a number of fruits, principally apples, cherries, and plums, are usually grown successfully, except that the late spring frosts occasionally partly or wholly destroy the fruit crop." The State is restricted to Temperate Zone crops and fruits. Tropical or even semitropical fruits can not be raised there.

Since moisture is probably the principal factor in crop production in New Mexico it should be kept in mind that the lower valleys are dry, averaging from 6 to 10 in. annually, and that agriculture there is precarious without irrigation. Precipitation increases with altitude, and also somewhat from west to east, especally east of the Rio Grande. The precipitation increases rapidly with altitude, amounting to 18, 20, 25, and even 30 in. annually over the highest peaks. A second controlling factor is temperature, which decreases with altitude and thus limits the number of crops that can be grown at the higher altitudes.

Particular care should be taken to select late-blooming varieties of fruits which are least susceptible to frost injury in the spring. The data presented indicate in general that frosts cease in the spring about April 1 below 4,000 ft., about May 1 below 6,000 ft., and by June 1 below 8,000 ft. "The San Juan Basin, however, will be found to be somewhat later; and, on the other hand, many of the mountain valleys will be earlier than their altitude would indicate."

Agricultural meteorology, J. W. Smith (*Proc. Ohio Acad. Sci., 6 (1916), No. 5, pp. 239–264, figs. 5*).—Agricultural meteorology is defined, and observations and investigations which may be classed in the subject are reviewed. The critical periods of plant growth and the relation of temperature and moisture, especially to the growth of corn, wheat, and potatoes, are discussed. A few of the problems needing investigation are enumerated, and the value of a service to investigate such problems is briefly explained.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 5 (1918), Nos. 5, pp. 207, pls. 4, figs. 2; 6, pp. 206, pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1918, respectively.

Free-air data at Drexel Aerological Station, July to December, 1917, W. R. Gregg (*U. S. Mo. Weather Rev. Sup. 11 (1918), pp. 108, pls. 6*).—This records in detail data obtained in 256 observations at an average altitude of 2,991 meters.

[Observations on aerology] (*U. S. Mo. Weather Rev. Sup. 12 (1918), pp. 82, pls. 5, fig. 1*).—This supplement contains the following articles: Free-air Data at Drexel, Nebr., and Ellendale, N. Dak., Aerological Stations, January to March, 1918, inclusive, and Free-air Temperatures During the Cold Winter of 1917–18, by W. R. Gregg; and The Ellendale Aerological Station, by V. E. Jakl.

Meteorological summary, 1916 (*Oklahoma Sta. Rpt. 1917, p. 40*).—This is a condensed tabular summary of observations at Stillwater, Okla., on temperature, precipitation, cloudiness, and wind for each month and for the year.

Annual report of the [Philippine] Weather Bureau, 1916 (*Ann. Rpt. [Philippine] Weather Bur., 1916, pt. 1–2, pp. 144*).—This contains a report of the work of the weather bureau and a record of hourly meteorological observations made at the central observatory of Manilla during the calendar year 1916.

Substances dissolved in rain and snow, V. C. Shippee and Lucia Fordyce (*Chem. News, 117 (1918), No. 3058, pp. 322, 323*).—Continuing previous work of Peck (E. S. R., 38, p. 416), analyses were made of 41 different precipitations, 28 of rain and 13 of snow, that fell between September 29, 1917, and June 1, 1918, the total precipitation for the period being the equivalent of 17.9 in. of rain.

The data are considered insufficient to establish any relation between length of time between precipitations and the amount of dissolved substances or between electrical disturbances and the amount of nitrates present. Sulphates were found to be most abundant during the winter, but this is considered dependent upon the amount of coal consumed in the community. Phosphates were found to be present but no carbon dioxid.

SOILS—FERTILIZERS.

Soils of southern New Jersey and their uses, J. A. Bonsteel (*U. S. Dept. Agr. Bul. 677 (1918), pp. 78, pls. 6, figs. 27*).—The author discusses in detail the adaptation of cropping and agricultural systems to local soil conditions in an area of 2,833,840 acres situated in southern New Jersey, embracing Monmouth, Ocean, Burlington, Camden, Atlantic, Gloucester, Salem, Cumberland, and

Cape May Counties and the southeastern portions of Middlesex and Mercer Counties. The work is based upon comprehensive soil and crop surveys of the region and upon soil preferences expressed by about 1,000 representative farmers located chiefly in the sections where the soil and crop surveys were made. For purposes of study and comparison, the region has been divided into areas designated as Freehold, Hartford, Thorofare, and Swedesboro, and the discussions are supplemented by tabulated statistics, numerous illustrations, and detailed soil and crop maps. The soils of the region have already been dealt with in the following surveys: Salem area (E. S. R., 14, p. 640), Trenton area (E. S. R., 15, p. 658), Freehold area (E. S. R., 34, p. 616), and Camden area (E. S. R., 37, p. 123).

The geographical location and transportation facilities of southern New Jersey are said to be such that the largest markets on the continent for both staple and special farm products lie within easy reach of even the most remote localities. The rainfall and temperature also favor the production of all the most important staple and special crops suited to the latitude.

It is concluded that "the more than two centuries of agricultural development in the region have brought about a thorough comprehension of the fact that crops do not all thrive equally well upon all soils. There has been a constant tendency to adapt the cropping and the agricultural systems of the regions to local soil conditions in such a way that the most paying crops may be grown upon each soil of marked characteristics. This selective cropping has resulted in the avoidance of excessively drained soils, like those of the Lakewood series, for any agricultural use; a failure to utilize wet soils for any but the most extensive systems of cropping, such as the growing of grass for pasture and hay upon the tidal marsh areas; the utilization of the more sandy soils, irrespective of their relative distance from market, for the growing of the early vegetables, commonly called truck crops; the use of intermediate types of soils, such as the sandy loams, for the growing of a wide variety of truck crops, general farm crops, and, where altitude favors, of commercial orchard crops; a decided specialization toward the grain and grass crops upon the fine sandy loam and loam soils, with the more recent use of the loam soils for the growing of Irish potatoes and of tomatoes for canning purposes; the utilization of every reasonably level acre of good upland soil for crop production of some kind; [and] the utilization of small areas of overflow or of undrained land for grazing purposes in connection with the special tillage of all upland areas. Other things being reasonably equal, the farmers of southern New Jersey have a very decided and well-founded preference for the utilization of each specific soil type for the growing of the special crop or group of crops which is best suited to that soil."

Some observations about the soils of the northeast Indian tea districts, G. D. Hope (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 102–113, pls. 2*).—The author presents a general description of the prevailing soils of the four principal tea districts in northeastern India, with particular reference to their origin. With the exception of the mountain areas, the soils of the whole region are said to be alluvial in character.

Relationship between the unfree water and the heat of wetting of soils and its significance, G. J. Bouyoucos (*Michigan Sta. Tech. Bul. 42 (1918), pp. 23*).—This reports the results of investigational work dealing with the relationship between the heat of wetting of oven-dry soils and other substances and the amount of so-called combined water that failed to freeze at —78° C. as measured by the dilatometer method (E. S. R., 39, p. 18), and with the heat of wetting of various materials in different liquids, including water, ligroin, toluene, and benzine. The possible nature of the combined water, whether chemical or physical, is discussed.

A real relationship was found to exist between the combined water and the heat of wetting of soils, both factors tending to vary in the same order in most of the soils examined. The heat produced ranged from 0 calories for quartz sand to 10.8 calories for Norfolk sand, 402.3 calories for black clay loam, and 1,109.25 calories for peat for the 50 gm. of material used. The corresponding percentage of water that failed to freeze in the respective substances amounted to 0, 1.59, 13.85, and 70 per cent. "This comparatively tremendous amount of heat represents energy expenditure on the part of one or both of the reacting materials. Evidences are deduced, however, which prove that all this energy expenditure is at the expense of the water only and not at all at the expense of the soil, [and] . . . is the result of the water undergoing a transformation from its liquid state of aggregation to a solid state of aggregation. This transformation is caused or brought about by the chemical affinity or capillary affinity or both that the soils have for water. The total heat of wetting is due partly to the latent heat of water, partly to the affinity or attraction that the soils have for water, and partly to the condition of the solid to which the water is transformed.

"In attempting to ascertain the exact nature of this solid water by determining the heat of wetting of soils and various artificial materials in water and ligroin, it was found that with the exception of silica, lampblack, and tricalcium phosphate the heat of wetting of the solid materials in ligroin was either entirely absent or comparatively very small. If to the solid materials was added water while they were still immersed in the ligroin, heat was evolved. This evolution of heat took place in all the agricultural soils except in the peat and in all of artificial materials except in the quartz sand, lampblack, and barium sulphate. The rapidity and magnitude of this heat evolution were almost the same as in water alone, or as if the ligroin were not present at all. In water alone, all the solid materials except lampblack gave more heat of wetting than in ligroin alone. Lampblack, however, gave more heat of wetting in ligroin than in water.

"The difference in the heat of wetting of the various solid materials in the different liquids indicates that the attraction or affinity of the different solid materials for the different liquids is specific or selective. This specific or selective attraction or affinity of the solid materials for different liquids is not due entirely to the magnitude of the surface of the solid materials, but principally to the chemical nature of the materials. The heat of wetting of materials by the addition of water when they are still immersed in ligroin indicates that the specific or selective attraction or affinity of the solid materials for water is not destroyed or satisfied by the substitution or presence of ligroin; and that this attraction or affinity of the solid materials for water will go through a solid film or continuous membrane of ligroin to reach the water and thus satisfy itself. The distance to which this force will be felt, even through an intervening solid film or continuous membrane of another liquid, is considerable.

"It appears to hold generally true that when a solid material is immersed in a liquid for which it has only a small attraction or affinity and then a second liquid is added for which the solid material has a great attraction or affinity, the second liquid will be attracted by the solid material with as much force or manifestation of heat as though the first liquid were not present at all. The converse of this is not true. The remarkable phenomenon of the attraction or affinity of a solid material being exerted for a liquid through an enveloping solid or highly compressed film of another liquid throws an abundance of light in understanding the possible mechanism in the reaction between soils and soluble salts or their ions.

"Considering all the evidence as a whole and from every angle, it appears that the water which refuses to freeze at the temperature of —78° and has been termed combined water, and which bears a close relationship to the heat of wetting, exists partly as water of hydration and partly as water of solid solution, with probably the former predominating. It may exist all as water of solid solution but not all as water of hydration. On the other hand, if we accept the recent theory that all interatomic or intermolecular forces should be regarded as strictly chemical, which includes such forces or phenomena as surface tension, evaporation, cohesion, absorption, condensation, etc., then all the combined water is chemically combined.

"The results obtained by the dilatometer method and those in the present investigation seem to necessitate a complete and radical change of many of the present conceptions regarding soil moisture. The present ideas regarding the forms of water in the soils, the movement of moisture in the soils, the rate of evaporation of the soil water, the available and nonavailable moisture in the soil, must all be changed. The necessary changes proposed in the present paper appear very reasonable and sound. It is now confidently believed that the dilatometer method is able to give a very accurate and true value of the wilting coefficient of soils. It accomplishes this with great rapidity and facility. And the value it yields is more definite and more comparable than that obtained by the use of plants."

The effect of drainage on soil acidity, S. D. Conner (*Science, n. ser., 46 (1917), No. 1188, p. 346*).—Examinations of samples of silt loam soil very low in organic matter and quite acid, from contiguous drained and undrained areas, showed that acidity as determined by the potassium nitrate method had been distinctly reduced by drainage.

The phosphoric acid and potash requirements of meadow land as indicated by analyses of the harvested material, P. Liechti and E. Ritter (*Landw. Jahrb. Schweiz, 31 (1917), No. 5, pp. 533–553*).—Considerable tabulated data are presented showing the phosphoric acid and potash content of dried material cut at three different times during the year from numerous meadows in an effort to ascertain the needs of the soil with respect to these two elements of plant food. Analyses of the first cutting appeared to give better results than those of either the total dry matter produced per year, or the second and third cuttings.

It was concluded that an index to the soil requirements could be obtained by determinations similar to those described, especially if the harvested material was particularly rich or particularly deficient in either potash or phosphoric acid, or both.

Soil aldehydes, J. J. Skinner (*Jour. Franklin Inst., 186 (1918), Nos. 2, pp. 165–186; 3, pp. 289–316; 4, pp. 449–480; 5, pp. 547–584; 6, pp. 723–741, pl. 1, figs. 70*).—This article reports the results of "a scientific study of a new class of soil constituents unfavorable to crops, their occurrence, properties, and elimination in practical agriculture."

It is shown that aldehydes form an important group of the organic compounds in soils and that they are harmful in varying degree to plant growth as shown by water cultures, pot tests, and field experiments. Their harmfulness is variously modified by the character and condition of the soil and by drainage and fertilizing. Salicylic aldehyde and vanillin are common, particularly in unproductive soils. Their harmfulness is rapidly overcome or destroyed in fertile, biologically active, and strongly oxidizing soils. Drainage, liming, and certain fertilizers are effective correctives of toxicity due to aldehydes.

An extensive bibliography of the subject is appended.

The non-persistence of bacterio-toxins in the soil, H. B. Hutchinson and A. C. Thaysen (*Jour. Agr. Sci.* [*England*], *9* (*1918*), *No. 1, pp. 43–62, figs. 4*).—Investigations are described which were undertaken at Rothamsted with seven different soils in an effort to ascertain the validity of Greig-Smith's claim that the effect of partial sterilization may be due to the destruction of bacterial toxins in the soil (E. S. R., 25, p. 214). The studies embraced observations on the rate of growth of *Bacillus prodigiosus*, and also, in the case of two soils, of *B. fluorescens liquefaciens* in the treated and untreated extracts of the different soils as compared with the rate of growth in a standard physiological salt solution. The treatments included heating the extracts to 94° C. for one hour, partially sterilizing the soil with toluene, and adding peptone representing six parts of nitrogen per million of extract to untreated soil extract which had been boiled. Bacterial counts were made directly after inoculation and 4, 8, 24, 48, and 72 hours later. The behavior of *B. prodigiosus* toward its own growth products was also studied. The results obtained have been summarized as follows:

The untreated extracts of the soils varied widely in their suitability for the growth of *B. prodigiosus*. In some instances vigorous growth occurred, while in others the numbers of introduced organisms fell to a minimum. Treatment of the extracts by heat (supposed to result in the destruction of "toxins") invariably led to still further bacterial decreases, while extracts of soils treated with antiseptics (which are not supposed to destroy toxins) were on the whole more favorable for growth than those of untreated soils. Such extracts were found to have appreciably more organic nitrogen compounds than extracts of untreated soils. The addition of minute quantities of peptone to unsuitable extracts sufficed to convert them into favorable media.

Extracts of the two poorest untreated soils were tested with *B. fluorescens liquefaciens*, but no evidence of toxicity could be obtained, growth being very abundant. It is concluded that results obtained by the use of an extraneous organism, such as *B. prodigiosus*, must be accepted with reserve. The curve of diminished numbers of bacteria in poor untreated soil extracts was practically identical with that obtained when bacteria were introduced into pure salt solutions, the decreases being symptomatic of starvation.

The only soil which gave extracts similar in behavior to those reported by Greig-Smith was an acid heath soil. The value of the extract of this soil was distinctly increased after the extract had been subjected to heat. The acid iron and alumina compounds which were removed from the soil by the action of the saline solution were also thrown out of action. The "toxicity" of this soil was found to be rapidly (within 24 hours) and effectively removed by treatment with calcium carbonate.

Alternate inoculation and removal of the bacterial growth by filtration rapidly produced an extract unfavorable for the growth of *B. prodigiosus*, due in part to the impoverishment of the extract in food material and also to the formation of some substance inimical to growth. This body was capable of passage through a porcelain filter and was heat stable, and therefore appeared to have little in common with the inhibitory bodies described by Rahn as occurring in cultures of organisms, such as *B. fluorescens liquefaciens* or *B. coli*, nor did it resemble in its relations to heat the toxins which are alleged to occur in the soil.

Although it is deemed possible under well-defined conditions to induce the formation of bacterio-toxins in culture solutions, it is stated that there is no evidence to show that these are likely to possess importance in the phenomena of partial sterilization of soil.

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The destruction of vanillin in the soil by the action of soil bacteria, W. J. Robbins and A. E. Elizando (*Alabama Col. Sta. Bul. 204 (1918), pp. 125-131*).—In connection with earlier investigations (E. S. R., 38, p. 129), further evidence is presented to show that vanillin-destroying bacteria occur in those soils to which the addition of vanillin was observed to have little bad effect on the growth of plants. In the case of a quartz sand, no organism destroying vanillin could be demonstrated, while in soil obtained from the Arlington (Va.) Farm the vanillin was found to persist in a toxic state, even though vanillin-destroying bacteria were present in the soil. Assuming that conditions in this soil were not suitable for the growth and action of the vanillin-destroying organisms, a study was made of the effect of the addition of vanillin to Arlington soil upon the number of microorganisms developing in it.

Soil treated with vanillin and with vanillin and vanillin-destroying bacteria showed 0.96 and 0.32 million microorganisms per gram of air-dry soil, respectively, 57 days after treatment, while untreated soil showed 2.66 million. Untreated Alabama soil showed 3.76 million, and Alabama soil treated with vanillin showed 18.12 million for the same length of time. Vanillin was observed in crystals on the surface of the Arlington soil more than 40 days after treatment.

Soil extracts of Alabama and Arlington soils to which vanillin was added failed to show any difference in the rate of vanillin destruction by a pure culture of the vanillin-destroying bacterium.

The acidity of the Arlington soil, represented by a lime requirement of 4,740 lbs. per acre, is not thought to be responsible for this condition, due to the fact that in an Alabama acid sandy loam soil having a lime requirement of 3,400 lbs. per acre, vanillin has been entirely destroyed in less than 57 days.

Evidence has been obtained which is held to indicate that poor aeration may be responsible for the persistence of vanillin in the Arlington soil, although no definite conclusion has been reached.

The influence of potsherds on nitrification in the Indian alluvium, Jatindra Nath Sen (*Jour. Agr. Sci [England], 9 (1918), No. 1, pp. 32-42, figs. 4*).—The author describes pot and lysimeter experiments in which a study was made of the effect upon nitrification of aeration produced by the addition of different quantities of potsherds to the fine-textured Pusa soil. Small, roundish pieces of brick from ⅛ to ¼ in. in diameter were added in amounts representing 0, 10, 20, and 30 per cent of the soil, and the percolate from the pots and soil samples from the lysimeters examined for nitrates. Increased nitrification followed the use of postherds in both experiments, the 30 per cent application generally giving the highest results.

The use of green manures, Schribaux and L. Brétignière (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 10, pp. 354-357, 360-365; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, pp. 667, 668; Jour. Bd. Agr. [London], 25 (1918), No. 7, p. 864*).—In experiments at Grignon during 1913 to 1916, oats after trefoil produced 8.95 cwt. of grain per acre, after clover 6.27, vetches 4.82, and white mustard 0.42 cwt. Good results were obtained by sowing the legumes with the cereals. By this means it was possible to grow successfully three successive crops of cereals without other nitrogenous fertilizer. The use of crimson clover, fenugreek, and white melilot for this purpose is also suggested.

The farmer and the dung heap (*Jour. Bd. Agr. [London], 25 (1918) No. 6, pp. 705, 706*).—Brief directions for caring for the manure heap are given.

Fertilizers after the war, E. J. Russell (*Nature [London], 102 (1918), No. 2549, pp. 5, 6*).—Referring to previous reports and estimates relating to the postwar use of fertilizers in Great Britain, the author submits an estimate based on a total cultivated area of 46,700,000 acres, 22,000,000 of which are fertilized. This leads to the conclusion that there will be required 1,730,000 tons of superphosphate and basic slag and 470,000 tons of sulphate of ammonia or its equivalent. No estimate of the amount of potash required is given.

The nitrogen problem in relation to the war, A. A. NOYES (*Jour. Wash. Acad. Sci., 8 (1918), No. 12, pp. 381–394; abs. in Nature [London], 102 (1918), No. 2550, pp. 26, 27*).—This article, by the chairman of the Committee on Nitrate Investigations of the National Research Council, gives a general view of the nitrogen situation with brief descriptions of sources of supply and methods of meeting the demands for nitrogen compounds.

It is pointed out that the Chilean nitrate supply is at best precarious, and that the utmost possible supply from by-product coke ovens is wholly inadequate. It is, therefore, necessary to develop methods of manufacture. The most promising of these so far developed are the cyanamid, cyanid, arc (nitric acid), and synthetic (ammonia) processes.

It is stated that the nitrate division of the Ordnance Department has greatly simplified the process of absorption of nitric vapors and that the Bureau of Mines has brought the oxidation process to a high state of perfection.

Storage of sulphate of ammonia on farms (*Jour. Bd. Agr. [London], 25 (1918), No. 6, pp. 703–705*).—Directions are given for storage either in bags or loose in a heap. It is essential that the sulphate should be kept dry.

Utilization of phosphate deposits of Australia, J. W. PATERSON (*Aust. Advisory Council Sci. and Indus. Bul. 7 (1918), pp. 96–107, fig. 1*).—This article reviews the results of various investigations on the amount and availability of phosphoric acid in soils and the relative availability of different kinds of phosphates, and notes briefly the results of examinations of 24 soils from different parts of Australia which show them to be low in total phosphoric acid but specially so in available phosphoric acid as determined by Dyer's method. The total phosphoric acid varied from 50 to 68 parts per 100,000 of soil, of which only from 5.3 to 15 per cent was available.

In pot tests with wheat, comparing calcium rock phosphate, aluminum phosphate, and iron phosphate, it was found that the calcium phosphate was decidedly superior to aluminum and iron phosphates when no lime was used, but that when lime was used iron phosphate was nearly as effective and aluminum phosphate apparently fully as effective as calcium phosphate. It is stated that the native phosphate deposits are of two kinds, calcium phosphates of low grade and iron and aluminum phosphates of various kinds. Various methods of utilizing these phosphates are suggested, and a plan for studying them by means of chemical investigations, pot tests, and field experiments is outlined.

Condition of fertilizer potash residues in Hagerstown silty loam soil, W. FREAR and E. S. ERB (*Jour. Agr. Research [U. S.], 15 (1918), No. 2, pp. 59–81*).—This is a report in detail of studies made at the Pennsylvania Experiment Station of the solubility of the potash of Hagerstown silty loam soil in hot, strong (1.115 sp. gr.) hydrochloric acid, fifth-normal hydrochloric acid, distilled water, carbonated water, and approximately third-normal ammonium-chlorid solution.

A comparative study was made of the solubility of the potash in a soil which has in the past 36 years received in 18 equal biennial applications 1,800 lbs. of fertilizer potash and that in a neighboring portion of the same soil which has been unfertilized but has been tilled and cropped in the same manner. Hot, strong acid dissolved somewhat larger amounts of potash from the fertilized soil. The remaining solvents dissolved in a short time at moderate temperatures twice as much potash from the fertilized soil as from the unfertilized. Of the weak solvents used fifth-normal hydrochloric acid dissolved the largest amount of potash. The clays separated by sedimentation in water contained less potash than the nonclays.

The soil is naturally rich in potash and applications of potash result in little or no crop increase, but there is an increase in the amounts of potash taken up by the crops. It was found that on the average for a 5-crop rotation the crops harvested from the soil treated with potash removed "in a given weight of harvest, 40 per cent more potash than a like harvest weight from the unfertilized land contains—that is, both chemical solvent and plant agree in indicating a higher availability for at least part of the potash in the potash-dressed soil. Moreover, the crops grown the second year after the application show a greater potash excess than those to which the potash fertilizer is directly applied. Crediting the fertilizer potash with the excess only of the potash in the crops from the fertilized soil, the crops have used not more than one-fourth of the potash dressings applied."

The general conclusion reached is that "much of the potash applied as fertilizer remains in the surface soil in a state highly available to crops, that most of it remains there in a condition of lower availability, and that the losses by drainage have probably not been great."

Potash situation growing serious, R. C. Randall (*Chem. Engin.*, *26* (*1918*), *No. 12*, *pp. 459–462*).—This article reviews the present situation with reference to the extent, development, and possibilities of a domestic supply of potash in the United States.

It is shown that the present production is far short of the 250,000 tons of pure potash which is estimated to be the annual need of the United States. Data are given for the production from the Nebraska lakes, Searles Lake, alunite, cement works and blast furnaces, and kelp.

The potassium problem and the utilization of olive oil residue in Italy, G. L'Abate (*Abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *9* (*1918*), *No. 8*, *p. 931*).—It is shown in this article that the 16,500,000 bu. of olive oil residue produced annually in Italy contains about 141,320 cwt. of potash obtainable by extraction, besides a considerable amount of nitrogen.

Production of lime in 1917 (*U. S. Geol. Survey Press Bul. 384* (*1918*), *p. 4*).—According to revised figures, the total production of lime in the United States in 1917 was 3,786,364 short tons, the output of 595 plants, as compared with 4,073,433 tons, the output of 778 plants in 1916. The average price increased from about $4 in 1916 to $6.29 in 1917. The amount of lime used in agriculture in 1917 was 488,297 tons.

Analyses of commercial fertilizers, R. N. Brackett and H. M. Stackhouse (*South Carolina Sta. Bul. 197* (*1918*), *pp. 3–62*).—This reports the actual and guarantied analyses of 1,474 official samples of commercial fertilizers and fertilizing materials inspected during the season of 1917–18. A total of 236 samples fell below the commercial value based on the guaranty.

AGRICULTURAL BOTANY.

Hardening process in plants and developments from frost injury, R. B. Harvey (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 2*, *pp. 83–112*, *pls. 6*, *figs. 3*).—A study was made of the practice of hardening plants to determine, if possible, the physiological basis of this practice and the mechanism of frost injury. The investigations, which were carried on in the Bureau of Plant Industry, U. S. Department of Agriculture, were made on the effect of hardening by exposure to cold in case of cabbage, tomatoes, and a number of other plants. Plants were kept in constant temperature chambers at 3 and 5° C., using 18 and 25° as controls. After 5 days' exposure to 3°, cabbages were not injured by 30 minutes' exposure to −3°, although frozen stiff. The maturity of tissues was found to be an important factor in frost resistance, although during the process of hardening young leaves seem to pass rapidly through some sort of maturation process.

Frozen cells in the leaves of cabbage, Bryophyllum, salvia, and lettuce were found to be stimulated to growth and to produce tumors similar to those in pathological conditions but without the presence of bacteria. Frozen spots on the leaves of tomato, coleus, geranium, and a number of other plants did not receive a growth stimulus but were killed by the freezing. The peroxidase content of the intumescences in the case of cabbage was found to be much greater than for the normal tissue. A decrease of hydrogen-ion concentration may occur in such cells, and this condition is believed to allow greater activity or accumulation of the respiratory enzyms, particularly peroxidase.

The principal effect of the hardening process on cabbage is believed to be a change in the constituents of the protoplasm which prevents their precipitation as a result of the physical changes incident upon freezing. The proteins are changed to forms which are less easily precipitated, as indicated by an increase in the amino-acid content of cabbage plants on hardening. Cabbage plants which had become resistant to freezing through the hardening process showed only slight changes in carbohydrates, and it is considered that the prevention of protein precipitation by sugar accumulation during hardening is not sufficient to account for the resistance of hardened plants to freezing. The proteins of the midrib of cabbage leaves were precipitated more rapidly than those of the rest of the leaf, and this is considered to be due to physiological differences between vascular and other tissues of the leaf. In the juices of nonhardened leaves of cabbages, the proteins were found to be precipitated to a greater degree by freezing than in those of hardened cabbages, the percentage of precipitation on freezing being closely paralleled by the relative precipitation on the addition of acid. The effects of desiccation, freezing, and plasmolysis are considered to be similar, in that all these processes cause changes in the hydrogen-ion and salt concentrations.

The transpiring power of plants, EDITH B. SHREVE (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 66–68*).—Studies reported so far as carried in comparing the index of transpiring power as determined with cobalt tripartite slips of standardized paper with the transpiring power as determined by the rate of loss of weight from the plant to that from an atmometer showed the same general curve except that the time of beginning of incipient drying can be detected sooner by the cobalt slips than by the weighing methods, and as accurately and more reliably, as the cobalt method can be used with plants naturally rooted in the earth. An attempt is being made to lessen the largest source of error, which lies in the assumption that the leaf temperatures agree with air temperatures.

It has become evident that a comparison of the transpiring power of different species or strains necessitates finding the whole daily march of transpiring power, isolated readings by either method having but little value. It is necessary also to test several leaves of the ages and sizes represented.

The relation between water loss by evaporation and water gain by absorption in colloidal gels, EDITH B. SHREVE (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 68–71*).—Preliminary experiments (E. S. R., 35, p. 733) on *Opuntia versicolor* showing the probability of a direct relation between the power to absorb water and the power to withhold water against atmospheric evaporative forces have been confirmed by further experimentation on this species and *O. blakeana* (?). Work testing this relation for colloidal gels has been planned, and tests have been made with gelatin, the absorption rate of which proves to be influenced greatly by its history in ways which are detailed, so that certain precautions must be observed in order to obtain comparable results. The conclusions derived are believed to throw light on the problem of water absorption by gels and at the same time to give a new view of the complexity of the factors which may operate to determine the rate and direction of growth, as well as absorption and transpiration in the highly complex colloids of the plant.

Colloidal phenomena in the protoplasm of pollen tubes, F. E. Lloyd (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 63, 64*).—In continuance of reports on previous work (E. S. R., 36, p. 526), the author gives details of studies intended to throw light on the behavior of pollen tubes grown in acids and alkalis in the presence of high concentrations of cane sugar, the results of which are summarized.

Within the limits of concentration 1/10 to 1/2,560-normal of the reagent, acid or alkali, the maximum swelling rates and maximum total swelling in acids occur at 1/10-normal, malic acid, to 1/320-normal, hydrochloric acid, and for alkalis at about 1/80-normal. Organic acids cause maximum swelling at higher concentrations than do mineral acids, apparently in direct relation to the degree of dissociation. At lower concentrations of acids and alkalis, there is a repression of swelling rates, especially in hydrochloric acid, this being generally greater for acids, while for alkalis the rates are about equal to or slightly less than for water.

The author has sought to determine how far parallelism exists between the behavior of protoplasm in pollen and that of gelatin. The effects of a series of acids, hydrochloric, acetic, malic, citric, formic, and oxalic, have been determined for concentrations 1/200 to 1/25,600-normal in association with cane sugar at 16 per cent concentration. It was found that no growth occurs at or above 1/3,200-normal of the acid. Below that limit growth rate varies inversely as the concentration. Rate (also, total) of growth for any concentration varies with the acid.

There is evidence that pollen tube growth rates are limited by their ability to utilize the swelling effects of the acids. The tubes may burst at high concentrations.

The parallelism of behavior between gelatin and the protoplasm of pollen tubes, when expressed in terms of accomplished growth, is more apparent in the case of alkaline than in that of acid media.

The effect of acids and alkalis on the growth of the protoplasm in pollen tubes, F. E. Lloyd (*Mem. Torrey Bot. Club, 17 (1918), pp. 84–89*).—A study of the pollen of *Phaseolus odoratus* in hanging drops of various reagents at different concentrations, associated with cane sugar in constant concentration, is said to indicate that the protoplasm of pollen grains is affected by acids and alkalis as is gelatin, and that the increased swelling caused by the reagents can be utilized in growth. This protoplasm is extremely sensitive to low concentrations of both acids and alkalis.

The construction of a biocolloid exhibiting some of the water relations of living plants, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 59, 60*).—It is stated that the systematic endeavor to construct, by methods which are described, a colloidal mixture displaying some of the fundamental physical properties of protoplasm in plants has resulted in finding that a mixture of substances of two of the three more important groups of constituents, carbohydrates and proteins, shows the imbibitional behavior of tissues and tracts of protoplasts of the plant. The differential action of such biocolloids in solutions yields striking parallels with growth. The general identity as to constitution of these colloidal mixtures and of cell masses and the similarity of their behavior are thought to make it possible to correlate more closely the processes of imbibition, metabolism, and growth, and on the basis of their interrelation to interpret growth enlargement and incidental variations in the volume and size of plant organs. It is also suggested that the differential action which might follow a change in the quantity of a nitrogenous compound in the carbohydrate body of protoplasts in special tracts, changing the imbibition capacity of chromosomes, of spindles or cell plates, etc., may play an important part in mitosis and cell division.

Imbibition in biocolloids as affected by acidosis, alkalosis, and neutralization, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 60–62*).—Some systematic information as to the swelling of agar and gelatin in water, acids, alkalis, and salts with regard to concentration of the reagents has become available as the result of the work in the physics of simple colloids.

The reactions of sections of living plants to similar solutions demonstrated that protoplasm shows a characteristic behavior which may be simulated fairly well by a mixture consisting of a base of an inert carbohydrate like agar and albumin or its derivatives, which for convenience is designated as a biocolloid. The swelling of dried sections of biocolloids gives data which can not be anticipated by a consideration of the known laws of imbibition of its components separately, but it is confidently predicted that with wider evidence the general behavior of a biocolloid may be foretold. Preliminary tests of imbibition by biocolloids were made chiefly with a single concentration of the reagent, which is taken to lie within the possibilities of conditions in the cell.

The data obtained are tabulated, and show some of the more obvious features of imbibition in a biocolloid as affected by conditions similar to those supposedly prevalent in living plants.

Imbibition of gelatin and agar gels in solutions of sucrose and dextrose, E. E. Free (*Carnegie Inst. Washington Year Book, 16 (1917), p. 66*).—From a comprehensive series of swelling tests made with sucrose and dextrose under guarded conditions upon the swelling of biocolloids consisting of varying proportions of agar and gelatin, it appears that for sugar solutions of less than 25 per cent concentration the results do not differ from those for distilled water more than is explainable by the accidental variation normal to the method when the temperature is not precisely controlled. It is thought that neither sucrose nor dextrose in concentrations under 25 per cent exercises any effect on the swelling of gelatin-agar gels in water so important as that of acids or alkalis. No specific effect of sugar was noted either on the swelling or imbibition capacity of the gels.

Gas interchange in Mesembryanthemum and other succulents, H. M. Richards (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 79, 80*).—This is a study of Mesembryanthemum, Dudleya, and Abronia under various conditions of temperature and illumination as related to the acidity conditions of their juices, most of the tests being carried out in darkness, a number in diffuse light or direct sunlight. The gas samples collected, over 200 in number, await analysis by methods previously described (E. S. R., 35, p. 225).

Desiccation and respiration in succulent plants, E. R. Long (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 80–82*).—Some results of earlier work (E. S. R., 34, p. 430) are referred to as having shown that Echinocactus exposed to air accumulates carbohydrate (a large portion of the increase being that of soluble nonreducing sugar), and that during prolonged desiccation in diffuse light oxidation of storage sugars keeps the relative dry weight of the plant tissue at a constant figure. An attempt has been made by the author to combine these effects in one plant in order to gain insight on the course of katabolism in carbohydrate types and on the time element involved.

An Echinocactus which had been loaded with carbohydrate, by being desiccated in the open air for eight months, was placed in a ventilated dark chamber. It was found that in darkness the rate of water loss tends to become constant, that acidity increases in darkness, and that soluble sugars are broken up, although but little change takes place in the insoluble polysaccharids. These polysaccharids do break down in the course of long confinement, this fact together with that of the resistance of Echinocactus to desiccation helping in a large measure to explain the viability of these plants in spite of long starvation.

Rate and course of growth of succulents, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 83–85*).—By employing auxographs of improved pattern, the author collected much information regarding the growth of plants, more particularly certain cacti, including Echinocactus, Opuntia, Carnegiea, and Mesembryanthemum. These data are briefly discussed.

The carbohydrate economy of cacti, H. A. Spoehr (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 73–79*).—A continuation of studies (E. S. R., 39, p. 224) on the carbohydrate metabolism of the cacti, platyopuntias and *Opuntia versicolor*, has yielded an insight into various phases of this subject which could not be gained from work with thin-leaved plants. The purpose of the work as a whole is primarily to secure facts bearing upon the problems of photosynthesis, in particular at this stage to secure facts leading to a clearer understanding of the conditions governing the equilibria and mutual transformations of the groups of carbohydrates in the leaf and of the fate of these substances in the general metabolism. The data obtained are briefly discussed.

The present report deals with the methods of sugar analysis applicable to plants, seasonal variations in the carbohydrate content of cacti, the effect of temperature and of water content on carbohydrate equilibrium, carbohydrate equilibrium during starvation, and the rôle of pentose sugars in plant metabolism.

Root growth of Prosopis velutina and Opuntia versicolor under conditions of a small oxygen supply in the soil, W. A. Cannon (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 82, 83*).—The work here described confirms and extends that previously noted (E. S. R., 34, p. 334; 36, p. 525; 37, p. 213) as employing carbon dioxid with or without atmospheric air, the present work employing carbon dioxid, commercial oxygen, and commercial nitrogen.

The rootlets of seedling Prosopis show a variable reaction to small amounts of oxygen, depending apparently in the main on the length of the root. It appears probable that after germination has started root growth may continue for some time under practically anaerobic conditions, the time possibly being related to the duration of the cotyledonary food supply. In *O. versicolor* growth in all cases stopped promptly in 2.67 per cent oxygen. Roots 3 to 7 mm. long stopped growth in 4.56 per cent oxygen, although roots 11 cm. long grew for 48 hours in the same atmosphere. It appears, therefore, that at least the shorter roots of Opuntia cuttings have a greater oxygen requirement than the longer roots of Prosopis seedlings, but that a differential result may also occur which may be associated with the well-known differential development of the roots of the species into shallow absorbing and more deeply placed anchoring roots.

Effect of ammonium sulphate in nutrient solution on the growth of soy beans in sand cultures, M. I. Wolkoff (*Soil Sci., 5 (1918), No. 2, pp. 123–150, figs. 7*).—Employing soy beans grown in sand cultures, the author has studied the behavior of ammonium sulphate in the nutrient solution used by Shive (E. S. R., 36, p. 328) as his simplification (E. S. R., 34, p. 333) of that employed by Tottingham. The osmotic concentration of the solutions was in most cases below the calculated 2.5 atmospheres.

The substitution of ammonium sulphate for potassium nitrate improved the yield in certain proportions, but caused injury when added in excess. The foliage, on the whole, showed a greener color than did the plants in the Tottingham series, which it also exceeded in yield of dry weight of tops at optimum concentrations, though great variations appeared. A close relation was noted between top yield, root yield, and total transpiration. The water requirement was less in these experiments than in the Tottingham series.

Growth of wheat (Triticum) and corn (Zea), D. T. MacDougal (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 85–87*).—The facts here discussed as significant were obtained by analyses of the daily course of growth of corn and wheat.

Retardation of growth of Zea and of Triticum occurred at more than one place in the temperature scale and at different hours of the day. An uneven growth rate was particularly noticeable in Triticum. Temperature may be a cause of arrested growth. The highest growth rate maintained for some time by Zea ranged between 27 and 30° C. (80.6 and 86° F.). No retardations occurred except after 11 a. m. Zea alone showed acceleration late in the day after retardation at high temperatures. Wheat probably reaches its upper limit near the temperatures given above.

The individuality of the bean pod as compared with that of the bean plant, Helene M. Boas (*Mem. Torrey Bot. Club, 17 (1918), pp. 207–209*).—It is concluded from this study that in case of a variety of string bean the pods exhibited an individuality of almost the same order as that of the plants bearing them. It remains to be seen whether the individuality of the pods is due to purely chance differentiation, as in nutrition, or to definite morphological differentiation according to position on the plant.

FIELD CROPS.

[Work with field crops on the Truckee-Carson reclamation project experiment farm in 1917], F. B. Headley (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1917, pp. 1–12, 13–17, fig. 1*).—This reports the continuation of work along the same general lines as previously noted (E. S. R., 39, p. 226), including observations on weather and agricultural conditions on the project, together with a temperature survey of the area. The summer temperatures for 1917 are said to have been very favorable for the growth of corn, sorghum, melons, and tomatoes.

The average yield of alfalfa on the project for 1917 was 3.6 tons per acre, and the average yield on the experiment farm 3.2 tons per acre for an area of 8.4 acres.

In a test with 15 varieties of corn, Minnesota No. 13 was first with a yield of 31 bu. of shelled corn per acre. Reid Yellow Dent was first in yield of corn and stover, with 5.05 tons per acre, and Minnesota No. 13 second, with 4.04 tons. Of the corn varieties grown two or more years, Australian White Flint was first with an average yield of 35 bu. per acre.

In variety tests with barley, Trebi gave the highest yield, 23.6 bu., followed by a local sort with a yield of 20.5 bu. For the three years 1915 to 1917, inclusive, Coast was highest with 33.3 bu. per acre and the local variety was next with 30.3 bu.

Potatoes planted at weekly intervals from April 19 to May 24, inclusive, gave the highest yield from plantings made May 3. Tests were also made with 14 varieties or strains of potatoes, but owing to lack of uniformity in the soil, the actual yields obtained are not deemed of great value. The varieties appearing to be most desirable with respect to productivity and smoothness included Netted Gem, American Wonder, Earliest of All, and Colorado Pearl.

Based on relative values, Little Club, Marquis, and Sonora proved to be the leading wheat varieties grown on the experiment farm in 1917, while for the three years 1915 to 1917, inclusive, Little Club, Rieti, and Dicklow were highest, based on corrected yields eliminating irregularities in the experimental field.

Various treatments for the improvement of alkali land, including applications of gypsum, manure, and sulphuric acid and tile drainage, begun in 1914 have resulted in average yields of alfalfa for all treated plats of 3,292 lbs. per acre and for all untreated plats of 2,292 lbs. It is stated, however, that the increased yields have not yet reached the point of profitable production.

Report of agronomy department, M. A. Beeson (*Oklahoma Sta. Rpt. 1917, pp. 9–19, fig. 1*).—This notes the progress of work with field crops for the year ended June 30, 1917, including data as to variety tests with wheat, oats, cowpeas, grain and forage sorghums, and barley; continuous culture tests with wheat; plant breeding work with Sudan grass; fertility experiments with alfalfa; depth of plowing tests; cultural experiments with Kafir corn, alfalfa, and Sudan grass; a pasture experiment with sweet clover, Sudan grass, and Bermuda grass; and tests with delinted cotton seed.

Root crop culture in South Dakota, M. Champlin and G. Winright (*South Dakota Sta. Bul. 180 (1918), pp. 824–853, figs. 21*).—Cultural methods and field practices deemed best for growing root crops in South Dakota are described. Sugar beets, mangels, carrots, rutabagas, and turnips are considered. Mangels are said to produce the highest tonnage per acre, while sugar beets produce the greatest feed value per acre. Rather limited variety tests with the different crops, conducted at Brookings, Eureka, Cottonwood, and Highmore, are noted. Diseases affecting sugar beets are indicated. Brief notes by J. H. Shepard on sugar beets and other roots as stock feed are included.

Grasses of the West Indies, A. S. Hitchcock and Agnes Chase (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 18 (1917), pt. 7, pp. XVIII+261–471*).—This publication, previously noted (E. S. R., 39, p. 440) as dealing with the grasses of Bermuda, the Bahamas, Trinidad, and Tobago, covers all of the West Indies.

Victorian grasses, J. W. Audas (*Jour. Dept. Agr. Victoria, 15 (1917), No. 12, pp. 711–723, figs. 3*).—The distribution throughout Australia of grasses indigenous to Victoria is indicated by States in tabular form showing the genera with their relative strength in species. A further grouping of indigenous species indicates those grasses deemed undesirable and those suitable for pasture, moist soil, dry soil, and coast sand binders. Exotic grasses and forage plants other than grasses found in Victoria are briefly mentioned.

Variations in the development of secondary rootlets in cereals, E. H. Walworth and L. H. Smith (*Jour. Amer. Soc. Agron., 10 (1918), No. 1, pp. 32–35*).—This paper, a contribution from the plant breeding division of the University of Illinois, reports the results of experiments with certain miscellaneous varieties of wheat, oats, and barley and with selected strains of wheat and oats with respect to variations in the number of secondary rootlets. The term "secondary rootlets" is here applied to temporary roots of the seedling other than the radicle. Representative samples consisting of 100 or more kernels from each lot were sown in pure quartz sand in the greenhouse, and the counts made when the plumules had attained a length of from 1 to 2 in. The results are tabulated.

The number of secondary rootlets in the 21 oat varieties examined ranged from 0 to 5, in the 11 wheat varieties from 1 to 5, and in the 4 barley varieties from 1 to 7. In the selected strains of both wheat and oats the number varied from 1 to 4. The authors maintain that their observations in general confirm those of Wiggans (E. S. R., 35, p. 135), in that the number of secondary rootlets was by no means constant for any given variety, but varied among individuals so that counts made on a random sample usually gave a frequency distribution represented by a fairly normal curve. Furthermore, they conclude that different varieties of a given cereal show characteristic tendencies in the production of rootlets, and that of the cereals observed this tendency was greater in barley than in either wheat or oats, as indicated by varietal averages, modal numbers, and highest extremes.

Cereal culture in the Province of Alemtejo, Portugal (*Rev. in Compt. Rend. Acad. Agr. France, 3 (1917), Nos. 36, pp. 1049–1051; 41, pp. 1156–1161, figs. 3*).—A system of wheat culture known as the "integral method" employed in the arid regions of southern Portugal has been described by J. A. Paquito Rebello. The method is essentially as follows:

Wheat is sown in the fall (September) in rows 80 cm. (3.15 in.) apart and about 3 cm. deep, at the bottom of a furrow which is allowed to remain open. Before winter a double plow is employed to throw the soil into a rather high ridge in the interspaces, at the same time allowing a little soil to fall back around the wheat plant. This practice is said to afford the wheat greater protection in the winter, with shallow drainage, and less compacting of the soil from rain, and also favors the development of adventitious roots and tillering. At the close of the winter the field is reduced to one level by harrowing. The grain can be harvested sufficiently early to permit the reseeding of the field to wheat, thus eliminating the fallow year.

This method is reported to have given average annual yields of 10 hectoliters per hectare (about 11.5 bu. per acre) as compared with a yield of only 8 hectoliters per hectare every other year under the ordinary methods of cultivation.

Normal self-fertilization in corn, H. K. Hayes (*Jour. Amer. Soc. Agron., 10 (1918), No. 3, pp. 123–126*).—This paper, a contribution from the Minnesota Experiment Station, describes rather limited observations upon the effects of self-fertilization on yield in corn and upon the relative frequency of self-fertilization in the field.

Normally pollinated Minnesota No. 13 yellow dent corn gave a yield of 49.3 bu. per acre, while 15 F_1 self-fertilized lines showed an average yield of 24 bu. Single seeds of Rustler white dent planted in hills some distance apart in a field of Minnesota No. 13 produced 6 ears, the seeds of which were carefully examined and separated into groups composed of 1,911 yellows, 229 doubtful yellows, and 69 whites. The following year a number of hills of the doubtful yellow and of the white groups were grown, and about 25 ears from each group artificially self-fertilized. All of these ears contained a considerable percentage of yellow seeds.

It is concluded that the first year of self-fertilization in maize causes a reduction of about 50 per cent in vigor, as determined by the yields of shelled corn from normally pollinated and from self-fertilized strains; that if normally 5 per cent of the corn in the field was self-fertilized, as indicated by Waller (E. S. R., 37, p. 537), it might be profitable to use seed from detasseled stalks only; but that the amount of normal self-pollination observed in these tests was found to be less than 5 per cent.

Linkage in maize: The C aleurone factor and waxy endosperm, T. Bregger (*Amer. Nat., 52 (1918), No. 613, pp. 57–61*).—This paper, a contribution from the department of plant breeding of Cornell University, presents data on observations made by the author in back crosses of maize plants heterozygous for one aleurone factor and for waxiness with double recessive plants. With reference to the work of Collins (E. S. R., 27, p. 769), containing conclusive evidence of linkage between waxy endosperm and aleurone color in certain hybrids of Chinese and American corn, the author states that he "has presented additional evidence from back crosses, which shows the intensity of the linkage in the material at his disposal to be equivalent to 26.7 per cent of crossing over. It has been shown directly, by means of crosses between colorless individuals in a linkage family and aleurone testers and indirectly by means of aleurone tests with a nonlinkage family where the A factor and not the C factor is heterozygous, that the C factor for aleurone is linked with the factor for waxy endosperm."

Corn culture in South Dakota, M. CHAMPLIN and G. WINRIGHT (*South Dakota Sta. Bul. 181 (1918), pp. 852–911, figs. 34*).—The results of variety, crop rotation, and cultural tests with corn conducted on the Brookings, Cottonwood, Eureka, and Highmore experiment farms are noted, and the cultural methods and field practices deemed best for growing the crop in the State outlined. A number of corn varieties grown in the State are illustrated and briefly described.

South Dakota is said to be peculiarly adapted to growing seed corn for the States to the north and west, where corn is grown for roughage but does not as a rule mature seed. Adapted varieties for different sections of the State are recommended. Fall plowing for corn at a depth of from 6 to 8 in. is held to be desirable, while subsoiling was not warranted by the results obtained. Systematic crop rotation, preferably including a legume, is deemed essential to successful corn production. The selection and storage of seed corn is described, and some of the diseases affecting the crop are indicated.

Budding incompatible cottons (*Jour. Heredity, 9 (1918), No. 4, p. 181*).—A brief description is given of experimental work conducted by R. M. Meade in budding American upland cotton (*Gossypium hirsuum*) on two Asiatic species (*G. herbaceum* and *G. indicum*), in an effort to overcome a seeming chemical incompatibility which caused the shedding of the young bolls when the usual methods of cross-pollination were employed. Several successfully budded plants were secured, but they were obtained so late in the season that only one budded branch produced flowers, and that at a time when no flowers were open on the stock plant.

That the sap of the stock may alter the chemical composition of the budded branches is thought to have been indicated by an experiment in budding two distinct upland varieties. Willet Red Leaf, which has dark red foliage and stems, was employed for the bud wood, and Trice, a normal green variety, was used for stock. The first leaves on the budded branches were red in color like the bud parent, but succeeding leaves grew lighter in shade until at the end of the season they were only half as dark.

Length of cotton lint, crops 1916 and 1917, W. L. PRYOR (*U. S. Dept. Agr. Bul. 733 (1918), pp. 8*).—Statistical data relating to the production, distribution, yield, and price per pound of long staple cotton during 1916 and 1917 are presented and discussed as the result of an inquiry made in December, 1917. The principal areas of production of extra-length cotton are said to include the alluvial sections of Mississippi and Arkansas, eastern and northwestern Louisiana, northeastern Texas, eastern Oklahoma, and northeastern South Carolina. In addition, Sea Island, Egyptian, and Durango cotton were grown in certain sections of Georgia, Florida, South Carolina, Arizona, and California. The damage done to the cotton crop by weather and insects during 1917 is briefly noted. The qualities required for spinning and differences in classification of cotton according to length of staple in both American and English markets are indicated.

[Jerusalem artichoke in France], SCHRIBAUX (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 40, pp. 1119–1131; Vie Agr. et Rurale, 8 (1918), No. 7, pp. 116–118, fig. 1*).—Jerusalem artichoke is recommended as an excellent plant for use on fields overrun by weeds after three years of neglect due to a scarcity of hand labor and to insufficient tillage during the war. The advantages and disadvantages of the crop are briefly discussed and its uses indicated. Tabulated data are presented showing the relative yields of this crop and of potatoes to have been 17.4 tons and 7.9 tons per hectare (2.47 acres), respectively, in 1914.

The Jerusalem artichoke as a war plant, L. O. HOWARD (*Science, n. ser., 47 (1918), No. 1214, p. 344*).—This is a brief review of the article noted above.

Nettle as a textile, DE LAPPARENT (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 41, pp. 1161–1163*).—The author presents a brief note concerning the use of fiber from nettle as a substitute for flax and cotton.

Relation of size of sample to kernel-percentage determinations in oats, R. J. GARBER and A. C. ARNY (*Jour. Amer. Soc. Agron., 10 (1918), No. 3, pp. 134–142*).—This paper, a contribution from the Minnesota Experiment Station, presents data collected in studies of the relation of size of sample to accuracy in kernel-percentage determinations, in an effort to minimize the labor and expense attendant upon hulling oats by hand. Thirteen varieties, grown on University Farm in 1917, and representing wide differences in size and shape of grain, in percentage of kernel, and in other characteristics, were employed in the investigation. A range from 62.16 to 76.7 in percentage of kernel was obtained, which was deemed greater than that found for any one variety over a period of years, and consequently obviated the necessity of using the crop from more than one year.

Composite samples of a pound or more were made for each variety by taking portions from various places within the bags of bulk oats. Each sample was thoroughly mixed and poured into a conical pile, and the samples used in the determinations taken from one side of the piles. No selection was made beyond the rejection of broken or diseased kernels. Twenty 50-kernel samples of each variety were selected, and the frequency distributions of kernel percentages of the 13 varieties as shown by the determinations indicated. From these data tables were prepared for each variety showing the variability of kernel percentage for samples of from 50 to 500 kernels, based upon replications of the 50-kernel samples. The coefficients of variability for the samples and the different replications for each variety studied, together with the statistical constants of these coefficients, are also indicated. All data are tabulated and fully discussed.

It is concluded that for ordinary purposes a 200-grain sample of oats taken as described gives sufficiently accurate determinations of kernel percentage. The weight of this size of sample varied from 3 gm. in early to 5 gm. in midseason and late varieties. When more than ordinary accuracy is demanded, the sample should be increased to at least 300 grains, and with some varieties even larger samples are deemed desirable.

A preliminary study of the bleaching of oats with sulphur dioxid, G. H. BASTON (*U. S. Dept. Agr. Bul. 725 (1918), pp. 11, figs. 3*).—This bulletin reports the results of laboratory tests made in connection with investigations begun in 1915 in a study of the commercial methods most commonly employed in bleaching oats, the results obtained by these methods, and the effects of bleaching upon the grain itself. Samples of oats were obtained from representative sections in which the commercial bleaching of the crop is practiced to a considerable extent, and an examination of the grain was made before and after treatment. Data showing the sulphur reaction, percentage of germination, moisture content, weight per bushel, and percentage of sound and damaged oats are presented in tabular form and briefly discussed.

Bleaching weather-stained, discolored, and damaged oats is said to give them the appearance of natural oats of good quality and to improve slightly the appearance of badly bin-burned and ground-damaged oats. In practically every case the viability of the oats was materially reduced by the bleaching process, the greatest reduction being observed in a sample which germinated 97.5 per cent before treatment as compared with 9.5 per cent after treatment. The methods employed were found to be practically uniform throughout the oat-bleaching section. The character of the harvest season is said to have a direct influence upon the subsequent handling of the crop, oats harvested in a dry season rarely showing any damage and hence seldom being bleached.

[Peanut culture in southern France], A. MOREL (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 40, pp. 1131–1136*).—Peanut growing in the Department of Gironde is briefly described. Reviewing results obtained from field tests, it is found that the highest yields of mature peanuts and of vine were secured from plantings made on or before June 1, and at a seeding rate of from 25 to 30 kg. per hectare (from 22.2 to 26.7 lbs. per acre) with the plants spaced from 50 to 60 cm. (from 19.7 to 23.6 in.) apart in all directions.

The book of the potato, T. W. SANDERS (*London: W. H. & L. Collingridge, 3. ed., rev., [1917], pp. 110, pls. 11, figs. 30*).—This is the third edition of a work previously noted (E. S. R., 17, p. 132), revised and brought up to date in regard to cultural and manurial methods, the treatment of disease and insect pests, and the selection of suitable varieties.

Grow more rape, J. M. EVVARD and W. R. HECHLER (*Iowa Sta. Circ. 53 (1918), pp. 3–12, figs. 4*).—The value of rape as pasturage for sheep and hogs is indicated, and an increased acreage is recommended. Methods employed in growing the crop are briefly described.

Sudan grass, R. L. STEWART and L. FOSTER (*New Mexico Sta. Bul. 111 (1918), pp. 3–13, figs. 2*).—Date, rate, and method of seeding tests and pasture experiments with Sudan grass made during the period 1915 to 1917, inclusive, are briefly described, and the suitability of the crop for both hay and pasture in the irrigated valleys of New Mexico discussed.

Yields of from 3 to 7¼ tons of hay per acre have been obtained under irrigation. Early plantings (the latter part of April) gave the highest yields, while broadcasting seed at the rate of from 20 to 25 lbs. per acre was found best. Slightly higher yields were obtained from seedlings made in 32-in. rows, but the resulting hay crop was of inferior quality.

Pasture tests indicated that Sudan grass will make a good supplementary pasture for dairy cows during the latter part of the summer.

Sugar beet seed [in France], É. SAILLARD (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 16, pp. 508–510*).—Stating that approximately 5,000,000 kg. (about 5,500 tons) of sugar beet seed was used annually in France before the war and that approximately four-fifths of this seed was of foreign origin, the author briefly reviews experiments begun in 1904 to compare French-grown seed with German-grown seed. During the war the seed was practically all of Russian and French origin. For the 10-year period of 1904 to 1913, inclusive, weekly analyses of the beets grown in the comparative tests were made at 14 sugar beet factories beginning about August 1. In 1905 French seed produced approximately 140 kg. per hectare (125 lbs. per acre) less sugar than German seed and the beets showed approximately 0.9 per cent less sucrose. At the present time it is claimed that production is practically the same, although beets from French seed analyze from 0.3 to 0.4 per cent less sucrose than those from German seed. Further observations were made of the sugar beet crop during 1916 and 1917 by means of analyses made at nine factories, although the variety tests had to be discontinued. The average weekly results obtained from these two sets of analyses are presented in tabular form, showing the weight of roots lifted, the percentage of sucrose, amount of sugar in roots lifted, and sugar produced per hectare and per root per week.

It is concluded that the beet crop was practically as rich in sugar in 1916 and 1917 as for the 10 years preceding the war. For the 10-year period a maximum production of sugar of 569 kg. per hectare and 7.95 gm. per root was obtained the first week in September, while in 1916 and 1917 the maximum production was reached about the third week in September and amounted to 653 kg. per hectare and 9.92 gm. per root.

[A study of the relative value of seed cane from different sources], F. LEDEBOER and J. W. VAN DAPPEREN (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 23, pp. 989–1004; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 9 (1917), pp. 16*).—This reports the results of plant cane tests with first-generation and introduced cane of 247 B for the period of 1913 to 1916, inclusive. The experiments were conducted on several fields representing two distinct soil types. The results are held to indicate that imported cane was superior to first-generation cane in point of yield of both cane and sugar.

Statistics on the distribution and production of sugar cane varieties in Java in 1912, VAN HARREVELD (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 42, pp. 1589–1634, figs. 2; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 15 (1917), pp. 46, figs. 2*).—Tabulated data are presented showing the distribution and yield of sugar cane varieties grown in Java during 1912.

Black Cheribon, 100 P. O. J., and 247 B occupied 8, 32, and 54 per cent, respectively, of the total area planted to sugar cane while 56 other varieties occupied the remaining 6 per cent. The average yields in standard muscovado, or raw sugar, for the three principal varieties amounted to 115.6, 123.4, and 124.3 pikols per hectare (from about 3.1 to 3.3 tons per acre), respectively. The average yield for the 56 other varieties was 113.3 pikols per hectare.

Statistics on the distribution and production of sugar cane varieties in Java in 1913, J. VAN HARREVELD (*Arch. Suikerindus. Nederland. Indië, 26 (1918), No. 28, pp. 1241–1289, figs. 2*).—This presents statistics for 1913 similar to those noted above.

Sugar cane varieties, J. JESWIET (*Arch. Suikerindus. Nederland. Indië, 25 (1917), Nos. 10, pp. 331–352, figs. 12; 21, pp. 913–946, figs. 15; 34, pp. 1369–1411, figs. 20; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., 1917 Nos. 3, pp. 22, figs. 12; 8, pp. 34, figs. 15; 12, pp. 43, figs. 20*).—In a continuation of work previously noted (E. S. R., 37, p. 443), numerous other sugar cane varieties grown in the Dutch East Indies are described in considerable detail.

Sugar cane variety tests in west Java, 1915–16, F. LEDEBOER (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 13, pp. 451–462; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., 4 (1917), pp. 12*).—The results of extensive tests are reported for the season indicated.

Observations of sugar cane variety tests, VAN HARREVELD (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 41, pp. 1573–1584; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 14 (1917), pp. 12*).—This presents a statistical study of variety tests with sugar cane to determine the effect of new varieties on the total yield in Java.

[Annual report of the Bureau of Sugar Experiment Stations], E. JARVIS (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 17 (1917), pp. 1–29*).—This report reviews the progress of the cane sugar industry in Queensland and the production of cane and sugar during 1917. Considerable tabulated data are also presented, showing the composition of new and introduced varieties of sugar cane and the results of fertilizer and cultural experiments with sugar cane conducted at Mackay and Bundaberg in a continuation of work previously noted (E. S. R., 37, p. 540).

Tests of different methods of ratooning at Bundaberg resulted in yields amounting to 38.76 tons of cane per acre for cane ratooned by plowing four furrows between rows 9 inches deep, 41.93 tons where three furrows were plowed (the usual practice in the region), and 36.94 tons where the cane was allowed to volunteer through trash. A fertilizer mixture of 1 cwt. each of sulphate of ammonia and nitrate of soda, and 2 cwt. of tankage resulted in a yield of 55.37 tons of cane per acre as compared with a yield of 48.74 tons from unfertilized plats. A yield of 57.56 tons of cane was obtained on plats subsoiled and receiving 1 ton of lime per acre applied before the plant-cane crop, while a yield of 58.54 tons per acre was obtained from limed plats not subsoiled. Applications of lime alone resulted in a yield of 64.5 tons of cane per acre, while lime and a mixed fertilizer consisting of 1 cwt. each of nitrate of soda, sulphate of ammonia, sulphate of potash, and tankage resulted in a yield of 77.63 tons. This fertilizer mixture without lime yielded 80.75 tons of cane per acre as compared with 60.54 tons from untreated plats.

Badila cane planted in rows 5, 6, and 7 ft. apart showed average yields of 64.5, 53.88, and 49.06 tons of cane per acre, respectively. The use of tops, middles, and bottoms and middles of Badila cane for seed resulted in yields of 50.52, 42.47, and 42.18 tons of cane per acre, respectively.

A sterile dwarf form of Deli tobacco originated as a hybrid, J. A. Honing (*Bul. Deli Proefstat. Medan, No. 10 (1917), pp. 24, pls. 4*).—The author describes a tobacco plant found in a field of Deli tobacco (E. S. R., 33, p. 436) having a zigzag form of stem, small, long-stalked, diamond-shaped leaves with small appendages on the underside of the leaves and on the corolla (kroepoek disease), and with so-called "drip tips" on the leaves. When self-fertilized this plant produced 2,896 individuals, one-fourth being like normal Deli tobacco, one-half hybrid like the mother plant, and one-fourth sterile dwarfs 30 to 40 cm. (about 11.8 to 15.75 in.) in height, having as young plants long-stalked, irregularly shaped leaves with drip tips and many appendages on the underside. The progeny of nine selfed F_1 hybrids consisting of 4,655 individuals, segregated in about the same ratio, namely, 1:2:1. Two crossings of hybrid × normal and one reciprocal cross gave a ratio of 1:1.

Five self-pollinated normal F_1 plants gave 855 normal individuals, 2 hybrids, and 3 dwarfs. With this single exception a large number of differences in appearance were distributed over the offspring according to Medelian inheritance as if there existed but one factorial difference. The dwarf type is regarded as neither dominant nor recessive.

Observations of 555 individuals, the progeny of a second hybrid plant obtained in the field, showed them to be without exception entirely normal although, owing to the low viability of the seed, the author suggests that these individuals may be only the normal fourth part of the offspring, the hybrids and abnormal dwarfs having failed to develop.

A bibliography of 18 titles is appended comprising literature relating to experimental work in tobacco breeding.

The first Mendelian example of Deli tobacco, J. A. Honing (*Meded. Deli Proefstat. Medan, 10 (1917), No. 8, pp. 185–189, pls. 4*).—A brief discussion of the experimental work and the results obtained in the hybridization studies noted above.

Wheat breeding ideals, H. Snyder (*Jour. Amer. Soc. Agron., 10 (1918), No. 3, pp. 113–119*).—This is a general discussion of the ends sought by the wheat breeder, with special reference to maintaining and improving the bread-making qualities and the food value of wheat.

An anomaly of wheat anthers, S. A. ANTHONY (*Jour. Heredity, 9 (1918), No. 4, pp. 166–168, figs. 2*).—This reports observations in a greenhouse of the U. S. Department of Agriculture at Arlington, Va., of an anomaly of the anthers on a head of wheat in which one-half of the sporophyll was transformed into a process bearing stigma hairs. That an organ-forming substance of a different organ may have influenced the primordium of the sporophyll is deemed possible, as suggested by Sachs and Loele, while Goebel has considered hormones and changes of the concentration of the protoplasmic fluids as possible explanations of such phenomena. Abnormal physical factors of temperature or moisture are thought to have been possible contributing factors, since the anomaly occurred in the greenhouse.

A study of Colorado wheat, W. P. HEADDEN (*Colorado Sta. Bul. 247 (1918), pp. 3–15*).—This bulletin presents a brief recapitulation of the results obtained in Bulletins 205, 208, 217, 219, 237, and 244, previously noted (E. S. R., 33, pp. 41, 637; 35, p. 832; 37, p. 38; 39, pp. 238, 443).

Effect of fertilizers on wheat, 1917–18 crop, C. H. SPURWAY (*Michigan Sta., Quart. Bul., 1 (1918), No. 1, pp. 34–36, fig. 1*).—The results of demonstration experiments with fertilizers for four varieties of wheat grown under different soil and cropping conditions are held to indicate that fertilizers high in phosphoric acid had a marked effect in increasing the yelds of both grain and straw.

Official grain standards of the United States for wheat [and shelled corn], D. F. HOUSTON (*U. S. Dept. Agr., Bur. Markets Serv. and Regulatory Announcement 33 (1918), pp. 30*).—Modifications effective July 15, 1918, are presented of the previous official standards for wheat and shelled corn under the United States Grain Standards Act (E. S. R., 36, p. 442).

Handbook official grain standards for wheat and shelled corn, compiled by E. G. BOERNER (*U. S. Dept. Agr., Bur. Markets, 1918, pp. 47, figs. 7*).—This comprises a tabulated and abridged description of the official grain standards of the United States for wheat and shelled corn, as set forth in the publication noted above, together with a brief discussion of methods of sampling and grading thereunder.

[Clover and alfalfa seed investigations], W. J. FRANCK and G. WIERINGA (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], No. 21 (1917), pp. 29–120, pls. 19, figs. 4*).—This is a comprehensive account of extensive germination and purity tests of clover and alfalfa seed, and of field practices employed in growing leguminous crops for seed, forage, and soil improvement. Numerous illustrations and brief descriptions of weed seeds encountered in the tests are given, together with groupings of the weed seeds for purposes of identifying the origin of the sample. On this basis a classification is presented, designed to identify seeds from North and South America and southern, eastern, or western Europe. Seeds of different clovers and alfalfas are also described and illustrated, together with various related plants, such as sweet clover, vetch, etc.

Resistance of seeds to desiccation, G. T. HARRINGTON and W. CROCKER (*Jour. Agr. Research [U. S.], 14 (1918), No. 12, pp. 525–532*).—This paper, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, describes experimental work made in an effort to determine the effect on the vitality of barley, wheat, Sudan grass, and Johnson grass seed when dried under varying conditions and for different lengths of time. The investigations were begun in January, 1917, and continued throughout 10½ months, the seeds being stored at room temperature in evacuated desiccators over calcium oxid and concentrated sulphuric acid, and in an open vessel. Samples were withdrawn at various times for moisture determinations and germination tests. Observations were also made upon the rapidity of germination and the vigor of the seedlings. Similar studies with Kentucky blue-grass seed, made in 1913, are briefly noted. The data are presented in tabular form, and the results are said to corroborate those of Pickholz (E. S. R., 25, p. 431) and Waggoner (E. S. R., 38, p. 127).

The percentage of germination was not materially changed when the seeds of the different plants were dried to less than 1 per cent of moisture. The percentage of germination of Kentucky blue grass and Johnson grass seed was not affected when the moisture content was further reduced to 0.1 per cent, although the vigor of the Kentucky blue grass seedlings was greatly reduced. Further drying of Kentucky blue grass seed in a vacuum oven for 6 hours at 100° C. caused a further reduction in the vigor of the seedlings, but did not materially affect the percentage of germination. With respect to the seeds used in these studies, the results are said to controvert Ewart's statements (E. S. R., 9, p. 454) as to the degree of drying which seeds are capable of withstanding and remaining viable.

Cleaning seed (*Canada Dept. Agr., Seed Branch Pamphlet 1 (1918), pp. 13, figs. 10*).—This is a rather detailed description of riddles and screens suited to the cleaning of clover and grass seed and of wheat, barley, oats, and flax, together with directions for the operation and care of the fanning mill.

The growth of sheep sorrel in calcareous and dolomitic media, W. H. MacIntire (*Jour. Amer. Soc. Agron., 10 (1918), No. 1, pp. 29–31, pl. 1*).—This paper, a contribution from the Tennessee Experiment Station, describes pot tests conducted during 1913 and 1914 by J. I. Hardy under the author's direction. *Rumex acetosella* was grown in a medium of limestone having a lime-magnesia ratio of 184:1, and of dolomite with a ratio of 10:7. The limestone and dolomite percentages were 100, 75, 50, 25, 15, 5, 2.5, 1, 0.5, and 0, respectively, the remainder in each case being clean river sand. Sorrel seed was first used, but owing to the slow rate of growth was replaced by 8 stolons of equal size per pot. A growing period of 101 days was allowed for the limestone series, and 99 days for the dolomite series. The air-dry weight of the entire plants of sorrel grown in each pot was determined and the results tabulated.

Since the limestone pots were harvested in 1913 before seed formed, and the dolomite pots in 1914 after fructification, it was deemed inadvisable to make deductions as to the influence of the lime-magnesia ratios. The results are held to indicate, however, that sorrel is capable of making a good growth in strongly alkaline media when not subjected to competition with clover or other lime-loving plants, thus confirming the observations of White (E. S. R., 35, p. 529) and Pipal (E. S. R., 37, p. 239). The heavy root development obtained is said to demonstrate the fact that an abundance of the earthy alkali carbonates in no way inhibits the subsurface development of the plant.

HORTICULTURE.

Vegetation and reproduction with special reference to the tomato (Lycopersicum esculentum), E. J. Kraus and H. R. Kraybill (*Oregon Sta. Bul. 149 (1918), pp. 5–90, figs. 22*).—This bulletin reports a physiological and biochemical investigation of tomato plants grown under different conditions of nutrient and moisture supply in order to compare the internal conditions in fruiting and nonfruiting plants, with particular reference to the presence of total nitrogen, nitrates, moisture, and carbohydrates and the relations between them. It comprises one of a series of studies conducted by the senior author and others at the station to determine the factors involved in fruit setting among pomaceous trees (E. S. R., 38, p. 42). The work was carried on at the University of Chicago in partial fulfillment of doctorate requirements. The tomato was selected for study because of the nonavailability of fruit trees and because in its general responses in vegetation and fruit setting it accords very closely to those observed in apple and pear trees. Several series of pot experiments were started at different periods during the year. Various parts of the plants were analyzed and studied with reference to variations in content of moisture, dry matter, total nitrogen, nitrate nitrogen, free-reducing substances, sucrose, and starch, as well as to related changes in plant structure and plant functioning. The results are presented in a series of tables and diagrams and fully discussed. Some related work of other investigators is briefly reviewed and a bibliography of literature cited is appended.

The authors found that four general conditions existed in the relation of nitrates, carbohydrates, and moisture within the plant itself and the responses apparently correlated therewith. These are as follows: "(1) Though there be present an abundance of moisture and mineral nutrients, including nitrates, yet without an available carbohydrate supply vegetation is weakened and the plants are nonfruitful. (2) An abundance of moisture and mineral nutrients, especially nitrates, coupled with an available carbohydrate supply, makes for increased vegetation, barrenness, and sterility. (3) A relative decrease of nitrates in proportion to the carbohydrates makes for an accumulation of the latter, and also for fruitfulness, fertility, and lessened vegetation. (4) A further reduction of nitrates without inhibiting a possible increase of carbohydrates makes for a suppression both of vegetation and fruitfulness."

Whatever the conditions under which a plant has been grown, increased total nitrogen and more particularly increased nitrate nitrogen are associated with increased moisture and decreased free-reducing substances, sucrose, polysaccharids, and total dry matter. "Microchemical tests indicate very little difference in potassium content of individual cells whatever the condition of the plant. Withholding moisture from plants grown under conditions of relative abundance of available nitrogen results in much the same condition of fruitfulness and carbohydrate storage as the limiting of the supply of available nitrogen itself."

"In general, within the plant itself, in the stem from the top to bottom, there is a descending gradient of total nitrogen and moisture, and an ascending gradient in total dry matter, polysaccharids, and sucrose. The proportion of free-reducing substances to other carbohydrates, total nitrogen, and nitrate nitrogen is variable. The great variations in the amount of carbohydrates in plants grown under different nutrient conditions and in different parts of the same plant indicate that in studying problems concerned with plant metabolism it is necessary to know the specific environment of the plant as a whole and of its several parts."

Fruitfulness was found to be associated neither with highest nitrates nor highest carbohydrates but with a condition of balance between them. "The conditions for the initiation of floral primordia and even blooming are probably different from those accompanying fruit setting. The greatest number of flowers are produced neither by conditions favoring highest vegetation nor by conditions markedly suppressing vegetation. Lack of fruit development is not alone due to the lack of pollination or fertilization. The flowers may fall soon after pollination (markedly vegetative plants) or remain attached for many days without development of the fruit (markedly nonvegetative plants)."

The following deductions dealing with the nitrate, carbohydrate, and moisture relations of the plant and various cultural practices were made: "Parts of the stems or cuttings of plants with a large amount of storage carbohydrates and particularly those parts where such storage is localized, when supplied with moisture or moist conditions, produce roots abundantly. This would be of particular interest in vegetative propagation. . . . Fertilizers containing available nitrogen or that which may be made available are mainly effective in producing vegetative response. They may either increase or decrease fruitfulness, according to the relative available carbohydrate supply.

"Irrigation or moisture supply is effective in increasing growth or fruitfulness only when accompanied by an available nitrogen supply and vice versa. The effectiveness of the nitrogen value of leguminous cover crops is dependent upon the accompanying moisture supply. Cultivation is largely effective in conserving moisture and in promoting the supply of available nitrogen. If in any given soil, moisture and available nitrogen are already present in quantities such that the plants growing upon it are largely vegetative, a decrease in cultivation will tend toward fruitfulness.

"Nonleguminous companion crops or cover crops remove from the soil both available nitrogen and moisture. In regulating vegetation and fruitfulness by this means the relations of the available moisture, nitrogen, and carbohydrates largely determine the result. Pruning is largely effective in promoting or retarding fruitfulness by its effects in balancing the carbohydrate supply within the plant, or the means for its manufacture, with the available moisture and nitrogen supply. Girdling or ringing of the cortex or bark is effective through a modification of the carbohydrate-nitrate relationship. In practice the entire range of effects due to such a relationship may be expected from its application.

"Fruit production is seemingly a specialized vegetative function usually more or less closely associated with the function of gametic reproduction. Parts concerned in reproduction range from but little modified vegetative parts to those highly modified portions classified as fruits. The degree in which such modification is expressed is dependent upon physiological changes within any specific plant, and may vary widely within the same variety or even the same individual. At least some of the instances of sterility considered to be the result of physiological incompatibility may be due to the state or condition of nutrition of the plant itself.

"Until more exact information is available, both environmental and hereditary factors must be considered in any attempted explanation of the reproductive or vegetative behavior of plants."

[Horticultural investigations], F. M. Rolfs (*Oklahoma Sta. Rpt. 1917, pp. 32–35*).—Notes are given on the present status of various Adams and Hatch fund projects under way at the station.

Report of the assistant horticulturist, T. B. McClelland (*Porto Rico Sta. Rpt. 1917, pp. 24–28, pls. 3*).—During the year an experiment was undertaken in the restoration of coffee plantations seriously infested with a leaf disease, *Stilbella flavida*, which is more prevalent at the higher altitudes in Porto Rico, where climatic conditions are much more favorable for the growth of coffee than nearer the coast. In many places the trees have been so debilitated through long-continued defoliation that the crop is greatly reduced and the plantation made unprofitable. In addition to improvements in cultural practices different species of introduced coffee have been set in patches of *Coffea arabica* affected with Stilbella in an attempt to find a resistant species.

In continuance of the work with Murta coffee (E. S. R., 38, p. 749), 700 seeds were planted from blossoms which had been protected from foreign pollen. The resulting progeny gave evidence that the Murta form is inherited along Mendelian lines. The grains of the Murta coffee are similar in size and appearance to the typical Arabian coffee. The very short internodes of this type allow the production of a large number of cherries on a short length of branch. The trees are small and the indications are that to make this variety profitable two or three times as many trees should be set per acre as of the typical Arabian coffee.

In a fertilizer experiment conducted with 40 plats of 8 young coffee trees each, the first crop at three years from seed showed a large increase in yield from the plats which have received nitrogen. Of the 12 plats which gave the highest production nitrogen had been used in the fertilizer applied to 10 of them. In a fertilizer test with older trees, in which applications of a complete chemical fertilizer and stable manure had been made twice annually for a number of years the fertilized plat produced 73.4 per cent more than the check, whereas in the preceding season their yields were nearly uniform.

In a lime and nitrogen test with coffee trees grown for two years in 5-gal. cans, 18 plants grown in limed soil differed from the 3 check plants in average weight by only a very small fraction of 1 per cent. The lime was applied in a series of amounts ranging in rate from 0.5 ton to 16 tons per acre. In the division which had received nitrogen there had been made at intervals of six months three applications of 8 gm. each per tree of ammonium sulphate to one group and to the others sodium nitrate ranging in amount from 4 to 16 gm. per tree per application. The weight of the trees fertilized with ammonium sulphate averaged 22.1 per cent greater than the check, and those fertilized with sodium nitrate averaged 22.9 per cent greater than the check. The trees which had received 4, 8, and 10 gm. of sodium nitrate fell below, while those which had received 12 and 16 gm. of sodium nitrate surpassed, those which had received 8 gm. of ammonium sulphate, 16 gm. of sodium nitrate producing an increased weight of 50.3 per cent over the check. The production of coffee cherries averaged 87 per cent greater for the nitrogen-fertilized trees than for the check.

The work with cacao consisted chiefly in the collection of data as to the product of individual trees. From the older orchard set in 1903, the yield for the calendar year 1916 exceeded that of any preceding year, though more than one-fifth of the trees produced nothing.

Cultural experiments with vanilla were continued. In a planting test with 48 tip cuttings of 10 nodes each, half were left to wilt in a fairly well-shaded place for an interval of 12 days between cutting and planting, the others being set immediately. Half were planted in a mixture of equal parts of clay and river sand and half in leaf mold. Cuttings which had been wilted for 12 days before planting gave equally good root development when grown for the same length of time as cuttings planted without wilting. Root development was 85 per cent greater in leaf mold than in soil. Since both the wilted and unwilted cuttings gave vigorous and highly satisfactory growth, it is suggested that the planter's convenience should determine which method to follow.

Blossoms were observed to open in the spring on vine growth made as late as the preceding autumn. A period of approximately two months was observed to elapse from the pushing out of the inflorescence bud and the opening of the first blossom. After blossoming the pods attained full length in six to eight weeks, though seven to nine months were required for maturing. Fruit set from more than 90 per cent of the hand-pollinated blossoms in a recorded series and from 1.5 per cent of the blossoms in a series not hand-pollinated. Working steadily the author pollinated in one hour 237 blossoms, indicating that hand-pollination need not be costly as to time required for the operation.

In curing small quantities of vanilla, blistering was found to result from sweating the pods between scalding and drying. Sometimes 20 to 50 per cent of the pods developed watery blisters. The omission of this sweating reduced the proportion of blistered pods to less than 2 per cent, but an extract expert reported the quality of the unsweated pods as inferior to that of the sweated pods. The yield from a small planting of 4-year-old vines averaged slightly more than 0.5 lb. of cured beans per vine, with an approved valuation of from $3 to $4 a pound.

Report of the horticulturist, C. F. KINMAN (*Porto Rico Sta. Rpt. 1917, pp. 20–24, pls. 2*).—A brief report on progress made with various lines of work during the year (E. S. R., 38, p. 748).

In the fertilizer experiments with coconuts that have been conducted for several years the last application of fertilizer was given in June, 1916. The number of nuts collected from the plats given a complete fertilizer fell off somewhat at the last harvest, as compared with the check plats, thus indicating very little permanent benefit from the fertilization. A survey of the coconut plantations of the island was inaugurated during the year with a view to determining the most profitable practices.

Seedling trees of several varieties of East Indian mangoes fruited during the year. Among these, none except seedlings of the Cambodiana variety bore fruit which resembled the parent variety at all closely. All except the Cambodiana seedlings had a high content of long, tough fiber, while the parent fruits were practically free from fiber. A survey made during the fruiting season showed that along the north side of the island and through the higher interior, where there is considerable rain during the blossoming season, the mango crop was small, as is usually the case in these sections. Through the western and southwestern sections, where the winter drought continues well into the spring, there was usually a good crop of fruit. This survey indicates the necessity of selecting locations with reference to fruitfulness.

During recent inspections through the citrus sections of the island it was observed that the effect of the lack of fertilizer was already apparent on the trees of certain groves. The author points out that the need of a fertilizer rich in potash in these sections has been well established by experiments.

In December, 1916, 16 varieties of sweet potatoes received from the Bureau of Plant Industry, U. S. Department of Agriculture, were grown simultaneously with plantings of the same varieties received from the same source in 1911, the latter having been in cultivation in Porto Rico for nearly six years. The quantity and appearance of the potatoes produced from plants of one importation did not vary to any great extent from those of the others, but all were markedly inferior in texture and flavor to the seed material received from the Bureau. A thorough study is to be made of the apparent deterioration of northern types when grown in Porto Rico. In continued tests made with Porto Rican types, a variety locally known as Blanca has been found to produce roots which are superior to any of the lately introduced northern varieties both in texture and flavor.

Notes are given on the behavior of miscellaneous introductions under observation, including *Crotalaria saltiana*, *Tabebuia spectabilis*, *Corypha* sp., and plants of the East India sugar palm (*Saguerus saccharifer*).

[Work with vegetables and fruit on the Truckee-Carson Reclamation Project], F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1917, pp. 12, 13, 17, 18, fig. 1*).—Brief notes and data are given on variety tests of onions and tomatoes, together with data showing the blossoming period of fruit trees on the farm in 1916 and 1917.

Storage of vegetables for winter use, J. W. LLOYD (*Illinois Sta. Circ. 231 (1918), pp. 4*).—This circular contains practical instructions for storing vegetables in house cellars, outdoor pits, and permanent outdoor cellars.

Fall preparations for spring gardening, J. W. LLOYD, (*Illinois Sta. Circ. 232 (1918), pp. 4, fig. 1*).—Practical suggestions are given for preparing the next season's garden plat in the fall, with special reference to improving the soil fertility.

Notice relative to State insecticide and fungicide laws (*U. S. Dept. Agr., Insecticide and Fungicide Bd. Serv. and Regulatory Announcement 21 (1918), pp. 435–450*).—This announcement supplements a previous compilation of State laws dealing with the manufacture and sale of insecticides and fungicides (E. S. R., 36, p. 39). The laws of the following States are presented: Colorado, Connecticut, Iowa, Kentucky, Ohio, Pennsylvania, and Wisconsin.

Commercial Bordeaux mixtures: How to calculate their values, E. WALLACE and L. H. EVANS (*U. S. Dept. Agr., Farmers' Bul. 994 (1918), pp. 11, fig. 1*).—This publication describes methods of calculating the strength values and money values of Bordeaux mixtures, and also gives tables for determining approximate values without calculation.

Various factors entering into the efficiency of Bordeaux mixtures are discussed.

FORESTRY.

Report of the State board of forestry and of the State park committee of the State of Indiana for the year 1917, R. LIEBER ET AL. (*Yearbook State Ind., 1917, pp. 489–499; Reprint, 1918, pp. 13*).—A brief synopsis of the work being done by the State board of forestry, and also by the State park committee since its appointment in 1916, including financial statements for the year 1917.

Forest protection and conservation in Maine, 1917, F. H. COLBY (*[Augusta, Me.]: Dept. of Forestry, 1917, pp. 202, pls. 2, figs. 57*).—An account of forest fire protective work in Maine, including a discussion of forestry methods and measures needed for conserving the timberland. An account is also given of white pine blister rust work conducted in the State in 1917 in cooperation with the U. S. Department of Agriculture, together with an article by C. C. Andrews entitled What Thirty-nine States Are Doing in Forestry (pp. 189–202). This article summarizes the important forest legislation and forest activities in the different States.

The utilization of forest products in Massachusetts as affected by the war, P. D. KNEELAND (*Boston: State, 1918, pp. 14*).—A popular bulletin of information to woodland owners relative to the present commercial utilization of various species of trees.

Notes on European forest research, S. HOWARD (*Indian Forester, 44 (1918), No. 9, pp. 394–401*).—A brief discussion of methods of organizing and carrying on forest research, especially in France and Germany.

Report of the resolutions, proceedings, and debates of the interstate conference on forestry held at Perth, November, 1917 (*Rpt. Interstate Conf. Forestry [Aust.], 1918, pp. 114, pls. 6*).—This report contains a number of papers relating to the forests and various phases of forestry in Australia, including such subjects as forest policy, working plans, forest statistics, forestry education and research, and timber tests.

Report of the forest service in Netherlands India for the year 1916 (*Verslag Dienst Boschw. Nederland.-Indië, 1916, pp. 117, pl. 1, fig. 1*).—A statistical report relative to the administration and management of the forests in Java, Madoera, and outlying possessions of the Netherlands Indies for the year 1916. Information is given relative to the condition of the forests, and work in regeneration, exploitation, protection, and investigations. A progress report of the rubber plantation of the forest service is also included.

Statistics compiled in the office of the silviculturist, Forest Research Institute, Dehra Dun, during 1916–17, E. MARSDEN (*Indian Forest Rec., 6 (1918), No. 5, pp. IV+44*).—The statistics herein presented comprise a summary of results of stand measurements of several Indian tree species that have been made for varying periods of years either in divisional sample plats or in Forest Research Institute sample plats. The data presented for each species deal with one or more of the following measurements: Girth, volume, and height increments; yield, stem analysis, and comparative growth of natural and plantation saplings; and effect of thinnings.

Some forest species of Indo-China suitable for national defense, A. Bertrand (*Bul. Écon. Indochine, n. ser., 21 (1918), No. 130, pp. 438–446*).—This comprises an extract from the author's report to the Colonial Congress of Agriculture at Paris. Information is given relative to the mechanical properties of a number of Indo-China woods, including data on mechanical tests conducted with these woods.

Field experimentation with Hevea brasiliensis, J. Grantham and M. D. Knapp (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 8, pp. 614–636, figs. 3*).—The authors present additional data substantiating evidence previously reported that natural variations may occur among carefully chosen experimental plats (E. S. R., 37, p. 837). The value of applying the probable error method to field experimentation is emphasized by showing the application of the rule that "the weights (or relative reliability) of observations (or results) vary inversely as the squares of their probable errors." Additional data recording the probable error of rubber yield are given from which is ascertained the probable error that should be used in field experimentation with Hevea for plats of varying sizes.

Reliability of field experiments with Hevea, J. G. J. A. Maas (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 8, pp. 561–613, pls. 4, figs. 5*).—The object of the investigations here reported was to collect figures on the natural variation in the yield of rubber fields under estate conditions to show the limits up to which differences in yield in field experiments may be due to natural variation and how such limits can be altered by alterations in the experiments.

As a result of this study it is concluded that in order to fix the relation between the yield of the experimental plats a preliminary experiment of three months is sufficient for practical purposes. In a well-planned experiment the standard deviation for this period need not exceed 5 per cent. The plats should not be smaller than 100 trees.

The budding of Hevea, W. M. Van Helten (*Teysmannia, 29 (1918), No. 5, pp. 276–284, pl. 1*).—Comparative results are given of experiments in which three different forms of shield budding were used for propagating Hevea rubber trees.

Guide to the preparation of rubber, P. Arens (*Malang, Java: Expt. Sta. Malang, 1918, pp. 50; trans. from Meded. Proefstat. Malang, No. 17 (1917), pp. 61*).—A practical guide to the plantation preparation of various types of rubber, with special reference to the acetic-acid process, translated from the second Dutch edition.

Rubber: Its production, chemistry, and synthesis, A. Dubosc and A. Luttringer (*London: Charles Griffin & Co., Ltd., 1918, pp. XI+383; rev. in Chem. News, 117 (1918), No. 3059, p. 338*).—This is an English translation by E. W. Lewis of a practical handbook for the use of rubber growers, chemists, and economists. The subject is discussed under the following general headings: Natural rubber, its production, present position, and cost of production; the formation, physical and mechanical properties, analysis, and constitution of crude rubber; and the synthesis of caoutchouc.

Note on the mangrove forests of British India, R. S. Pearson (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 625–633*).—A short account of the mangrove forests of British India, with special reference to the utilization of mangrove barks for the preparation of tan extracts.

The germination and juvenile forms of some oaks, L. H. PAMMEL and C. M. KING (*Proc. Iowa Acad. Sci., 24 (1917), pp. 367–391, figs. 66*).—This comprises preliminary notes on germination studies of a number of Iowa species of oak.

Hybrids of the live oak and overcup oak, H. NESS (*Jour. Heredity, 9 (1918), No. 6, pp. 263–268, figs. 3*).—The author briefly describes and gives illustrations of some young hybrid oak trees growing on the Texas Experiment Station grounds that were produced by using the overcup oak (*Quercus lyrata*) as father and the live oak (*Q. virginiana*) as mother.

Note on the dying back of sal seedlings, E. A. SMYTHIES (*Indian Forester, 44 (1918), No. 9, pp. 420–422, pl. 1*).—The results of a preliminary experiment here reported indicate that the rather severe dying back of seedlings of sal (*Shorea robusta*), due to heavy clearing operations, is not a detriment to the seedlings as large numbers of them throw up new shoots and appear better able to withstand hot weather than seedlings continually growing under shade.

DISEASES OF PLANTS.

Fungi and disease in plants, E. J. BUTLER (*Calcutta: Thacker, Spink & Co., 1918, pp. VI+547, pls. 5, figs. 201*).—This book is presented as an introduction to the diseases of field and plantation crops, especially those of India and the East. About 200 diseases of crops are included, nearly all of which have been studied by the author in the laboratory and in the field. Fruit and forest tree diseases are not treated, and vegetable diseases are only incidentally mentioned.

After chapters dealing with fungi as a cause of plant diseases, the author describes the principles upon which control measures are based and gives chapters on special diseases, the arrangement being according to the host plants. Where definite means of control are known, they are given under the different diseases. The book is designed primarily for planters and those interested in the crops, and all the more technical matter is printed in smaller type than the body of the work, so that this information will be available for use by students and investigators.

An extensive bibliography of plant disease literature is given.

Report of the plant pathologist, H. E. THOMAS (*Porto Rico Sta. Rpt. 1917, pp. 28–30*).—A brief report is given on diseases observed on vegetables, vanilla, and citrus trees.

A wilt disease of beans caused by an undetermined Phycomycete, a rust of Lima beans caused by *Uredo concors*, and a powderly mildew of kidney beans are said to have been abundant during the past season. Tomatoes are reported to have been badly infected with *Phytophthora infestans*, and cabbage with the black rot caused by an organism resembling *Pseudomonas campestris*.

Among the parasites attacking vanilla, the common leaf spotting alga (*Mycoidea parasitica*), *Glœosporium rufomaculans*, and a species of Fusarium on the roots were observed.

Some attention has been paid to the withertip fungus (*Colletotrichum glœosporioides*) of citrus trees, and also to citrus scab (*Cladosporium citri*).

[Plant] diseases, J. S. DASH (*Rpt. Dept. Agr. Barbados, 1916–17, pp. 59, 60*).—During 1916–17, the most troublesome disease of sugar cane, particularly young ratoon canes, was *Marasmius sacchari*. *Colletotrichum falcatum* occurred in a few places. *Thielaviopsis paradoxa* continues to be a troublesome disease of cane cuttings. *Cercospora vaginæ* was fairly common. *Cephalo-*

sporium sacchari was very restricted in extent this year, generally following attack by *M. sacchari* or other injury.

Tobacco showed the presence of wilt due to attack by bacteria just above the ground, also a disease which withers and kills the plants and which is supposedly caused by a Fusarium. A case of blossom-end rot of tomatoes was examined. Mango leaves were injured by an alga, supposedly a Cephaleuros, and mango branches and trunks showed what is thought to be another species of alga.

Mycology and plant pathology, J. Mackenna (*Rpt. Prog. Agr. India, 1916–17, pp. 64–72*).—It is now known that *Tylenchus angustus*, the cause of ufra disease, though not able to reach the tender portions of the rice plant when the air is dry, is able to do so when the point of saturation of the air with moisture is approached. Nematodes retain their vitality in dry air for eight months, in moist air for four months, and in water for one or two months. They do not reproduce in water or dry air.

Tokras (*Orobanche* sp.) were not controlled by the use of sodium nitrate. *Striga lutea*, a pest of millet which germinates only in the presence of a host, can be counteracted in large part by the method of trap crops. Striga appears to be controllable in case of *Eleusine coracana* by employment of early-maturing varieties. Rhizoctonia on jute appears to be greatly favored by deficiency of potash. Cotton root rot appears to be due to some soil deficiency of a chemical nature. Peanut was heavily attacked by tikka disease, supposedly due to deficiency of phosphates.

Bud rot of palmyra palms has been reduced considerably by systematic observations and other operations. Koleroga disease of areca palm is being successfully controlled by spraying, and the anaberoga disease, caused by *Fomes lucidus*, is being successfully combated by eradication, liming, and trenching. Root disease of coconut palm, though still important, has been checked.

Rubber black thread disease is said to be caused by a fungus which is a wound parasite and which develops only in moist conditions. A serious root disease of tea has been identified as *Rosellinia bothrina*. *Sphærostilbe* sp. was found on living tea roots in stiff acid soils. A sickly growth of tea bushes was thought to be due to *Nectria cancri*. An outbreak of blister blight (*Exobasidium vexans*) was investigated.

A coffee root disease (*F. australis*) was studied. Black rot and leaf disease of coffee were controlled with Bordeaux mixture. Spike disease of sandal has been shown to be infectious, although it may be influenced by external factors. A similar or identical disease attacks a number of wild plants in southern India.

Scab of potatoes (*Spongospora subterranea*) is reported from Bombay Presidency. Experiments in the treatment of peach leaf curl with Burgundy mixture and lime-sulphur are in progress. Other diseases under investigation at Pusa are sal tree disease, anthracnose of chilies and legumes, and sclerotial diseases of sugar cane and rice.

Operations against [plant] disease, G. A. D. Stuart (*Rpt. Dept. Agr. Madras, 1916–17, pp. 13, 14*).—The system of examination and treatment for protection against palmyra disease is said to have reduced greatly the percentage of infection in spite of conditions most favorable to the disease. Favorable results are reported of the spray treatment for mahali disease of areca nuts. Copper sulphate solution as a seed treatment was found to be effective against smut in case of Italian millet, Guinea corn, etc.

Corticiums causing Pellicularia disease of the coffee plant, hypochnose of pomaceous fruits, and Rhizoctonia disease, E. A. Burt (*Ann. Missouri Bot. Gard., 5 (1918), No. 2, pp. 119–132, figs. 3*).—This is an account of study by the author on the morphology, probable relationships, and habits of specimens of fungi collected on coffee leaves at Mayaguez, P. R., in August, 1915, and May, 1917. The author describes *C. koleroga* on coffee, *C. vagum* on various plants (also on other bodies), and *C. stevensii* (which is newly named) on apple, pear, quince, and Codiæum. It is stated that many fungi in the Tropics have the thread blight habit of growth.

Sclerotinia diseases (*Jour. Bd. Agr.* [*London*], *23* (*1917*), *No. 11*, *pp. 1095–1098*, *pls. 2*).—The causes of loss here discussed as due to *Sclerotinia sclerotiorum* are stalk disease of potato (said to be widely distributed and destructive in England and Scotland and to cause serious damage in the western part of Ireland), and diseases of tomato, artichoke, sunflower, bean, squash, cucumber, carrot, and turnip. In all cases the sclerotia, which are produced in abundance, fall to the ground or remain dormant in the dead tissues until spring. The disease seldom appears before midsummer, being favored by warm, damp weather. Preventive measures include sterilization of the soil with steam, a 3-year rotation, late planting, and in case of potato, careful selection of tubers to be stored for seed.

The use of formaldehyde to control cereal smuts, G. H. Coons (*Michigan Sta. Quart. Bul.*, *1* (*1918*), *No. 1*, *pp. 11–14*).—The concentrated and dilute methods of treating oats and wheat with formaldehyde for the control of smut are briefly described, and the necessity of care in their use is emphasized.

The stinking smut of wheat, F. D. Heald (*Washington Sta. Popular Bul. 115* (*1918*), *pp. 3–14*, *fig. 1*).—A popular account is given of the wheat smut which occurs in the Palouse region of eastern Washington with suggestions for its control.

Under present conditions it is considered impossible to produce absolutely smut-free wheat, since wind-blown spores reach uninfected fields. Seed treatment alone is not effective on account of the general and wide dissemination of smut spores during the thrashing season. Seed treatment is generally effective for spring wheat, since wind-blown spores do not survive the winter. Experimental seedings have shown that either early or late plantings are either entirely free from smut or show a low percentage of infection.

The installation of exhaust fans in connection with thrashing machines is recommended as a means of preventing fires in separators, improving the quality of the wheat, and reducing the amount of wind-blown smut.

Corn root rot and wheat scab, G. N. Hoffer, A. G. Johnson, and D. Atanasoff (*Jour. Agr. Research* [*U. S.*], *14* (*1918*), *No. 13*, *pp. 611, 612*).—In a preliminary contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, the authors call attention to investigations of rots of the root, stalk, and ear of Indian corn, from which there appears to be a relation between the occurrence of these rots and the scab of wheat. Field observations have shown a conspicuously greater abundance of wheat scab in fields where wheat was grown immediately following corn which had been affected with the Fusarium rot of root and stalk. This was specially true in Indiana, and a similar condition was noted in Wisconsin. In both States, where spring wheat was grown immediately following a corn crop, an abundant development of perithecia of *Gibberella* spp. was found on the old cornstalks remaining in the field. Water suspensions of the ascospores found on the cornstalks gave positive results when inoculated on wheat heads, the appearance of the heads infected artificially being identical with that of those naturally infected with scab.

The authors suggest that, in view of their preliminary findings, a crop rotation should be adopted in which wheat following diseased corn should be avoided.

The white spot disease of alfalfa, P. J. O'Gara (*Science, n. ser., 48 (1918), No. 1238, pp. 299–301*).—While carrying on experiments on the treatment of soils with various water soluble substances, the author observed that white spot of alfalfa appeared in two or three days after treatment of the soil. No injury to the crowns could be found and no parasites were present. White spot of alfalfa did not appear where the concentration of the water soluble substance was below a certain amount. Further experiments are said to have indicated that the soil solution alone did not produce white spot but that the coincidence of several environmental factors, as soil temperature, atmospheric temperature, relative humidity, and light, is necessary.

The investigation is said to have progressed to the point where the author believes that the osmotic pressure of the soil solution is one of the important factors in the production of white spot, not only under experimental conditions but under field conditions as well. In the intermountain country where these investigations were carried on, it was noted that fields showing a considerable incrustation of alkali when irrigated exhibited white spot in more or less amount, depending upon the other environmental factors above mentioned. A sudden rise of the water table in irrigated districts is also said to have brought about the same condition of the plants in the field.

An extended report on these investigations is to be published later.

Bean diseases in Vermont, H. E. Bartram (*Ann. Rpt. Vt. State Hort. Soc., 15 (1917), pp. 23–33*).—This discussion deals with an insect pest (the bean weevil) and with bean diseases causing serious trouble in Vermont, including pod spot (anthracnose), dry rot (a new but serious trouble ascribed to a Fusarium), the true bean rust, and bean blight (bacterial).

Important potato foliage diseases, I. E. Melhus (*Iowa Agr., 18 (1917), No. 4, pp. 170–172*).—A brief discussion is given of potato blackleg, curly dwarf, and tipburn, also of appropriate control measures.

Tissue invasion by Plasmodiophora brassicæ, L. O. Kunkel (*Jour. Agr. Research* [*U. S.*], *14 (1918), No. 12, pp. 543–572, pls. 20, figs. 2*).—In a previous publication (E. S. R., 33, p. 346), the author described the tissue penetration of *Spongospora subterranea* on the potato. In the present paper, which is a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, an account is given of a study of clubroot, in which is presented information regarding the method of tissue invasion by *P. brassicæ*.

The author found that cabbage plants of all ages up to one year are susceptible to clubroot, provided they are actively growing. The typical club is a morphological unit, usually the result of a single primary infection, but by the coalescence of several swellings a compound club may be produced. The spread of the disease from points of primary infection is accomplished through direct invasion of cells by infecting plasmodia. Host cell divisions increase the number of infected cells, but have a very small part in distributing the parasite throughout the tissues. The infection of a given cell may be either permanent or temporary, and if permanent it stimulates the cell to abnormal growth and division. The growth stimulus is diffuse and seems to travel in advance of infection. The mass of parasitic protoplasm in a given volume of diseased tissue was found to be remarkably constant in different clubs and in the clubs of different plants. The average volume relation between host and parasite in the tissues studied is approximately given by the ratio 28 : 72.

As a result of this study, it is claimed that the method by which *P. brassicæ* infects host tissues differs from that of *S. subterranea*, but if judged by the kind of galls produced and by the position of diseased tissues, it is believed that the method of infection for *Sorosphæra veronica*, *Sorodiscus callitrichis*, and *Tetramyxa palustre* may be similar to that found for *P. brassicæ*.

Potato wilt, T. G. B. Osborn (*Jour. Dept. Agr. So. Aust., 20 (1917), No. 11, pp. 864, 865*).—The author, inspecting several areas in the Mount Gambler district where diseased potatoes had been reported, found a wilted condition prominent among the symptoms associated with various fungi, among which were *Verticillium alboatrum* and *Phoma* sp. These fungi are being studied and will be reported upon later.

Experiments with eelworm-infested potatoes, F. B. Headley (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1917, pp. 18–21*).—Preliminary investigations at the Nevada Experiment Station having indicated that eelworms and their eggs in potatoes are killed at a temperature between 35 and 40° C. (95 to 104° F.), the author was led to test the efficacy and practicability of this method of treating seed. A lot of badly infested potatoes was secured and different portions were heated at 30, 35, and 40° for various periods from 6 to 24 hours. After treatment with heat, the potatoes were soaked in a corrosive sublimate solution for 2 hours before planting.

It was found that germination was apparently stimulated by treatment at 30° and was decidedly decreased by that at 40°, regardless of the length of time they were treated. At the time of harvesting, a careful examination was made of the tubers to determine the amount of eelworm infestation, and it appeared that treatment at either 35 or 40° resulted in a marked reduction of the infestation in the crop. The original seed used was very heavily infested, and it is thought probable that with lightly infested seed the percentage of eelworms surviving treatment would have been somewhat less.

[Sugar cane diseases in the Hawaiian Islands], H. P. Agee (*Proc. Hawaii. Sugar Planters' Assoc., 37 (1917), pp. 38, 39, 42, 43, 68–76, 77, 78*).—In a report of wider scope, it is stated that the eye-spot fungus (*Cercospora sacchari*) caused considerable damage in certain varieties of cane, being epidemic on Oahu. Yellow-stripe disease was epidemic in parts of Hawaii, and infectious top rot occurred on Maui. An undetermined fungus attacked leaf sheaths of different cane varieties when below the normal as regards vigor of growth. Root-knot nematodes are reported to be on the increase in the islands, and threaten soon to become a serious pest, as they are able to eliminate susceptible varieties completely. Lahaina disease, supposedly due to toxic concentrations of black alkali in the soil, was much less prevalent on Oahu following the excessive rainfall of the last two winters. Experimentation has indicated the possibility of correcting, in part, the effects of black alkali by the use of gypsum.

The report is followed by a discussion of these diseases.

Chlorosis of sugar cane, P. L. Gile and J. O. Carrero (*Porto Rico Sta. Rpt. 1917, pp. 10–20*).—The results are given of a study of the chlorosis of sugar cane which occurs in restricted areas in various portions of the southern part of Porto Rico. Studies were made of the soils in connection with this condition of diseased plants, and of various treatments for the prevention of the trouble.

It was found that lime-induced chlorosis occurs on some but not all calcareous soils, and that it is probably caused by a lack of iron in the plant due to the fact that the carbonate of lime depresses the availability of the iron in the soil. On those calcareous soils where chlorosis occurred the availability of iron appeared less than where chlorosis did not occur, but just what conditions served to lower the availability of the iron was not determined.

Ash analyses of green and chlorotic leaves showed that there is no more lime in the ash of the chlorotic leaves than in the green ones. Apparently, therefore, chlorosis can not be attributed to an increased assimilation of lime.

In attempting to correct the trouble, the authors found that chlorosis can be prevented to some extent by the application of stable manure containing ferrous sulphate and stable manure alone, although large applications did not overcome the chlorosis completely. The application of iron to the plants by brushing or spraying the leaves with solutions of iron compounds was found effective but apparently not commercially feasible.

Relationship of fungus diseases to the watermelon industry, F. C. Meier (*Off. Minutes Melon Distributors' Assoc., 4 (1918), pp. 19–28*).—This is in the main a discussion of watermelon diseases and means to minimize losses therefrom, dealing specifically with anthracnose, wilt, and stem-end decay, and emphasizing the employment of systematic and thorough treatment both in the field and at the car in ways which are outlined.

Report of investigation of alleged spray injury to apricot buds, G. P. Gray (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, p. 454*).—As a result of the frequent failure of apricot and the less extended failure of prune orchards to set fruit normally during the spring of 1918, an investigation was undertaken, the main conclusion from which is to the effect that the crude petroleum emulsion applied to apricot trees in January and February may have been a secondary, though not the primary, cause. It is recommended that the application of this treatment to apricots be delayed until there is an indication of a swelling of the buds. The primary cause of bud injury is still regarded as unsettled.

Notes on some fungus diseases and a new codling moth attacking the persimmon in Japan, T. Tanaka (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, pp. 461–463*).—This very condensed account includes the fungi *Glœosporium kaki*, *Myxosporium kaki*, *Phoma lutii*, *Mycosphærella diospyri* (*Cercospora kaki*), *Fusicladium diospyræ*, *Pestalozzia kaki*, *Stypinella mompa* (*Septobasidium mompa*, *Helicobasidium mompa*), and *Botrytis diospiri*, also a new codling moth (*Kakivoria flavofasciata*) attacking persimmon.

Black smut of figs, R. W. Hodgson (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 4, pp. 188, 189, fig. 1*).—Giving briefly the results to date of an incomplete and now discontinued investigation of the black smut of fig, which has caused loss to growers for a number of years, the author states that the associated fungus (*Sterigmatocystis* sp.), said to be identical with the organism causing internal rot of pomegranates, may considerably discolor the fig outwardly or may give little or no external indication of its presence. The rate of infection varies with locality and weather and from season to season, ranging from 3 to 15 per cent.

Citrus diseases of Porto Rico, J. A. Stevenson (*Jour. Dept. Agr. P. R., 2 (1918), No. 2, pp. 43–123, figs. 23*).—This number contains in condensed form the results of work done by the author and others during about four years on citrus diseases, some of which began to be noted as early as 1901 and to be serious about 1913. A gradual spread of diseases is apparent, also an increase in the virulence of some of them. Recommendations which proved practicable elsewhere were often found to fail under the conditions existing in Porto Rico.

After a general statement regarding the relation of cultural practices to health and disease in citrus groves and a general account of methods of prevention and control, specific diseases are treated in some detail.

Progress report on citrus scab, L. R. Hesler (*Porto Rico Sta. Rpt. 1917, pp. 30, 31*).—A preliminary account is given of experiments for the control of citrus scab due to *Cladosporium citri*, the work having been started in February, 1917. This work consisted in comparing sprays and dusting materials in two groves on the island.

In general, Bordeaux mixture was found more efficient in the control of scab, but it also destroyed the scale parasitic fungi. On the other hand, the sulphur fungicides were less effective for scab control but also less injurious to the scale parasites. The author suggests that applications of a standard liquid sulphur fungicide, such as lime-sulphur, with occasional applications of Bordeaux mixture, will give fair control of both scale and scab.

Fungus diseases of tea, C. J. J. VAN HALL (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 58 (1918), pp. 26, 27*).—The author lists as causes of tea root diseases recently examined at the station *Rosellinia bothrina* (?), *R. bunodes* (?), *Rosellinia* sp., *Ustulina zonata*, *Poria hypolateritia*, *Hymenochæte noxia*, and Armillaria (?).

Tea roots [diseases], II, A. C. TUNSTALL (*Indian Tea Assoc. [Pamphlet] 1 (1918), pp. 17, pls. 7*).—Besides a brief discussion of the general situation in northeast India as regards tea diseases, which is said to be very satisfactory, particular diseases are dealt with in some detail, omitting some of those previously mentioned (E. S. R., 37, p. 52) and including some not specifically mentioned in the previous pamphlet, as *Rosellinia bothrina* and *Sphærostilbe repens*.

Fungus diseases [of nursery stock in Kentucky], H. GARMAN (*Bien. Rpt. Bur. Agr., Labor, and Statis. Ky., 22 (1916–17), pp. 417–419*).—In this portion of an inspection report dealing also with insect pests and other matters, the author lists, with brief comment, nursery twig blight (*Bacillus amylovorus*), crown gall of various fruits (*Pseudomonas tumefaciens*), apple and crab apple rust (*Gymnosporangium macropus*), mildew of apple and cherry (*Podosphæra oxyacanthæ*), pear and apple blight (*Bacillus amylovorus*), pear leaf spot (*Septoria pyricola*), peach spot (*Cladosporium carpophilum*), plum black knot (*Plowrightia morbosa*), grape downy mildew (*Plasmopara viticola*), gooseberry mildew (*Sphærotheca more-uvæ*), rose mildew (*S. pannosa*), raspberry anthracnose (*Glœosporium venetum*), blackberry rust (*Gymnoconia peckiana*), white pine blister rust (*Cronartium ribicola* or *Peridermium strobi*), and chestnut bark disease (*Diaporthe parasitica*).

Manual of tree diseases, W. H. RANKIN (*New York: The Macmillan Co., 1918, pp. XX+398, figs. 70*).—The object of this book is to describe and suggest means for the control of the diseases of forest, shade, and ornamental trees that have been most studied. The general and specific diseases are treated separately, the common diseases in the first four chapters, followed by the specific diseases grouped alphabetically according to the common names of their hosts. The diseases are arranged according to the part of the tree affected, as leaf, twig, branch, trunk, and root diseases. The plan of the book is to facilitate the diagnosis of tree diseases and, where control measures are known, to state them. Unfortunately no means other than eradication is known or is applicable to many diseases.

Stem lesions caused by excessive heat, C. HARTLEY (*Jour. Agr. Research [U. S.], 14 (1918), No. 13, pp. 595–604, fig. 1*).—In a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, a description is given of white spot injury to pine seedlings noticed in the forest nursery in the sand hills of Nebraska. This disease, which was previously described (E. S. R., 30, p. 151), attacks very young seedlings, causing characteristic lesions which have been termed white spot. The disease is distinct from the common damping-off disease, although it resembles it so closely as to be often confused with it.

From a study of the lesions and their relation to insolation, to dry surface soil, and to the production of typical lesions by artificial heating, the author has been led to the conclusion that excessive heat is the cause of most of the white spot trouble. Observations on the soil of seed beds have shown temperatures well above 50° C., with reported maxima as high as 68°. In addition to young seedlings, older conifers ranging in age from several months to several years have shown killing lesions which are attributed to the effect of heat.

The pine blister rust, H. T. Fernald (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, pp. 451–453, figs. 2*).—This is a discussion of the possibilities connected with the introduction to the western five-leaved pines of the blister rust, which has not yet been found west of the Federal quarantine line established along the western boundaries of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.

Preventive measures against black thread (Phytophthora faberi), H. C. Pratt (*Trop. Agr. [Ceylon], 48 (1917), No. 5, pp. 304–306*).—This is a short preliminary note on black thread of Hevea as to its causal fungus (*P. faberi*), its effects, its progress, factors affecting it, and remedial measures.

Wet weather favors the progress of the disease, as do also poor drainage, thick shade, and a low tap cut. Daily disinfection decreases the severity of the attack. Izal, which is available, is said to be an effective fungicide. While a strength of 1:5 is said to burn the delicate tissue on the tapping surface, a strength of 1:10 has proved satisfactory.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Game laws for 1918, G. A. Lawyer and F. L. Earnshaw (*U. S. Dept. Agr., Farmers' Bul. 1010 (1918), pp. 70*).—This is the nineteenth annual summary of the provisions of Federal, State, and Provincial statutes.

Synopsis of the supergeneric groups of rodents, G. S. Miller, Jr., and J. W. Gidley (*Jour. Wash. Acad. Sci., 8 (1918), No. 13, pp. 431–448*).—This is a brief synopsis of the results of a 4-year study of the taxonomy of living and extinct rodents.

The life history and control of the pocket gopher in the Willamette Valley, H. M. Wight (*Oregon Sta. Bul. 153 (1918), pp. 55, figs. 20*).—The author first presents a description of *Thomomys bulbivorus* and a discussion of its distribution, together with an account of its life history and habits.

It appears that every crop raised on the farm is injured in one way or another by this gopher. Clover, alfalfa, and vetch are eaten in large quantities, while a greater amount is undermined or dried out from below. The grains, especially when first sprouted, suffer greatly because of mounds and underground burrowing. In some sections the grazing on the hillsides is nearly ruined, the dirt being brought out in such quantities that the grass becomes covered. All root crops are attacked, potatoes, carrots, parsnips, and other garden crops being carried off in large quantities and placed in their store piles. It is also a very severe menace to the fruit industry, the roots of apple, cherry, nut, and many other trees affording the gopher an opportunity to gather a large amount of material without extending his burrow very far. Data, based on a questionnaire, show an estimated total annual loss from this source in the Willamette Valley of a million and a half dollars.

During the course of control work particular attention was given to the determination of the preferred food, the results of which are given in tabular form. In feeding experiments carried on with 60 different foods, dandelion was the food chosen most frequently, regardless of any habits the gopher may have previously formed; a consistent study has shown the dandelion to be most frequently found in the nest, in the runways, or being gathered at the surface.

In the selection of a spreader for the preparation of dandelion as a gopher bait Irish moss was chosen, since it is taken readily by the pocket gopher, has excellent spreading power, possesses strong adhesiveness, is readily soluble in water, dries quickly, is very inexpensive, and is kept in stock by nearly every standard drug store. In search for a poison 3 gm. of strychnin sulphate in 1,000 cc. of water proved to be the best concentration of the poison, for while in individual cases it is stronger than is necessary, it was found that weaker solutions were not always successful. In attempts to disguise the taste of the poison it was found that when saccharin was added in small amounts to a solution composed of 3 gm. of strychnin to 1,000 cc. of Irish moss sirup until a pleasant but still bitter flavor was reached, the gopher took the poisoned dandelion readily, and it is believed that dandelion prepared in this way forms a palatable bait, which will be taken in preference to any other food, even that which has not been poisoned.

The author finds it possible to place poison carefully for 250 gophers in one day. The gopher may be poisoned at any season of the year, but the best time is during the months when sowing or planting is being done, thus preventing the damage that is certain to follow. Attention is called to the fact that community cooperation in gopher poisoning is eminently advisable.

A new cuckoo from New Zealand, A. Wetmore (*Proc. Biol. Soc. Wash., 30 (1917), pp. 1, 2*).—A new subspecies is here described under the name *Urodynamis taitensis pheletes*.

Swan Lake, Nicollet County, Minn., as a breeding ground for waterfowl, H. C. Oberholser (*Fins, Feathers, and Fur, No. 13 (1918), pp. 1–4, figs. 5*).—A list of birds observed by the author at Swan Lake, Minn., from July 25 to 27, 1917, is included.

Wounds and diseases of the Ophidia: Snakes and serpents, O. Larcher (*Bul. Soc. Cent. Méd. Vét., 94 (1918), No. 8, pp. 182–221*).—A summary of information on the subject with references to the literature and a 5-page bibliography.

The spotted garden slug, W. H. White (*U. S. Dept. Agr., Farmers' Bul. 959 (1918), pp. 8, figs. 3*).—*Limax maximus* has attracted considerable attention in recent years in this country and abroad by its depredations in gardens, greenhouses, and mushroom beds, being more abundant in the United States along the Atlantic and Pacific coasts than in the interior.

This slug is one of the largest land mollusks of its kind, often attaining a length of 7 in. when fully extended, but more generally ranging in length from 1.5 to 4 in. It attacks plants of many kinds, in the greenhouse usually confining its attack to young tender seedlings, but ornamentals are rendered unsightly and unsalable by the trail of mucus which exudes from the animal's body. In the garden it often causes serious injury to such plants as celery, lettuce, peas, and beans. It has been recorded as also feeding on tomato, parsnip, carrots, strawberry, beet, turnip, cabbage, onion, leek, melon, white potato, sweet potato, and common grasses. Its fondness for fungi make it a serious pest when once it has gained access to a mushroom house. Fungi and stored tubers appear to be its favorite food.

The eggs are deposited in masses of from 50 to 70 in moist places, especially under decaying boards, flower pots, and refuse, from spring until fall. At a temperature of 60 to 70° F. they hatch in about 28 days and the young slugs attain a length of about an inch in 30 days. Slugs held in captivity and reared from eggs made a growth of 2 in. in six months, though the exact time required by the animal to attain full growth is not known. The winter is passed below the frost line in the ground, in drain pipes, cellars, greenhouses, and pits, on well walls, and along foundations.

The common toad is said to be the principal enemy of this slug.

The application of arsenicals to the plant as a control measure is said to be impractical, principally because its attack is local and it avoids most poisonous substances. The use of poison baits is also not entirely satisfactory because of the slowness of the slug to change its diet, though where large plants are being injured poisoned baits may be employed with fair results. Cleanliness is said to accomplish much toward its riddance. In greenhouses where the slugs have become established, they may be collected at night with the aid of a lantern or pocket flashlight and destroyed. Lime is said to be a standard remedy and salt and soot are efficient.

In a footnote by P. Bartsch it is pointed out that there are 32 species of garden slugs reported from the United States of which four are introduced forms. Most of the native species are comparatively harmless so far as their ravages on crops and gardens are concerned. The real pests of gardens, cellars, and walls are three introduced species, namely, the spotted garden slug (*L. maximus*), here considered by the author; the tawny garden slug (*L. flavus*), which rarely attains a length of over 4 in.; and the true garden slug (*Agriolimax agrestis*), which is the smallest species, scarcely exceeding 1.5 in. in length, and which is probably the greatest pest of all the slugs in this country.

[Economic insects and rodents in California] (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 4, pp. 196–209, 211–215, figs. 15*).—The several papers here presented include the following: The Pink Bollworm of Cotton, by H. S. Smith (pp. 196–198); The Potato Tuber Moth, by E. R. de Ong (pp. 198–201); Fruit Flies of Economic Importance in California; Currant Fruit Fly (*Epochra canadensis*), by H. H. P. Severin (pp. 201–206); Poisoned Grain Baits for Rodents, by M. R. Miller (pp. 206–209); and Pest Control for April (pp. 211–215).

Acarina and Insecta of Barbados, J. R. Bovell (*Rpt. Dept. Agr. Barbados, 1916–17, pp. 45–55*).—This is a preliminary annotated list of the ticks, mites, and insects of Barbados, exclusive of the Coccidæ, which has been previously noted (E. S. R., 36, p. 252).

Twentieth annual report of the State entomologist for 1917, E. L. Worsham (*Ga. Bd. Ent. Bul. 51 (1918), pp. 44, pl. 1, figs. 3*).—Included in this report are accounts of the boll weevil in Georgia, where it now occurs in the greater part of the State; of pecan insects, a report upon which by Turner has been previously noted (E. S. R., 38, p. 762); etc.

Report of the entomologist, R. H. Van Zwaluwenburg (*Porto Rico Sta. Rpt. 1917, pp. 31–34*).—The author first reports upon biological studies of the cattle tick, the results of which are presented in tabular form and include the preoviposition and oviposition periods of female ticks kept in closed tins in weather shelter compared with the same period under natural conditions and the incubation period of the eggs in weather shelter and under natural conditions. Of 130 engorged ticks passed through a dip containing 0.16 per cent arsenious oxid only 30 (23 per cent) died without laying.

The larva of an undetermined phorid fly, first noted during the year, is said to be largely responsible for the failure of a large percentage of the ears of corn to set kernels. This dipteran deposits eggs in clusters of 25 or more among the strands of the new silk, several clusters often being placed in the tuft of a single ear. Upon emerging from the egg the larvæ feed on the silk strands and follow them downward. Often practically all of the strands will be destroyed in this way before the silk has been pollinated, thus preventing the setting of kernels. In June over 75 per cent of the ears in a field at the station were found either infested with larvæ or with eggs in the silk tuft.

Miscellaneous notes include mention of the noctuid moth *Noropsis hieroglyphica* which feeds commonly on the foliage of *Waltheria americana* and has also been reared upon *Morongia leptoclada;* a heavy infestation of rose apple fruits (*Eugenia jambos*) by the mango fruit fly (*Anastrepha fraterculus*), which is the first record of this plant as its host in Porto Rico; a general outbreak of the noctuid *Meliopotis januaris* on guamá (*Inga laurina*) in the vicinity of Mayaguez; serious attacks by the slug *Veronicella occidentalis* on beans and tobacco; and the occurrence of *Conchaspis angræci* upon vanilla.

Proceedings of the Entomological Society of Nova Scotia for 1917 (*Proc. Ent. Soc. Nova Scotia, 1917, pp. 96, pls. 10, figs. 43*).—The papers here presented include the following: The Tree Hoppers of Nova Scotia, by W. H. Brittain (pp. 7–14); The Work of the Dominion Entomological Laboratory in Nova Scotia, by G. E. Sanders (pp. 15–17); Notes on the Yellow Leaf Hopper of the Birch (*Oncopsis sobrius*), by W. H. Brittain (pp. 18–22); The Locustidæ of Nova Scotia, by C. B. Gooderham (pp. 23–36); Miscellaneous Notes on the Apple Faggot (1917), by W. H. Brittain (pp. 37–41); The Zebra Caterpillar (pp. 44–49), The Fall Cankerworm (pp. 49–53), The Rusty Tussock Moth (*Notolophus antiqua*) (pp. 54–61), and The White-Marked Tussock Moth (pp. 62–68), all by H. G. Payne; *Empoasca unicolor* as an Apple Pest, by W. H. Brittain and L. G. Saunders (pp. 69–73); The Introduction of the Parasites of the Brown-Tail and Gipsy Moths into Canada, by L. S. McLaine (pp. 74–76); The Dropping of Apples Caused by Spraying with Lime-sulphur, by G. E. Sanders and A. Kelsall (pp. 77–84); Notes on the Biology of *Lygus pratensis* in Nova Scotia, by W. H. Brittain and L. G. Saunders (pp. 85–91); and Some Notes on the Crambinæ of Nova Scotia, by E. C. Allen (pp. 92–94).

The papers presented include morphological and biological notes on the apple maggot, zebra caterpillar, fall cankerworm, rusty tussock moth, white-marked tussock moth, and *E. unicolor*, respectively, much of the data being given in tabular form. Technical descriptions of the instars of these pests are included. *E. unicolor*, the injury of which to apple foliage resembles that of *Empoa rosæ*, has proved to be a common leaf hopper on apple in Nova Scotia although it has not as yet appeared in sufficient numbers to warrant special treatment.

Investigations of the dropping of apples caused by lime-sulphur have shown that the injury may be influenced by a number of factors. Of first importance is the direction in which the spray is applied, the application of lime-sulphur to the underside of the leaf causing the damage. As regards period of application the least injury is caused by the early sprays, the damage increasing with each successive spraying period. At a specific gravity of 1.005 lime-sulphur will do more damage when wrongly applied than will lime-sulphur with a specific gravity of 1.01, properly applied. Some varieties, such as McIntosh, will stand a very strong solution, while Baldwin and Ribston injure very easily. It was found that the longer the solution is on the leaves before evaporating, and the more frequently the dry spray material is brought into solution, the greater will be the injury. A tree loaded with fruit will not stand as much or as strong a spray as one of the same variety that is not full of fruit. The more thrifty a tree is, the greater its resistance to injury.

Annual report of work done in the entomological section during the year ended June 30, 1917, H. L. Dutt (*Rpt. Agr. Activ. Govt. Bihar and Orissa, 1917, pp. 11–13*).—A brief report of the occurrence of and control work with crop pests.

Sugar cane insects, R. Ramírez (*Bol. Dir. Agr. [Mex.], 3 (1917), No. 1–2, pp. 41–44, figs. 5*).—A brief account of the more important sugar cane insects of Mexico, including the sugar cane beetle, sugar cane borer, *Sphenophorus obscurus*, *Castnia licus*, *Schistocerca americana*, (*Dactylopius*) *Pseudococcus sacchari*, *D. destructor*, *D. longispinus*, and army worm.

Miscellaneous truck crop insects in Louisiana, T. H. Jones (*U. S. Dept. Agr. Bul. 703 (1918), pp. 19, pls. 5, figs. 5*).—This bulletin consists of three parts which deal with the subject as follows:

I. *Insects injurious to the globe artichoke in Louisiana* (pp. 1–5).—The author first calls attention to the fact that apparently little attention has been given to the insect injury to globe or burr artichoke (*Cynara scolymus*) in this country, the increasing demand for edible heads of which led to the studies here reported. The most serious injury to this vegetable in Louisiana is said to be caused by two species of plant lice, namely, the artichoke aphis (*Myzus braggii*) and the bean aphis (*Aphis rumicis*), both of which usually occur in the same field and are most numerous during the late winter and in the spring. The artichoke aphis is the most common and the most injurious insect enemy of the globe artichoke in Louisiana. No parasites have been found to attack this species but several predators have been observed, a list of which is here presented. At Baton Rouge *Scymnus puncticollis* appears to be the most efficient. *M. braggii* also infests the yellow thistle (*Carduus spinosissimus*=*Cirsium horridulum*), a common weed in Louisiana.

A. rumicis, while not as common as *M. braggii*, is more difficult to control by spraying, largely because of the fact that infested leaves become distorted in such a manner that the aphids can be reached only with difficulty with a contact insecticide. In work during 1917 both species were satisfactorily controlled by spraying with one part, by weight, of nicotin solution (40 per cent nicotin sulphate) to 1,000 parts of water, with laundry soap added at the rate of 1 lb. to 25 gal. of water. A company in Plaquemines Parish, which annually grows from 10 to 15 acres of globe artichokes, has found that the aphids are killed successfully by a nicotin spray, consisting of tobacco extract containing 40 per cent nicotin as sulphate, 8 oz.; fish-oil soap, 3 lbs.; and water, 50 gal.

Other insects mentioned as attacking globe artichoke in Louisiana include the banded leaf-footed plant bug (*Leptoglossus phyllopus*), the bollworm, a plant bug (*Thyreocoris pulicarius*), *Nezara viridula*, a scarabæid beetle (*Euphoria sepulchralis*), cutworms (particularly *Feltia annexa* and the black cutworm), the larvæ of two agromyzid flies (*Agromyza platyptera jucunda* and *Agromyza* sp.), a membracid (*Entylia sinuata*), the larva of the cabbage looper, and the adult of the southern corn rootworm (*Diabrotica duodecimpunctata*).

II. *The granulated cutworm, an important enemy of vegetable crops in Louisiana* (pp. 7–14).—Observations by the author indicate that the granulated cutworm (*F. annexa*) is the principal cutworm which attacks vegetable crops in Louisiana. Of 1,431 cutworms collected from April to December in 1915, 1916, and 1917, 1,345 (94 per cent) were identified as *F. annexa*, the black cutworm being second in number (3.2 per cent) and *F. malefida* third (2.5 per cent).

The most serious damage caused by the granulated cutworm is that due to its habit of cutting off small plants near the surface of the ground. Irish potatoes, beets, and Brussels sprouts have been observed to be defoliated, while the fruit of tomato and eggplant resting on the ground are sometimes bored into and made unsalable.

Technical descriptions of the several stages of this species are reproduced, followed by a report of studies of its life history and habits. A list of crops observed by the author to have been injured include bean, beet, Brussels sprouts, cabbage, cauliflower, eggplant, Irish potato, pepper, tomato, and turnip. Records of oviposition of individual females show from 311 to 1,374 eggs to have been deposited, as many as 307 having been deposited during a single night. During December eggs were deposited on a night when the thermograph registered as low as 19° F. In the locality of Baton Rouge, there are apparently five and possibly six generations a year, these so overlapping that at certain times all stages are present in the field simultaneously. The length of the egg stage varied from 4 days in July to 54 in December and January. Pupation may take place in August as soon as 24 days after emergence from the egg and the pupal stage is passed during August within 16 days. The minimum period for egg, larva, and pupa stages combined was as low as 38 days during July and August.

A tachinid (*Linnaemyia comta*) and an ichneumonid (*Enicospilus purgatus*) were reared from larvæ collected at Baton Rouge, and *Sarcophaga helicis* is thought to have been so reared. Dead larvæ infested with the fungus *Entomophthora virescens* were found in rearing cages. Experiments with methods of control indicate that the use of poisoned baits and the treatment of attacked plants with arsenicals will prove satisfactory. A mixture made of bran 10 lbs., molasses 1 qt., Paris green 0.5 lb., water 7 qt., and the juice and finely chopped rind and pulp of two oranges is said to have given satisfactory results.

III. *Experiments in controlling the tomato fruit worm with arsenicals* (pp. 15-19).—The details of dusting and spraying experiments at Baton Rouge for the control of the tomato fruit worm or bollworm extending over a period of two years are presented in tabular form. The results show considerable variation, and none of the treatments reduced the injury profitably. Arsenate of lead applied undiluted as a dust gave the best results.

Measures for protecting wheat-flour substitutes from insects, R. N. CHAPMAN (*Science, n. ser., 47 (1918), No. 1224, pp. 579-581*).—This is a discussion of work being done by the University of Minnesota in cooperation with the State Food Administration to prevent the loss of wheat flour substitutes from insect attack. Attention is called to the fact that the amount of embryo included in the flour and the coarseness of the product are usually taken as an index of susceptibility to insect attack, coarse flours with the most embryo being the most susceptible. The wheat flour substitutes and other cereals contain embryo, are relatively coarse, and are known to be highly susceptible to insect attack.

The measures recommended, which are preventive, consist in subjecting the sealed packages to a temperature of about 85° C. (185° F.) at the time of packing, which will kill all stages of insects, rapid handling of cereals and proper sanitation of stores by retail dealers, and the subjecting of the cereal in the home to temperatures such that the minimum in any part of the cereal is well above the fatal temperature of insects, or about 45° C. (113° F.) at 24 per cent of relative humidity.

The consumption and cost of the economic poisons in California, 1916, G. P. GRAY (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 3, pp. 140-144*).—A table showing the consumption and cost of economic poisons in 1916 in 28 counties reporting is included in this paper.

The selection of petroleum insecticides from the commercial point of view, P. R. JONES (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 4, pp. 189-191*).—A brief discussion.

Wettable sulphurs, G. P. GRAY (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 4, pp. 191, 192*).—Attention is called to the fact that a number of substances, such as soap, flour paste, oleic acid, glue, dextrin, diatomaceous earth, etc., when mixed with sulphur commonly counteract its aversion to water but do not otherwise modify its properties. The author recommends the following formula in the preparation of wettable sulphur: Powdered glue 1.5 oz., hot water 3 gal., sublimed or powdered sulphur 10 lbs., and water to make 200 gal. Since sulphur is apt to cause foliage injury during hot, dry weather, it is generally advised not to apply sulphur or sulphur pastes to plants when the temperature exceeds 100° F.

On two species of Physothrips injurious to tea in India, R. S. BAGNALL (*Bul. Ent. Research, 9 (1918), No. 1, pp. 61-64, figs. 2*).—Two species of thrips found on tea in sufficient numbers to be regarded as pests are *P. setiventris* n. sp. and *P. lefroyi*.

A study of the capsid bugs found on apple trees, F. R. PETHERBRIDGE and M. A. HUSAIN (*Ann. Appl. Biol., 4 (1918), No. 4, pp. 179-205, pls. 3*).—This is a report of investigations conducted in continuation of those previously noted (E. S. R., 38, p. 57; 39, p. 763).

The authors find that *Plesiocoris rugicollis* causes marked damage to the leaves, shoots, and fruit and is responsible for most of, if not all, the damage in the Wisbech district of England. "*Atractotomus mali*, *Orthotylus marginalis*, and *Psallus ambiguus*, although they feed on the juices of the apple, do not cause any apparent damage to the varieties badly marked by *P. rugicollis*. In no case have we found either of these three species causing any visible damage to apples." Studies of *P. rugicollis* are reported upon at some length and brief accounts are given of *O. marginalis*, *P. ambiguus*, and *A. mali*.

Further observations on the capsids which attack apples, F. R. PETHERBRIDGE and M. A. HUSAIN (*Jour. Bd. Agr.* [*London*], *25* (*1918*), *No. 1*, *pp. 54–58*, *pl. 1*).—A report of work, a more detailed account of which is above noted.

New Aphidinæ of Japan, S. MATSUMURA (*Trans. Sapporo Nat. Hist. Soc.*, *7* (*1918*), *No. 1*, *pp. 1–22*, *pl. 1*).—This paper, which supplements that previously noted (E. S. R., 38, p. 463), gives descriptions of five new genera (Metaphis, Yezosiphum, Acanthaphis, Sappaphis, and Myzopsis) and 22 new species.

Life history of Pemphigus populi-transversus, T. H. JONES (*Jour. Agr. Research* [*U. S.*], *14* (*1918*), *No. 13*, *pp. 577–594*, *pls. 5*, *fig. 1*).—This is a report of studies conducted by the Bureau of Entomology of the U. S. Department of Agriculture in Louisiana.

It is first pointed out that prior to the publication of the present article there was no published record of any species of Pemphigus as occurring on crucifers in the United States, although collected from turnip roots in Texas by Paddock in 1914, from watercress in Colorado by Bragg, and from curly turnip (*Brassica rapa*) in Mississippi. The species which causes galls on the leaf petioles of some of the poplars or cottonwoods was first described by Riley in 1879. Its first collection from the roots of Cruciferæ in Louisiana was made by Tucker of the Louisiana Stations in November, 1914, having been taken on cabbage roots in Tangipahoa Parish. Shortly afterwards it was collected by the author at Baton Rouge. The experiments here described led to the conclusion that the form which causes galls on the leaf petioles of some of the poplars or cottonwoods (*Populus* spp.) and that which feeds on the roots of crucifers represent the same species. This species has been recorded as occurring on poplar in California, Texas, Colorado, Kansas, Nebraska, Missouri, Iowa, Minnesota, Illinois, Indiana, New York, and Massachusetts, and has also been collected in Wyoming, Arizona, Wisconsin, Michigan, Ohio, and Florida. Four species of the genus Populus (*P. balsamifera*, *P. monilifera*, *P. trichocarpa*, and *P. fremontii*) have been mentioned as hosts.

The formation of galls, dates when galls are found at Baton Rouge, percentage of leaf petioles showing galls, dates when winged migrants are found in galls, dates when winged migrants leave galls, and number of wingless viviparous females to which winged migrants give birth are considered by the author.

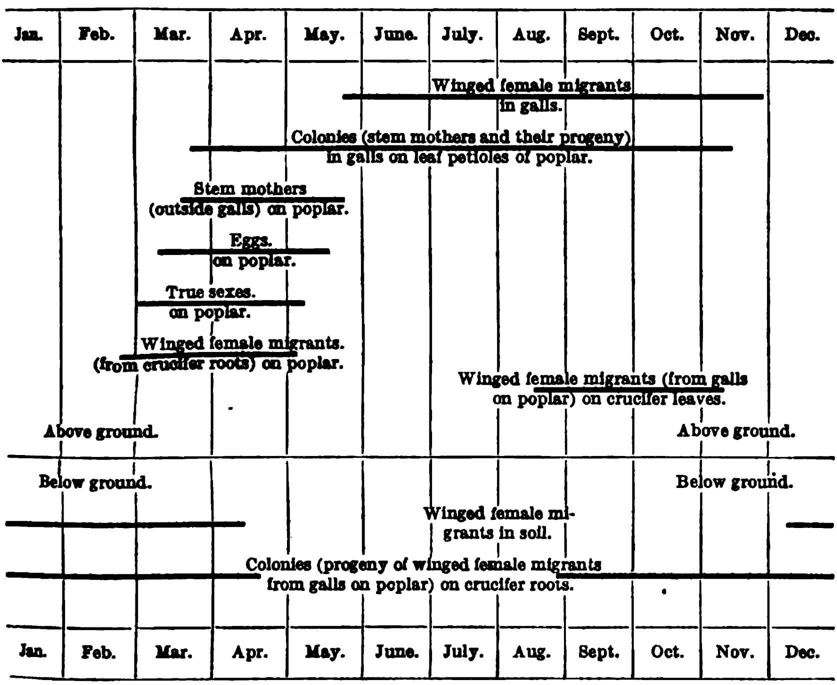
As regards the effect upon the plant, it is stated that a slight or moderate infestation of the roots of crucifers does not usually affect the appearance of the plant, but a severe infestation of the roots is manifested by a wilted condition of the leaves. Colonies may be found upon any portion of the root system but the small rootlets appear to be preferred. At Baton Rouge the subterranean forms apparently cause more severe injury to turnip than to any other cultivated cruciferous crop that has been under observation. The planting of rape and kale at the live-stock experiment farm at Jeanerette, La., is said to have been abandoned on account of this root louse.

"Wingless specimens of the genus Pemphigus have been taken in Louisiana from the roots of the following Cruciferæ: Cabbage, turnip, mustard (*B. nigra*), cauliflower, and broccoli (*B. oleracea botrytis*), Brussels sprouts (*B. oleracea gemmifera*), rape (*B. napus*), *Coronopus didymus*, *Lepidium virginicum*, and *Roripa* sp. . . . Winged migrants (fundatrigenia) of the species of Pemphigus under consideration have been found at the roots of cabbage, turnip, Brussels sprouts, rape, *C. didymus*, and *Roripa* sp. It is quite possible that further observations will disclose the fact that the species occurs also at the roots of plants not belonging to the family Cruciferæ."

Winged females have been found in the soil as early as December 12 and as late as April 9. Six was the greatest number of sexed individuals to which a winged migrant from crucifers was observed to give birth. Only a single egg is deposited by the true sex.

The seasonal history of this aphid at Baton Rouge is illustrated by the following diagram:

Seasonal history of P. populi-transversus at Baton Rouge, La.



Descriptions of Stages of *P. populi-transversus* and Its Gall, by C. P. Gillette (pp. 589–592), and a list of 23 references to the literature cited are appended.

New pests and their natural enemies: Three new Argentine scales and their parasites, P. Caride Massini and J. Brèthes (*An. Soc. Rural Argentina, 52 (1918), No. 3, pp. 148–158, pls. 8, figs. 10*).—The three new Argentine scales, *Pulvinaria platensis*, *P. flavescens*, and *P. minuta*, are described, together with five hymenopterous parasites reared from them which represent two new genera (Onophilus and Pseudaphelinus) and five new forms.

Destruction of nits of the clothes louse by solutions of cresol soap emulsion and lysol, A. W. Bacot and L. Lloyd (*Brit. Med. Jour., No. 2991 (1918), pp. 479, 480*).—The authors have found that lysol (crude phenol and soft soap emulsion) solutions are decidedly more effective than the cresol soap emulsion solution at the higher temperatures but less so at 82° F. The evidence seems to establish the fact that steeping for 20 minutes in a 2 per cent solution, either of lysol or the cresol soap, is quite effective provided the temperature is not below 50°.

The orange papilio and its natural enemy, Pteromalus caridei, P. Caride Massini and J. Brèthes (*An. Soc. Rural Argentina, 52 (1918), No. 2, pp. 73–76, pls. 2*).—A brief account of *Papilio thoas thoantiades*, which attacks citrus foliage, and the value of *P. caridei* in its control.

Some notes on the natural control of the cherry tree ugly nest tortricid (Archips cerasivorana), A. B. Baird (*Agr. Gaz. Canada, 5 (1918), No. 8, pp. 766–771, figs. 6*).—This tortricid is said to occasionally become very abundant over large areas in eastern and western Canada during June and July on the choke cherry (*Prunus virginiana*), making the trees very unsightly by spinning its large tentlike web. The present paper deals largely with measures of control, especially by insect parasites, based upon studies largely at Fredericton, N. B.

A study of tobacco worms and methods of control, L. B. Edrozo (*Philippine Agr. and Forester, 6 (1918), No. 7, pp. 195–209*).—The author here outlines the life history of several tobacco worms occurring in the Philippines, together with remedial measures. The pests considered are the tobacco cutworm (*Prodenia litura*), *Chloridea assulta*, the tobacco stem borer (*Gnorimoschema heliopa*), *Plusia eriosoma*, and the tobacco hornworm (*Acherontia lachesis*).

The tick as a possible agent in the collocation of the eggs of Dermatobia hominis, L. H. Dunn (*Jour. Parasitology, 4 (1918), No. 4, pp. 154–158*).—The author presents evidence obtained in the Canal Zone, Panama, which leads him to consider that a tick, probably *Ambylomma cajennense*, not only acts as the carrier of the eggs of *D. hominis* but is also instrumental in assisting the larvæ to penetrate the skin.

The presence of lateral spiracles in the larva of Hypoderma, G. H. Carpenter and F. J. S. Pollard (*Proc. Roy. Irish Acad., 34 (1918), No. 4, Sect. B, pp. 73–84, pls. 6*).—A report of anatomical studies.

Work and parasitism of the Mediterranean fruit fly in Hawaii during 1917, C. E. Pemberton and H. F. Willard (*Jour. Agr. Research [U. S.], 14 (1918), No. 13, pp. 605–610*).—This is a report of work by the Bureau of Entomology of the U. S. Department of Agriculture conducted in 1917 in continuation of that carried on since 1913 as previously noted (E. S. R., 38, p. 659.)

During the year there was a rather heavy infestation of several varieties of fruits, some of which were badly infested. Details relating to these are presented in tabular form, as is information on the percentage of larval parasitism of *Ceratitis capitata* and total parasitism by months of all larvæ of *C. capitata* collected in Hawaii during 1917.

There was a 47 per cent reduction in the abundance of the fruit fly during the year, and this was entirely due to parasitic importation. This reduction in the numbers of the fly brings little relief to its favored host fruits, but those fruits classed as unfavored hosts show a marked improvement in the degree of infestation and some may become almost wholly free from larvæ. The propagation of such fruits and the encouragement of the parasitic method of control is thought to be the most favorable method of contending with this pest in Hawaii. It is also considered of importance in contributing toward reducing the chances of introduction to the mainland.

The total parasitism by all species during 1917 was 14.3 per cent higher than in 1916. The average infestation of all fruits combined was, however, not strikingly different from that of 1916. The parasitism by *Opius humilis* was 4.5 per cent less than in 1916, while that of *Diachasma tryoni*, *D. fullawayi*, and *Tetrastichus giffardianus* was 7, 5.2, and 6.6 per cent greater, respectively.

The fauna of British India, including Ceylon and Burma, edited by A. E. SHIPLEY and G. A. K. MARSHALL (*London: Taylor & Francis, 1917, pp. XIII+387, pls. 5, figs. 77*).—This second part of the Lamellicornia by G. J. Arrow deals with the Rutelinæ, Desmonycinæ, and Euchirinæ and includes descriptions of 403 forms.

The cherry leaf beetle, F. Z. HARTZELL (*New York State Sta. Bul. 444 (1917), pp. 749–820, pls. 8, figs. 8*).—This is a report of studies for three consecutive seasons, principally at Fredonia in the Lake Erie Valley, N. Y., with *Galerucella cavicollis*, studies of which by Herrick and Matheson (E. S. R., 34, p. 756) and Cushman and Isley (E. S. R., 35, p. 260) have been previously noted.

"During 1915 the adults emerged from August 23 to September 18, but during the summer of 1916, which was warmer, the adults appeared in the breeding cages from July 31 to September 2. The adults are rather sluggish, feeding very little during the late summer and fall. By September 15 some show a tendency to seek hibernating quarters, at least on cooler days, although most of the beetles will emerge and feed on warm, sunny days. By October 1 all beetles entered hibernation, from which they did not emerge during the warm weather of early October.

"The hibernation period of the insect in western New York is nearly eight months, emergence occurring during the latter part of May. In 1916 the first beetles emerged on May 27 at Fredonia. During 1917 at Lily Dale, 8 miles from Fredonia and at an elevation 500 ft. greater, the first beetle emerged on May 30. The time of the appearance of the beetles was about one week after the bird cherry was in full bloom. The most extensive feeding by the adults occurs during the early part of June. It is at this time that practically all injury by the species to cultivated trees is inflicted. The greatest natural dissemination of the beetles occurs during the latter part of May and early June, when they may fly considerable distances to new feeding grounds.

"Egg laying in 1916 began on June 5, under natural conditions, and on June 10 in observation cages, reaching the maximum in the first week of July and ending in the cages on August 9. The eggs are deposited on or near the trunk of the tree upon which the adults are feeding, usually not more than 6 in. above the surface of the soil, the majority being placed at the junction of the surface of the soil and the trunk. Some of the eggs are scattered loosely on the soil, but most of them are glued to rootlets, small stones, or the tree trunk. They are found to a depth of about 1 in. in the soil. The number of eggs laid in breeding cages by an individual varied from 10 to 294, with an average of 93. The normal life of the beetles appears to vary from 11 to 12.5 months, although some individuals may reach an age of nearly 14 months.

"The length of the incubation period during 1916 averaged 13 days, with a maximum of 23 days and a minimum of 9 days. These differences are ascribed largely to variation in temperature, although there is individual variation in the incubation period of eggs deposited on the same day. In 1916 hatching began on June 23 and ended August 20, the emerging larvæ being most numerous during the latter part of July.

"Upon hatching, the larvæ climb and feed upon foliage. They are able to reach maturity only on the leaves of the bird cherry, and when compelled to subsist on the foliage of other species of cherry they invariably succumbed. The total feeding period of the larva varied from 8 to 24 days, with an average during 1916 of 12.3 days. When the larvæ have reached full growth they burrow into the leaf mold or a short distance into the soil and form cells in which to pupate. The time spent in these cells was found to average 15 days, the shortest period being 12 days and the longest period 23 days. The total developmental period from hatching to emergence as adult averaged 27.2 days at Fredonia during 1916.

"The chief factors in the natural control of the beetles are drowning of adults, reforestation which decreases the amount of the bird cherry, a carabid beetle (*Lebia ornata*) which attacks the beetles, and the cedar waxwing (*Bombycilla cedrorum*) which was observed feeding on the adults. The cherry leaf-beetle is effectively controlled by arsenicals, preferably combined with Bordeaux mixture, and nicotin sulphate; for the proper employment of which directions are given."

Notes on the strawberry leaf beetle (Galerucella tenella), H. C. Efflatoun (*Ann. Appl. Biol., 4 (1918), No. 4, pp. 206–210, figs. 3*).—Both the larva and adult damage the leaves of strawberries in England in the same way by eating the lower and upper epidermis and the soft underlying tissue, leaving the opposite layer of epidermis intact. Technical descriptions are given of the larva, pupa, and adult.

Bean and pea weevils, E. A. Back and A. B. Duckett (*U. S. Dept. Agr., Farmers' Bul. 983 (1918), pp. 24, figs. 25*).—A description is given of the principal pea and bean weevils, and methods for the prevention of loss therefrom are outlined.

The preparation of bees for outdoor wintering, E. F. Phillips and G. S. Demuth (*U. S. Dept. Agr., Farmers' Bul. 1012 (1918), pp. 20, figs. 6*).—It is pointed out that the preparation of bees for outdoor wintering is of most vital importance, no other phase of beekeeping having so direct an influence on the honey crop of the following season. The apiary should be located in a protected place and the colonies should not be moved at the time of packing.

Directions are given in this publication for the proper arrangement of the apiary to prevent confusion due to the shifting of hives. The amount and character of the packing materials and the most economical type of packing cases are discussed. A schedule of dates for packing and unpacking the hives is presented for all parts of the United States, and the amount and character of winter stores are indicated. It is deemed important that none of the factors of good wintering be omitted, and several tests are given by means of which the beekeeper can determine whether his bees are wintering properly.

Wintering bees in cellars, E. F. Phillips and G. S. Demuth (*U. S. Dept. Agr., Farmers' Bul. 1014 (1918), pp. 21, figs. 3*).—Cellar wintering is said to be practicable where the average outdoor temperature during the winter months is as low as 25° F. Bees should be put into the cellar after a good flight in late November, or earlier in the more northern localities, and should be removed when fresh pollen and nectar are available.

"The cellar should be arranged so that the ceiling is below the frost line, and so that the ceiling and side walls are thoroughly protected at all points. The cellar should be kept so that the lowest temperature within the hives is at least 52°. At this temperature there will be little need of special ventilating arrangements There should be no condensation of moisture within the hives, and the cellar should be well drained."

Heat insulators for beehives, R. H. Pettit (*Michigan Sta., Quart. Bul., 1 (1918), No. 1, pp. 20, 21*).—Tests made of the comparative value of a number of materials as insulators gave the following results: Dead air space 18, corrugated cardboard 33, planer shavings 34.5, mineral wool 35.5, and forest leaves 41. Thus it appears that corrugated cardboard, the most expensive material used, is the least effective and that ordinary leaves, raked up, dried, and firmly packed, give the best results. A 2-in. layer was tested with each material.

In tests made to determine the relative rates of heat loss when one surface of the chamber was left unprotected, it was found that there was a loss of 3.5° F. when the undersurface was unprotected, a loss of 4° when one side was left unprotected, and a loss of 5° when the top surface alone was left unprotected.

Rearing queen bees in Porto Rico, R. H. VAN ZWALUWENBURG and R. VIDAL (*Porto Rico Sta. Circ. 16 (1918), Spanish Ed., pp. 12, figs. 5*).—A Spanish edition of the circular previously noted (E. S. R., 38, p. 865).

Report of entomology department, C. E. SANBORN (*Oklahoma Sta. Rpt. 1917, pp. 30, 31*).—This consists of a brief statement relating to the equipment of the department and tests made of honey-producing plants. It is stated that sesame has proved to be drought-resistant and very hardy. White clover yields well about once in every three years, while alfalfa yields nectar only when the weather is favorable.

Preliminary report on Isle of Wight bee disease, J. TINSLEY (*West of Scot. Agr. Col. Bul. 85 (1918), pp. 27–40*).—In investigations conducted by the author, in the course of which a thorough examination was made of bodies of thousands of bees which had undoubtedly perished from Isle of Wight disease or at least from a disease the diagnostic features of which are the same as those of Isle of Wight disease, *Nosema apis* was rarely found, even after a minute examination of the chyle stomach and feces. "It certainly does not appear to us that *N. apis* is the universal cause of the disease familiarly known as the Isle of Wight bee disease. . . . On the other hand, the stomach contents and the excrement of diseased bees have shown the unfailing presence of masses of bacteria, and we are of the opinion that these are not without special significance."

The subject is discussed under the headings of cause of the disease, spread of the disease, symptoms, infection experiments, preventive and remedial measures, and breeding to produce immunity.

Notes on the bee genus Andrena (Hymenoptera), H. L. VIERECK (*Proc. Biol. Soc. Wash., 31 (1918), pp. 59, 60*).

Natural enemies of the Argentine ant (Iridomyrmex humilis), C. W. MALLY (*So. African Jour. Sci., 14 (1917), No. 5, pp. 245–247*).—It is pointed out that in South Africa the Argentine ant is practically immune from attack by insect enemies.

A list of families and subfamilies of ichneumon flies of the superfamily Ichneumonoidea (Hymenoptera), H. L. VIERECK (*Proc. Biol. Soc. Wash., 31 (1918), pp. 69–74*).

Observations on Pimpla pomorum, a parasite of the apple blossom weevil (including a description of the male by C. Morley), A. D. IMMS (*Ann. Appl. Biol., 4 (1918), No. 4, pp. 211–227, pl. 1, figs. 5*).—*P. pomorum* in its larval stage is an ecto-parasite of the apple blossom weevil (*Anthonomus pomorum*), attacking both the larva and pupa. Pupation takes place within a slight silken cocoon within the cavity of the unopened apple buds. The adult ichneumons commence to emerge on June 17, an average of 23 days from the time of spinning the cocoon. From among 1,270 apple buds gathered at Chatteris in Cambridgeshire infested with *A. pomorum*, *P. pomorum* was found to effectively parasitize 27 per cent.

A bibliography of 28 titles is appended.

Two new microsporidian parasites of the larvæ of Pieris brassicæ, A. PAILLOT (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 2, pp. 66–68, fig. 1; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 5, p. 177*).—The first of two new Microsporidia, *Perezia mesnili*, which parasitized the Malpighian tubes and silk glands of the larvæ of *P. brassicæ* in the Sathonay-Rillieux region, is here described.

FOODS—HUMAN NUTRITION.

The nutritive value of certain fish, J. C. DRUMMOND (*Jour. Physiol., 52 (1918), No. 2-3, pp. 95-109, figs. 8*).—From feeding experiments using laboratory animals as subjects the following conclusions are deduced:

"The coagulable proteins of the muscle tissue of cod, herring, and canned salmon possess a nutritive value as high as those derived from beef.

"The so-called 'fatty' fish, which contain considerable quantities of fat distributed throughout their muscle tissue, may serve as valuable sources of the important dietary essential, the fat-soluble 'A.' Certain fish-liver oils are particularly rich in the fat-soluble accessory.

"No appreciable amounts of the water-soluble or antineuritic factor were detected in the muscle tissues of the fish examined. Small amounts were, however, present in extracts prepared from the whole herring, having originated in all probability from the reproductive organs, or other glandular organs.

The milling and baking qualities of Australian wheat, P. R. SCOTT and F. G. B. WINSLOW (*Jour. Dept. Agr. Victoria, 15 (1917), No. 8, pp. 474-481, figs. 5*).—The amount of wheat produced in New South Wales, South Australia, Western Australia, and Victoria is approximately four and one-half times greater than the amount required for local consumption. To regulate the quality of wheat exported, the following tests are made: Determination of the amount of impurities; grading into different sizes; the bushel weights of original and cleaned wheat; a milling test; the gluten content; and a baking test.

Nutritive value of whole wheat and of 85 per cent flour compared with white flour, L. LAPICQUE and J. CHAUSSIN (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 7, pp. 300-302*).—From metabolism experiments with a dog fed a ration of casein, fat, and bread made from whole wheat flour, the nutritive value of the whole wheat was calculated at 90 per cent of its weight of white flour. In metabolism experiments on man practically no difference was found in the nutritive value of white bread and of breads made from flour containing 85 per cent of the grain.

The use of limewater in the preparation of war bread, BALLAND (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 5, pp. 198-201*).—Observations are reported on the effects of the use of limewater in making bread from flour of 85 per cent extraction.

The author concludes that reports on the quality of the bread made with limewater are contradictory. It is often impossible to detect the least difference, although with very dark flour the odor and taste appear slightly bettered by the use of limewater.

The prevention of rope in bread, L. J. HENDERSON (*Science, n. ser., 48 (1918), No. 1236, pp. 247, 248*).—It is stated that the growth of *Bacillus mesentericus*, which seems to be the common cause of rope in bread, can not take place at a greater hydrogen ion concentration than 10^{-5}N. A method of measuring the hydrogen ion concentration of bread is outlined, which consists of adding to the freshly cut surface of the loaf three or four drops of an ordinary solution of methyl red (0.02 per cent in 60 per cent alcohol). If after five minutes the color is a full red without an orange tinge, the hydrogen ion concentration is approximately 10^{-5}N or more. If an orange tinge develops, greater amounts of acid should be added to successive batches of dough until the test with bread just gives the desired color.

Wheat substitutes in war bread, BALLAND (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 21, pp. 846-849; abs. in Chem. Abs., 12 (1918), No. 21, p. 2217*).—A number of substances suitable for substitution of wheat in war bread, including the common grains, beans, soy beans, chick peas, sorghums, and fenugreek, are noted, and the proportions in which they can be used and their general effect upon the quality of the bread are discussed.

War flours as an entire substitute for white flour, ETHEL B. CLARKE (*Cambridge, [Eng.]: W. Heffer & Sons, Ltd., 1917, pp. 4*).—A brief discussion of whole wheat flour, barley flour, oatmeal flour, and maize flour, with recipes for their use in cakes and puddings.

Some experiments with wheat substitutes, CORA E. GRAY (*Jour. Home Econ., 10 (1918), No. 8, pp. 348–352, pls. 2*).—An illustrated article showing the results obtained by the use of different substitutes in varying proportions in the making of cakes and muffins.

Barley bread, optimum reaction and salt effect, LORRAINE L. LANDENBERGER and W. MORSE (*Science, n. ser., 48 (1918), No. 1237 pp. 269, 270*).—The authors report that by maintaining a reaction at approximately pH=5 and an added sodium chlorid content of 2 per cent, barley flour may be utilized by itself to make an acceptable war bread.

The growth-promoting properties of foods derived from corn and wheat, C. VOEGTLIN and C. N. MYERS. (*Pub. Health Rpts. [U. S.], 33 (1918), No. 22, pp. IV+843–868, figs. 30*).—The purpose of the present investigation was to determine by means of feeding experiments with squabs, young albino mice, and a few hogs, whether the corn and wheat products used in human nutrition exhibit dietary deficiencies similar to those of the whole grains, as previously noted (E. S. R., 38, p. 869).

From the experimental data the authors conclude that "bread made from 'whole wheat' flour or old-fashioned cornmeal should be used in preference to 'white' bread and 'highly milled' corn foods, whenever the diet is restricted to those cereal foods to the more or less complete exclusion of other foods possessing greater dietary values."

The preparation and the preservation of vegetables, HENRIETTA W. CALVIN and CARRIE A. LYFORD (*U. S. Bur. Ed. Bul. 47 (1917), pp. 24*).—This includes recipes for the preparation of vegetables for the table, directions for storage of those which can be kept in their natural fresh condition, and methods of canning, salting, and drying others.

Use of dried fruits and vegetables, MRS. A. W. PARKS (*[Univ. Nebr., Col. Agr.], Ext. Serv. Emergency Bul. 33 (1918), pp. 12*).—This pamphlet gives a list of fruits and vegetables for drying, directions for drying them, and methods of cooking the dried products. Special recipes illustrating the various uses are also included.

The nutritive value of the banana, K. SUGIURA and S. R. BENEDICT (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 171–189, pls. 2, figs. 14; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 20, p. 1694*).—This is a study of the nutritive value of the banana as determined by the maintenance and growth of albino rats when placed upon a diet of bananas alone or together with certain supplementary substances.

As a result of the experiments reported, the authors conclude that the banana is deficient in protein and in the water-soluble vitamin as a foodstuff for the growth or maintenance of albino rats. A diet of bananas, purified casein, and yeast or carrot extract was found to be sufficient for growth and reproduction of the rat, but was not, however, adequate for the production of proper milk by the mother. This deficiency was qualitative rather than quantitative in nature.

How to sweeten cranberries (*Washington: U. S. Food Admin., 1918, pp. 2*).—Recipes illustrating the use of sirups and sweet fruits in place of sugar in the preparation of various cranberry dishes are given.

Sugar substitutes in bottled soft drinks, II–III, W. W. Skinner and J. W. Sale (*Nat. Bottlers' Gaz., 37 (1918), No. 436, pp. 74, 75, 76–78*).—Continuing work previously noted (E. S. R., 39, p. 769), the second paper of the series takes up nonacid beverages. Formulas for using part sugar substitutes are included, as well as analyses of commercial sugars and a table giving the relative sweetness of sucrose and sugar substitutes.

In the third paper the use of sugar substitutes in certain acid beverages with imitation flavors, namely, cherry, raspberry, strawberry, pineapple, lemon, orange, and grape, is discussed. It is concluded that "the investigations up to the present time on the keeping quality of the finished products indicate that combinations of ordinary sugar with glucose, corn sugar, and maltose sirups and honey can be used satisfactorily in carbonated bottled beverages when the precautions suggested are carefully observed."

Specific heat of fats and oils, D. Wesson and H. P. Gaylord (*Cotton Oil Press, 2 (1918), No. 6, pp. 40, 41*).—This article records specific heats of various fats and oils, including cottonseed oil and hydrogenized cotton-seed oil; peanut oil (plain and hydrogenized); liquid, solid, and hydrogenized coconut oil; and plain and hydrogenized soy-bean oil.

Food Surveys (*U. S. Dept. Agr., Food Surveys, 2 (1918), Nos. 11, pp. 12, figs. 13; 12, pp. 16, figs. 21*).—These numbers deal, respectively, with commercial stocks (not including retail stocks) on July 1, 1918, of beans, peas, grain sorghums, rice, and buckwheat flour, and of dried fruits, nuts, and peanuts.

Reports of storage holdings of certain food products, J. O. Bell and I. C. Franklin (*U. S. Dept. Agr. Bul. 709 (1918), pp. 44, figs. 23*).—Statistics are given showing the actual quantities of different commodities held in storage in 1916–17, as reported from the warehouses, comparison being made with reports of other months and years.

Production and preservation of food supplies, P. H. Bryce (*Com. Conserv. Canada Rpt., 8 (1917), pp. 123–154*).—A discussion of the food situation in Canada, with suggestions for the solution of the most pressing problems.

The cost of food.—A study in dietaries, Ellen H. Richards (*New York: John Wiley & Sons, Inc., 3. ed., rev., 1917, pp. IX+148*).—A revision by J. F. Norton of the work previously noted (E. S. R., 13, p. 877).

Charts showing the relative cost of equivalent fuel portions of foods, Alice F. Blood (*[Boston]: Simmons Col., 1917*).—A cost chart is given.

Food and fitness, or diet in relation to health, J. Long (*London: Chapman and Hall, Ltd., 1917, pp. IX+208*).—A treatise on diet in relation to health, which emphasizes the importance of fruits and vegetables and deprecates the use of large quantities of meat.

Infant feeding, R. M. Smith (*Mo. Bul. Bd. Health Mass., 5 (1918), No. 9–10, pp. 260–265*).—Specific directions for the feeding of infants are given. Sample diets for use after the first year are also included.

Diet of older children, F. B. Talbot (*Mo. Bul. Bd. Health Mass., 5 (1918), No. 9–10, pp. 266–270*).—The author states that nine out of ten of the diseases of infancy and childhood are due to a faulty diet. He discusses the time of meals and the foods they should include, and warns against overfeeding in fats and in sugars.

Diet of the United States Army soldier in the training camp, J. R. Murlin (*Jour. Amer. Med. Assoc., 71 (1918), No. 12, pp. 950, 951; abs. in Chem. Abs., 12 (1918), No. 23, p. 2603*).—The messing system of the United States Army is described briefly, and an account is given of the nutrition investigations conducted by the food division of the Surgeon General's Office at more than 40 training camps in this country. A statistical summary is included of the nutritional surveys in respect to nutrients supplied and wasted, the distribution of fuel value consumed and wasted, and the cost per man per day, and a table shows the average daily consumption of the different articles of food. Differences between these results and the regular garrison ration are pointed out, and the advisability is suggested of the readjustment of the ration to a basis more nearly approaching the basis of choice, as shown by the surveys. It is considered that this would result in (1) " reduction of waste by obliging organizations to secure their luxuries by exercising rigid economy, (2) guarantying a satisfactory distribution of nutrients, (3) the possibility of centralized purchasing and consequent reduction in cost to the Government, and (4) training the men on a ration basis much more nearly approaching the requirements of field conditions."

A biological analysis of pellagra-producing diets.—IV, The causes of failure of mixtures of seeds to promote growth in young animals, E. V. McCollum and Nina Simmonds (*Jour. Biol. Chem., 33 (1918), No. 2, pp. 303–311, pls. 7*).—In continuation of the investigations previously noted (E. S. R., 39, p. 666), this paper discusses the supplementary relationships for nutrition of mixtures of seeds as determined by feeding experiments on growing rats.

The results indicate that seeds of plants can be classed together without exception in their dietary properties in that they must be combined with other foods which carry a much greater amount of calcium, sodium, and chlorin in order to render them complete from the dietary standpoint. In lesser degree the poor quality of the proteins of seeds and seed mixtures and the low content, with few exceptions, of fat-soluble A seem to be contributing factors in causing the stunting of animals fed too largely on this class of vegetable foods.

The authors are of the opinion that the poor quality of the protein content of the diet is in all probability one of the factors in lowering the vitality of those peoples who live during the winter season on a diet restricted to a few articles, the chief one being corn or wheat bread.

A biological analysis of pellagra-producing diets.—V, The nature of the dietary deficiencies of a diet derived from peas, wheat flour, and cottonseed oil, E. V. McCollum, Nina Simmonds, and H. T. Parsons (*Jour. Biol. Chem., 33 (1918), No. 3, pp. 411–423, figs. 5; abs. in Chem. Abs., 12 (1918), No. 19, p. 2004*).—Continuing the investigation noted above, the authors have studied the deficiencies of the diet with which Chittenden and Underhill (E. S. R., 36, p. 764) produced in dogs the condition said to be similar to pellagra in man.

As the result of experimental evidence, the authors conclude that this diet " is not deficient in the sense that it fails to furnish a sufficient amount of another specific substance which when present protects against the development of the syndrome of pellagra. The deficiencies of this diet are all dependent upon the shortage of the fat-soluble A, the character of the inorganic moiety, and the relatively poor quality of its protein mixture. The experimental demonstration of this fact, provided the interpretation be accepted that the dogs were suffering from a disease analogous to pellagra in man, eliminates a second syndrome, pellagra, from the list of supposed 'deficiency' diseases."

A study of the diet of nonpellagrous and of pellagrous households in textile mill communities in South Carolina in 1916, J. Goldberger, G. A. Wheeler, and E. Sydenstricker (*Jour. Amer. Med. Assoc., 71 (1918), No. 12, pp. 944–949, figs. 2; abs. in Chem. Abs., 12 (1918), No. 23, pp. 2610, 2611*).—In continuation of the investigations on pellagra previously noted (E. S. R., 36, p. 363), this paper gives a brief report of the results of a study of the relationship of household diet to pellagra incidence in some cotton-mill village communities in South Carolina.

A comparison of the diets of pellagrous with those of nonpellagrous households led to the conclusion that the pellagra-producing dietary fault is the result of some one or more, or probably a combination of two or more, of the following factors: A physiologically defective protein supply, a low or inadequate supply of fat-soluble vitamin, a low or inadequate supply of water-soluble vitamin, and a defective mineral supply. This is in accord with the conclusions of McCollum and others noted above.

"The somewhat lower plane of supply, both of energy and of protein, of the pellagrous households, though apparently not an essential factor, may, nevertheless, be contributory by favoring the occurrence of a deficiency in intake of some one or more of the essential dietary factors, particularly with diets having only a narrow margin of safety.

"The pellagra-producing dietary fault may be corrected and the disease prevented by including in the diet an adequate supply of the animal protein foods particularly milk, including butter and lean meat."

The rôle of antiscorbutics in our dietary, A. F. Hess (*Jour. Amer. Med. Assoc., 71 (1918), No. 12, pp. 941–943, fig. 1; abs. in Chem. Abs., 12 (1918), No. 23, p. 2610*).—This is a general discussion of the subject based on investigations previously noted (E. S. R., 39, p. 771).

The author suggests the practicability of using orange peel in place of orange juice as an antiscorbutic. An infusion made by adding to washed and grated orange peel twice its volume of boiling water, allowing to stand over night and then straining, has been found to be entirely satisfactory in antiscorbutic properties.

The "vitamin" hypothesis and the diseases referable to faulty diet, E. V. McCollum (*Jour. Amer. Med. Assoc., 71 (1918), No. 12, pp. 937–941; abs. in Chem. Abs., 12 (1918), No. 23, p. 2610*).—Investigations leading to the present conception of an adequate diet are reviewed, and the deficiency diseases—scurvy and pellagra—are discussed in the light of recent studies conducted by the author and other investigators.

The inorganic elements in nutrition, T. B. Osborne, L. B. Mendel, et al. (*Jour. Biol. Chem., 34 (1918), No. 1, pp. 131–139, pls. 3*).—The rôle in nutrition of the inorganic elements, individually and collectively, has been studied by the use of salt mixtures in which one or more of the elements has been omitted and replaced by increments of the remaining ones so as to maintain as nearly as possible the balance of acids and bases. These were used in the customary feeding experiments with rats to replace the complete mixtures of inorganic salts, which have been shown to be adequate.

It was found that good growth took place when magnesium, sodium, and calcium were all present in traces only. With less than 0.04 per cent of either chlorin or sodium, slightly more than 0.01 per cent magnesium, and only 0.03 per cent of potassium, respectively, the usual growth was attained. When both sodium and potassium were simultaneously decreased, growth ceased. The subsequent addition of sodium alone caused only a slight gain, but later substitution of potassium for sodium caused rapid recovery. Cessation or restriction of growth followed rapidly as a result of feeding diets low in calcium or phosphorus. This was promptly remedied by the introduction of either in organic form.

The authors discuss the significance of the results obtained, and conclude that in the long run much smaller quantities of those inorganic elements which can be husbanded will be required for well-being than of those which are needed for the maintenance of neutrality and are continuously eliminated. This is wholly apart from any quantity necessary for the construction of special tissues like bone or for the production of milk. Attention is called to the fact that any shortage of an essential inorganic element can be suitably remedied under ordinary conditions by the use of its salts.

The rôle of inorganic sulphates in nutrition, Amy L. Daniels and Jean K. Rich (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 27–32, figs. 3; abs. in Chem. Abs., 12 (1918), No. 23, p. 2605*).—Feeding experiments with rats to determine whether the young animal is able to synthesize cystin from inorganic sulphates are reported. Evidence is furnished that the inorganic sulphates can not be used to replace the organically combined sulphur of cystin.

Observations on the significance of glycolic acid, glyoxal, glycol aldehyde, and amino-aldehyde in intermediary metabolism, I. Greenwald (*Jour. Biol. Chem., 35 (1918), No. 3, pp. 461–472; abs. in Chem. Abs., 12 (1918), No. 23 pp. 2608, 2609*).—From experiments with phlorhizinized dogs the author concludes that it is highly improbable that glycolic acid and glyoxal are converted into glucose in the body, but that it is probable, but not established, that glycol aldehyde may be converted into glucose. In regard to the significance of glycin and amino-aldehyde in intermediary metabolism, the possible sequence is suggested of glycin $\rightleftarrows$ amino-aldehyde $\rightleftarrows$ glycol aldehyde $\rightleftarrows$ glucose.

Hunger and appetite secretion of gastric juice in infants' stomachs, R. Taylor (*Amer. Jour. Diseases Children, 14 (1917), No. 4, pp. 258–266, fig. 1*).—An apparatus is described by which sham feeding can be carried out and gastric juice collected under conditions which are said to give positive evidence of the amount secreted. Experimental evidence obtained with this apparatus tends to prove that there is no appetite or psychic secretion of gastric juice in the infant. The empty stomach of the hungry infant was found to secrete a pepsin-containing gastric juice which is often as acid as that found in the adult stomach. The more profuse this secretion the higher is its acidity.

Contribution to the study of digestive leucocytosis, P. Brodin and F. Saint-Girons (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 7, pp. 302–305*).—A study of digestive leucocytosis was conducted by means of the determination of the number of leucocytes in the blood every half hour for six or seven hours after the ingestion of different food materials. The results are summarized as follows:

In the normal subject digestion is constantly accompanied by modifications in leucocytic equilibrium bearing upon the number of white corpuscles and the proportion of polynuclears. The number of leucocytes decreases at first and then increases, the largest number being found from two to three hours and again from four to six hours after the meal. The proportion of polynuclears follows a course almost parallel with that of the number of leucocytes. The modifications of the leucocytic equilibrium vary with each individual and, above all, with the nature of the food, being most pronounced on a meat diet. This is caused by the passage into the blood of ingested products.

ANIMAL PRODUCTION.

Feeding farm animals, W. E. Carroll (*Utah Sta. Circ. 32 (1918), pp. 3–23*).—This circular constitutes a brief popular treatise on the feeding of farm animals, discussing in particular the function of food nutrients, the digestion of feeds, rations, and the relative value of feeding stuffs. Compiled tables are presented showing the nutrient requirements for growth, fattening, milk production, and work production, and the relative values of different feeding stuffs as based on their content of digestible matter, net energy, and feed units, and also as employed in the feeding of the more common farm animals.

Composition and digestibility of Sudan grass hay, W. G. Gaessler and A. C. McCandlish (*Iowa Sta. Research Bul. 46 (1918), pp. 65–75*).—This has been abstracted from another source (E. S. R., 39, p. 672).

Commercial feeding stuffs, E. G. Proulx et al. (*Indiana Sta. Bul. 217 (1918), pp. 3–152*).—This bulletin contains the usual data regarding the Indiana feedings stuffs control law and its enforcement, including a discussion of the findings in the inspection during the year. Analyses are reported of wheat bran, wheat middlings, shorts, red dog flour, low-grade flour, rye middlings, buckwheat hulls, alfalfa meal, blood meal, meat scrap, meat meal, tankage, dried beet pulp, coconut-oil meal, corn bran, gluten feed, gluten meal, hominy feed, velvet bean feed, cottonseed feed, cottonseed meal, cold pressed cotton seed, brewers' grains, distillers' grains, yeast grains, linseed meal, and proprietary and mixed feeds.

New feeds, A. J. Patten (*Michigan Sta., Quart. Bul., 1 (1918), No. 1, pp. 15, 16*).—Brief descriptions of the following feeds which have appeared recently to a greater or less extent on the markets are given: Barley feed, oatmeal by-products, corn feed meal, corn bran, corn oil cake meal, velvet bean feed, and rye feed. The description in some instances includes the gross composition.

[Analyses of feeding stuffs], C. Dusserre (*Ann. Agr. Suisse, 19 (1918), No. 1, pp. 116–119*).—Analyses are reported of samples of feeding stuffs, including press cakes of sesame, peanuts, corn, and flaxseed; cereal flours; and fodder mixtures of various materials.

Synthetic capacity of the mammary gland.—I, Can this gland synthesize lysin? E. B. Hart, V. E. Nelson, and W. Pitz (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 291–307, figs. 13; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 1, p. 70*).—Feeding experiments similar to those of Osborne, Mendel, and Ferry (E. S. R., 28, p. 864), in which gliadin was used as a basal protein, have been conducted by the authors with rats as experimental animals and zein as the basal protein.

The results indicate that it is very probable that the mammary gland has not the capacity to synthesize lysin, and that lysin is not dispensable for normal maintenance. The evidence is considered to support the view that, as far as the proteins are considered, milk secretion, like growth, is ultimately dependent upon the quality and quantity of amino acids ingested with the food.

[Pasturing and feeding experiments], F. B. Headley (*U. S. Dept. Agr., Bur. Plant Indus., Work Truckee-Carson Expt. Farm, 1917, pp. 21–24*).—Three tests with pasture grasses for cattle are briefly described. On two acres of mixed grasses planted in June, 1917, and including in the seed mixture 2 lbs. alsike clover, 2 lbs. meadow fescue, 7 lbs. brome grass, 6 lbs. oat grass, 5 lbs. orchard grass, 3 lbs. rye grass, and 3 lbs. Kentucky blue grass, per acre, all varieties, except possibly Kentucky blue grass, made a rank growth the first year. The field produced some hay and was used for fall pasture. In another test a mixed grass pasture had made sufficient growth for pasturing by May 1 and continued to supply pasture until in October. It was estimated that on this pasture one and one-half acres would have provided continuous pasture sufficient for two cows.

Pigs on sweet clover pasture were fed a daily ration of 10½ lbs. of rolled barley for four weeks, when during the next four weeks 1 lb. of tankage was substituted for 1 lb. of the grain. At the end of this period the tankage was increased to 1½ lbs. daily. The quantity of grain per pound of gain was reduced from 6.55 lbs. when no tankage was fed to 2.3 lbs., including the tankage when this was added to the ration. In 1917 pigs on a 2 per cent grain ration required per pound of gain 3.1 lbs. of feed when on sweet clover pasture, while pigs on alfalfa pasture required 3.5 lbs. In 1916, however, pigs on alfalfa pasture required only 2.4 lbs. of feed to produce 1 lb. of gain. The results of a feeding test indicated corn to be more economical than barley for fattening pigs when the price per pound is the same. A comparison of hand feeding and self feeding pigs resulted in more rapid gains from self feeding but at a small financial loss, while with hand feeding there was a small margin of profit.

Labor-saving in live-stock production (*U. S. Dept. Agr., Off. Sec. Circ. 122 (1918), pp. 14, figs. 7*).—This circular presents a number of brief articles, each by a different author, on the production of live stock as a means of saving labor, and the possible saving of labor by the use of work stock and in the raising of hogs, sheep, beef cattle, and poultry.

Saving farm labor by harvesting crops with live stock, J. A. Drake (*U. S. Dept. Agr., Farmers' Bul. 1008 (1918), pp. 16, figs. 22*).—This points out, largely by pictures of actual farm practices, some of the advantages of keeping live stock and of using hogs, sheep, and beef cattle to help harvest and market farm crops.

Studies in inheritance of certain characters of crosses between dairy and beef breeds of cattle, J. W. Gowen (*Jour. Agr. Research* [*U. S.*], *15 (1918), No. 1, pp. 63, pls. 6, figs. 2*).—This paper presents a preliminary analysis of the inheritance of the more prominent characters in the first generation crosses of the principal dairy breeds, Holstein-Friesian, Guernsey, Jersey, and Ayrshire, on the Aberdeen-Angus, forming part of the crossbred herd being brought together by the Maine Experiment Station for the purpose of studying some of the outstanding problems of dairy husbandry. Individual descriptions of the animals in the parental and in the crossbred herd, and the individual records of the animals composing both the parental generation and the first and second filial generations are given. A list of cited literature is appended.

A study of the inbreeding in the foundation herd is reported as showing that the inbreeding as measured by the best mathematical methods is no greater than would be expected to occur in any of the modern breeds when the animals were selected at random. It is considered safe to assume, therefore, that the results of the study are not due to the width of the crosses, as a number of the animals famous in their breed have been far more inbred than any of the parental stock used in these experiments.

Black body color was found dominant to the other color in the first generation. The appearance in the second year of an orange-coated bull is explained on the basis of a recessive dilutor in the Guernsey segregated out along with the black color, and the appearance of a dark Jersey dun-coated heifer is regarded as showing that the Jersey does not normally possess this factor.

Of the white body markings the white in the inguinal region alone appeared dominant. All other white markings were in general suppressed in the offspring when such animals were mated to solid color. The pigmented muzzle was found dominant to the one not pigmented, and in accordance with previous results it was shown that a pigmented tongue is dominant to a nonpigmented one.

A black switch appeared to cause the suppression of the other switch colors in the offspring, and this together with the fact that all the matings had at least one animal with a black switch as parent made it impossible to study the behavior of the other colors. A deep red-orange switch was segregated out from a back cross of a black animal carrying an orange coat and white switch, genetically, thus showing the segregation of the factor for orange switch from that for both white and black.

With regard to the character of polledness, it is stated that two-horned animals resulted from crosses of polled with horned parents. It is pointed out that on the basis of the other results these could not have resulted from a heterozygous polled condition. These cases, one with the horns tight and the other loose, are looked upon as exceptions to the previously accepted hypothesis of simple dominance for the polled character, and it is suggested that the testes have some action on the presence or absence of horns. This hypothesis is considered as partially proved by the fact that of the polled animals 10 were females, 2 males, and 1 doubtfully polled, and of the animals with scurs 1 female and 7 males had loose scurs and 3 males had tight scurs, while those with horns (only 2) were also males. The author suggests this difference as apparently due to a hormone secreted by the germ cells.

It was observed that the type of head and heavy, deep-fleshed forequarters were transmitted when either parent was Aberdeen-Angus, while the body and hind quarters appeared intermediate but resembled most the dairy parents. The results further indicated that high milk production is dominant to low production, but that high fat percentage is recessive to a low fat percentage in the milk.

Baby beef, L. Foster and E. J. Maynard (*New Mexico Sta. Bul. 112 (1918), pp. 15, figs. 9*).—An experiment is reported in which the value of beef and dairy types for baby beef production was compared. The four steers used in the test included a Shorthorn-Hereford cross, an Angus-Hereford cross, a high-grade Holstein, and a high-grade Jersey. The Jersey steer weighed approximately 60 lbs. and the others each 90 lbs. at birth. One of the beef steers ran with his dam until 260 and the other until 330 days old, when they were given a full feed of grain and hay or grain and pasture, while the dairy calves were taken from their dams when a few days old and were put gradually on liberal rations of skim milk and grain. The steers were all slaughtered at the age of 583 days. The results of the test are summarized in the following table:

Comparison of beef and dairy types for baby beef production.

Type of steer.	Final weight.	Daily gain.	Grain consumed.	Hay consumed.	Cost of production.	Live weight.		Dressed meat.
						Cost per pound.	Value at 13 cents.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*		*Cents.*		*Per cent.*
Shorthorn-Hereford	1,140	1.80	1,863	2,823	$83.57	7.3	$148.20	59.57
Angus-Hereford	1,120	1.76	2,696	3,166	97.78	8.7	145.60	60.54
Grade Holstein	984	1.53	3,332	4,387	81.45	8.2	127.92	63.09
Grade Jersey	860	1.37	3,332	4,387	81.45	10.1	111.80	60.31

In estimating the cost of production grain was valued at $1.50, and skim milk at 15 cts. per hundredweight, alfalfa hay at $10 per ton, and pasture at $1 per month. The cost of raising the beef calves by their dams was placed at $36 each.

In this connection attention is called to certain results from other experiments conducted at the station. In a trial with cattle of different ages the average daily gains were as follows: Calves 3.18 lbs., yearlings 2.22 lbs., two-year-olds 2.15 lbs., and three-year-olds 0.96 lb. In a second trial the corresponding gains were 2.7, 2.21, 2.25, and 1.52 lbs. In the first test the calves consumed 7.77 lbs. of feed for each pound of grain, the yearlings 11.11 lbs., the two-year-olds 11.46 lbs., and the three-year-olds 20.34 lbs., while in the second trial the corresponding figures were 6.96, 9.57, 9.63, and 12.6 lbs.

Sheep investigations, D. A. Spencer (*Oklahoma Sta. Rpt. 1917, pp. 23–26*).—A preliminary report on sheep breeding investigations in progress since 1910 is presented, in which the methods of procedure for each year are summarized, and the studies of characters with some of the results are briefly described.

It is pointed out that the numerous cross-bred individuals show that it has been possible to maintain a dominance of the desirable mutton conformation with as much as 50 per cent of the inheritance of Shropshire or Dorset blood. Satisfactory size was dominant in all crosses except in those having from 25 to 50 per cent American Merino inheritance combined with as much as 25 to 50 per cent of Shropshire inheritance. The results of crossing also indicated that the hornless character of the Shropshire is dominant in the female offspring. The absence of folded skin in the mutton breeds appears to be dominant over the presence of folds in the fine-wool breeds.

The Merinos and Rambouillets transmitted satisfactorily their density and fineness of fleece. The fine-wool breeds stood first in fall and winter lambing, followed closely by the Dorsets, but most of the Shropshires lambed in March and April. In several of the simple crosses the lambing time was about midway between the periods of lambing for the two breeds represented. The prolificacy of the different breeds and crosses was as follows: Merinos 114 per cent, Rambouillets 114, Merino-Dorsets 138, Shropshire-Dorsets 139, Shropshires 139, and Dorsets 148 per cent.

Pork production in North Dakota, W. H. PETERS and D. J. GRIKEN (*North Dakota Sta. Bul. 127 (1918), pp. 253–278, figs. 13*).—This bulletin discusses briefly some of the more important phases of swine management, points out the value of certain crops for pasturing swine, and reports the results of a number of feeding trials, giving numerical data in tabular form.

The average results of all the station's trials with feeding grain alone to hogs in the dry lot are considered as indicating that under these conditions of feeding it takes about 4½ lbs. of grain to make 1 lb. of pork. It was shown also that it is more difficult to keep pigs in good health and to produce a good firm quality of pork under these conditions than when the pigs are kept on pasture.

From the results of feeding experiments in 1916 and 1917 with pigs on alfalfa pasture it is concluded that alfalfa is the most successful pasture crop for hogs, and that a ration of 3½ lbs. of grain per 100 lbs. of live weight of pigs per day fed to young growing animals on alfalfa pasture produces better and more uniform hogs, and also gives a larger profit than either a lighter or a heavier grain ration, In a trial in which the pigs were pastured on sweet clover, it was found that this crop did not prove very palatable to them. Canada field peas at the station were not found satisfactory for providing summer pasture. At the Edgeley Substation in 1917 four acres of field peas pastured by 100 pigs during the greater part of August produced a gain of 1,750 lbs., which, at 12 cts. per pound, gave the field an acre value of about $52.50. Hogging off Canada field peas when mature proved practical and profitable. Hogging off the early maturing varieties of corn through the fall months was also found advantageous.

Feeding good alfalfa hay to brood sows in winter made possible a saving of from ½ to ⅓ of the grain that otherwise would have been required.

Fattening hogs by the use of the self-feeder, J. S. MALONE (*Oklahoma Sta. Rpt. 1917, p. 22*).—A feeding test was conducted from November 29, 1916, to February 28, 1917, to study the value of self-feeders, of Kafir corn for the fattening feed, and of tankage, peanut meal, and cottonseed meal as protein supplements. Kafir corn was fed through a self-feeder with each one of the supplements, and in one instance with the three supplements together. The net profit per lot of 7 hogs from Kafir corn and tankage was $121.10, from Kafir corn and peanut meal $96.35, from Kafir corn and cottonseed meal $96.08, and from Kafir corn combined with the three supplements, $130.34. In the calculation the values per 100 lbs. of the different feeds were as follows: Kafir corn, $1, tankage $3, peanut meal $2, and cottonseed meal $1.50.

Feeding value of skim milk, H. W. NORTON, JR. (*Michigan Sta., Quart. Bul., 1 (1918), No. 1, pp. 17, 18*).—A summary of the results of a large number of feeding trials by different experiment stations throughout the country was made to determine the value of skim milk as a supplement to corn and other cereal grains when fed to pigs. It is pointed out that 415 pigs fed cereal grains only made an average gain of 100 lbs. from 486.5 lbs. of grain and that 325 pigs fed cereal grains supplemented by skim milk made an average gain of 100 lbs. from 266.9 lbs. of grain and 785.1 lbs. of skim milk. This indicates that 100 lbs. of skim milk replaced 28 lbs. of grain. Calculated on the basis of $50 to $80 per ton for the different grains used, which included corn, wheat, rye, and barley, the value of the skim milk ranged from 0.7 to 1.2 cents per pound. Attention is also called to the fact that this summary showed much greater returns from the skim milk when 2 to 3 lbs. of milk was fed per pound of grain than when the milk was fed in larger quantities.

Velvet bean feed for pigs, H. W. Norton, Jr. (*Michigan Sta., Quart. Bul., 1 (1918), No. 1, pp. 7, 8*).—Seven lots of thrifty pigs weighing from 90 to 125 lbs. at the beginning of the test were fed velvet beans in the pods and velvet bean feed consisting of the ground beans and pods. These feeds were used singly and in combinations with middlings, corn, and tankage. The first lot was fed the velvet beans in the pods dry through a self-feeder, while the other lots received the feed as slop. On the basis of $37.50 per ton for unground velvet beans and pods, $40 per ton for velvet bean feed, $40 per ton for wheat middlings, $60 per ton for corn, and $100 per ton for tankage, the feed cost per pound of gain in the first lot amounted to 41.73 cts., and in the lot receiving velvet bean feed alone to 39.88 cts. The cheapest gain by far, the feed cost per pound of gain being 10.86 cts., was made by the check lot fed 10 parts of corn and 1 part tankage.

Second annual report for the year 1917 by the Oklahoma State Livestock Registry Board (*Oklahoma Sta. Circ. 44 (1918), pp. 117, figs. 7*).—This report contains the text of the State live stock registration law and rules and regulations adopted by the board for its enforcement, and gives lists by breeds and counties of the stallions and jacks licensed in the State in 1917. Lists of the horse and jack registry associations recognized and not recognized in Oklahoma and a list of the States having stallion laws are also given. A number of popular articles on raising and handling horses are included.

The value of skim milk and meat scraps for White Plymouth Rocks, A. G. Philips (*Indiana Sta. Bul. 218 (1918), pp. 20, figs. 4*).—The results are reported of feeding experiments with pullets and with hens. The experiments with pullets, conducted for three consecutive years beginning in December, 1914, included an annual series of three pens, each receiving a mixed grain ration made up of corn and wheat, 10 lbs. each, and oats 5 lbs. with a mash consisting of 5 lbs. each of bran and shorts. In addition to this allowance one pen received 50 lbs. of skim milk and another pen 3.5 lbs. of meat scrap, these quantities furnishing approximately the same amount of protein. During the winter the corn was increased to 15 lbs., the wheat reduced to 5 lbs., and in the fall 1 lb. of oil meal was added. Grit, oyster shell, and dry bone were always available as was also water, except in the skim milk pen. When not on range the birds were fed mangels. The bran and shorts were fed together as a dry mash. The skim milk was fed in an open pan and the meat scrap was mixed with the mash.

The average annual consumption of feed per fowl was 97.63 lbs. for the meat scrap pen, 83.24 lbs. for the check pen, and 201.82 lbs., including 115.74 lbs. of milk, for the skim milk pen, the cost being $1.69, $1.37, and $1.79, respectively. The cost of feeding a pullet on a good ration averaged about $1.75 in 1916 and nearly $2.50 in 1917. No difference in feeding capacity between good and poor layers was observed. The use of skim milk and meat scrap increased the efficiency of the grain. The average cost of producing 1 dozen eggs was 15.5 cts. in the skim milk pen, 15.2 cts. in the meat scrap pen, and 27.5 cts. in the pen receiving no food from animal sources. For the production of 1 lb. of eggs the skim milk pen required 4.9 lbs. of dry matter, the meat scrap pen 5.14 lbs., and the check pen 9.57 lbs., while the egg production per pullet averaged 140.2, 135.9, and 61.2 eggs, respectively. All the pullets in the tests tended to lay the most eggs in or about the month of April.

The profit over feed per pullet in the skim milk pen was $1.59, in the meat scrap pen $1.62, and in the check pen 5 cts. The feeding value per 100 lbs. of skim milk was $1.60 and of meat scrap $20.03. The meat scrap pen produced better fertility but not so good hatching power of eggs as was produced by the skim milk pen, while the check pen produced the best fertility. It was found that the average yearly manure production per pullet at night was about 27 lbs. The method of feeding appeared to have no influence on health or mortality.

At the close of the first and the second years of the experiments above described the check pens were retained and placed on the skim milk ration, while the skim milk pens were also retained and continued on their ration another year. This was done to determine whether or not the poor egg production in the check pens had been due to the lack of animal protein or to poor laying powers in the particular birds. The results secured in this test showed that the hens consumed nearly as much food as when they were pullets, the feed cost being only slightly less, and that pullets fed no animal protein increased their consumption of everything as hens when given skim milk in abundance. The fowls which had had sufficient animal protein all their lives normally laid less eggs as hens than as pullets, but fowls not receiving sufficient protein as pullets when given skim milk as hens laid at least as many eggs as pullets normally did.

The pullets from the check pens molted early, were in full new feathers by October, and when skim milk feeding was begun in November they laid more winter eggs as hens than any fowls did as pullets. It is pointed out that early molting indicates poor laying but may not indicate poor laying capacity. The hens not fed milk as pullets produced a greater profit over feed as hens than did the milk-fed pullets. While hens seemed to produce better fertility than pullets they showed little improvement in the hatching power of the eggs.

The nesting habits of the hen, G. M. Turpin (*Iowa Sta. Bul. 178 (1918), pp. 209–232, figs. 6*).—This bulletin reports the results of experiments and observations made to determine the important factors influencing hens in selecting the place for laying their eggs. Data for March and April, and April and May, showing the regularity in time of nesting are presented in tables, together with other records.

Of the hens under observation as to the diurnal time of laying 17.7 per cent laid before 9 a. m., 28.5 per cent from 9 to 11 a. m., 27.3 per cent from 11 a. m. to 1 p. m., 19.5 per cent from 1 to 3 p. m., and 7 per cent from 3 to 5 p. m. Nesting records showed that a large percentage of hens adhere closely to a uniform schedule of daily egg production and the time of day of laying. Hens laying regularly every other day were found to lay at about the same hour each day, and those laying two days in succession in every three-day period as a rule laid the first egg of the cycle at a certain definite hour of the forenoon and the second egg during a definite period in the afternoon. Most of the hens laying three eggs in a cycle laid the first egg comparatively early in the forenoon, the second somewhat later in the forenoon, and the third at a definite period in the afternoon. In general hens laying more than three eggs in a cycle laid a larger proportion of their eggs in the forenoon than those laying a smaller number in a cycle. It was observed that hens usually visited a number of nests and spent some time on them before selecting the nest in which they finally laid.

The average time spent on the nest in laying was found to be 1 hour and 35 minutes for each of two tests with White Leghorns, 1 hour and 45 minutes and 1 hour and 49 minutes, respectively, for two tests with Rhode Island Reds, and 2 hours and 16 minutes in one test with White Plymouth Rocks. The time the hens spent on nests when not laying brought the average per egg produced up to about two hours. The proportion of the total time spent on the nest before and after the egg was actually delivered varied greatly, but no correlation was apparent between the rate of egg production and the average length of time spent on the nest in laying. Hens frequently visited the nests and spent considerable time there on days when they did not lay.

Nests appeared much more attractive to the hens when they contained at least one egg, and to become less attractive as the number of eggs was increased to more than three or four. In three tests to determine the value of nest eggs, the numbers of eggs laid in the first test in nests furnished, respectively, with no nest egg, china egg, and hen's egg were in the ratio 100 : 198 : 269; in the second test with no nest egg, glass egg, hen's egg, and wooden egg in the ratio was 100 : 160 : 184 : 233; and in the third test with no nest egg, hen's egg, wooden egg, and plaster of Paris egg, 100 : 194 : 208 : 221.

The relative number of eggs laid in concealed and exposed nests was, respectively, 113 and 100. In one test 91.7 per cent and in another 87.6 per cent of all eggs produced were laid in concealed nests with nest eggs, compared with exposed nests without nest eggs. Habit did not appear as a strong factor in determining the particular nest in which the hen chose to lay from day to day. It is stated that at least one nest for each four or five hens is required to meet the needs of the average farm flock.

Seasonable facts of special interest to poultrymen, H. R. Lewis (*New Jersey Stas., Hints to Poultrymen, 7 (1918), No. 1, pp. 4*).—Present conditions of the poultry industry, the feed, fuel, and poultry supply situation, and recent rulings of interest to the egg trade are briefly noted, and the standard shipping boxes adapted by the International Baby Chick Association are described.

DAIRY FARMING—DAIRYING.

Profitable dairy-farm organization in Kentucky, W. D. Nicholls and J. B. Hutson (*Kentucky Sta. Bul. 217 (1918), pp. 95–146, figs. 9*).—Studies by the farm management survey method were made of 162 dairy farms situated in the district furnishing the bulk of the milk supply of Louisville, and the average results as well as the data pertaining to a number of individual farms on which noteworthy results were secured are reported in detail and discussed. On the farms studied 46 per cent of the total receipts were secured from dairy products, 8.2 per cent from dairy cattle, 10 per cent from hogs, 4.5 per cent from beef cattle, 1.4 per cent from sheep, 8.4 per cent from tobacco, 4.3 per cent from wheat, 4 per cent from feed crops, 2 per cent from poultry, and 11.2 per cent from other sources.

As based on the average results, the relation to labor income of the receipts per cow, crop yields, the receipts per cow and crop yields combined, size of farm, crop acreage, size of herd, capital, rate of stocking the farm, pasture utilization, amount of live stock kept on crop yield, proportion of farm animals in cows and receipts per cow, receipts from hogs, receipts from crops, and receipts per $100 worth of feed is shown in tables. The average for the most profitable 10 farms showed a production of milk to the value of $208 per $100 worth of feed as compared with $163, the average for all the farms. These 10 farms had four times the labor income, twice the capital and crop area, 40 per cent greater total area, were twice as heavily stocked, had 21 per cent better crop yields, 26 per cent greater receipts per cow, and carried 70 per cent more cows per unit of pasture than did the average farm.

A large production per cow was shown to be a fundamental factor in profitable dairy farming. The profitable proportion of dairy cows to farm animals was determined mainly by the quality of the cows. With poor cows profits decreased as their proportionate number increased, while with high-producing cows the profits increased until their number reached 60 to 65 per cent of the farm stock, beyond which the percentage of profits decreased. The profits also increased with the crop yields, and the farms having both crop yields and herd production better than the average made profits six times greater than those made on the farms with crop yields and herd production under the average. In general the farms with the larger acreage and herds and employing the larger amounts of capital gave the better returns. The most profitable farms had about three-fourths of their total capital in real estate and one-fourth in operating capital.

The well-stocked farms produced much the larger crop yields. Pastures furnished by far the cheapest feed for milk production. The farms with pastures carrying one cow to 1.3 acres made labor incomes 20 times as great as the farms with pastures carrying only one cow to 4.4 acres. A few hogs on dairy farms proved profitable, but sheep were kept to advantage only on the larger farms where the sheep and cattle could be kept separate. Cash crops to a certain extent were found profitable, but too large a proportion of the receipts from this source caused profits to decline.

Cooperative bull associations, J. C. WINKJER (*U. S. Dept. Agr., Farmers' Bul. 993 (1918), pp. 35, figs. 7*).—The history of the movement is briefly noted and some of its advantages, including the keeping of better and fewer bulls, the low cost of cooperation, the quick returns of the investment, the possibility of line breeding, the elimination of the scrub, and the encouragement of community breeding, are discussed. The influence of heredity and the sire as a factor in herd improvement are set forth, and the educational value of bull associations is pointed out. Advice is presented regarding the eradication of disease and suggestions, including the form of constitution and by-laws, are given on how to organize an association of this kind. The selection of bulls is also briefly considered.

Diphtheria, G. W. McCOY, J. BOLTEN, and H. S. BERNSTEIN (*Pub. Health Rpts. [U. S.], 32 (1917), No. 43, pp. 1787–1804, figs. 7*).—This is the history of an epidemic of diphtheria, probably of milk origin, occurring at Newport, R. I., and vicinity in the summer of 1917. The source of infection was evidently contaminated milk used in making ice cream. It is pointed out that the epidemic could have been averted by proper pasteurization of the milk supply.

Pasteurization, O. C. BALLHAUSEN (*Agr. Gaz. N. S. Wales, 29 (1918), No. 8, pp. 585–591*).—The methods in use in New South Wales for pasteurizing cream for butter manufacture and for the preparation and propagation of lactic acid starters are described, and a critical discussion is given of the value of both processes in the manufacture of butter of the first quality.

The manufacture of Neufchâtel and cream cheese in the factory, K. J. MATHESON and F. R. CAMMACK (*U. S. Dept. Agr. Bul. 669 (1918), pp. 28, figs. 4*).—This bulletin discusses important factors in successful production, the process of making these types of cheese, and the methods of packing best adapted to the product, and reports the results of experimental work on the manufacturing process and the keeping qualities of the cheese. Statements regarding the yield of cheese per 100 lbs. of milk are also presented.

The results of tests with different quantities of rennet indicated that from 0.5 to 2 cc. per 100 lbs. is most satisfactory for Neufchâtel and from 1 to 2 cc. for cream cheese. In experiments with pepsin as a substitute for rennet, pepsin was used in making cream cheese in quantities of ½ to $\frac{1}{16}$ gm. per 100 lbs. of milk, and fat determinations were made of the whey. The use of about $\frac{1}{16}$ gm. gave the best results. The fat losses in the whey were practically the same for both the pepsin-made and rennet-made cheese.

In studies of the effect of temperature on the making process, temperatures ranging from 15 to 34½° C. (59 to 94.1° F.) were used. A degree or two of variation between the temperature of setting and that of pouring was observed, and a temperature below 25° or much above 30° did not prove desirable. It was noticed that the losses of fat increased with the higher percentages of fat and that the losses with the low setting temperatures were somewhat high.

To determine the effect of the starter on the making process, samples of Neufchâtel and cream cheese were made with 0, 1, 10, 50, 250, and 1,250 cc. of starter per 30-lb. unit. The loss of fat showed the desirability of using a starter instead of depending upon the normal fermentation. The use of a heavy starter and of milk ripened to a high degree before setting had a tendency to check drainage. The best results were secured with setting the milk at 28.5° and using rennet at the rate of 1 cc. per 100 lbs. The use of different quantities of starter up to 250 cc. per unit of 30 lbs. showed very little difference in the flavor of the cheese.

Several trials were made to study the effects of pasteurization on fat loss and drainage. No marked difference in the fat losses was observed when pasteurized and nonpasteurized milk were used in making the cheese. With Neufchâtel cheese the curd from pasteurized milk showed a tendency to retain more of the whey than the curd from unpasteurized milk. When the pasteurized and the raw product were handled under the same conditions the pasteurized cream cheese contained an average of 49.46 per cent of moisture as compared with 47 per cent for the cheese from the unpasteurized milk. A study of the effect of homogenization on fat losses in cream cheese indicated a slight advantage due to the process but hardly sufficient to make it profitable.

In a study of the influence of yield on quality, samples of cream cheese were pressed to yield from 15 to 24 lbs. per 100 lbs. of milk and judged at intervals of a few days during storing periods of 15, 18, and 25 days. The samples yielding highest were found slightly more acid than those of the lower yields which ranked lower in texture. The cheese giving a yield of 18 lbs. per 100 lbs. of milk stood first in preference and that with a yield of 21 lbs. stood second. Samples containing 0.75 and 1.25 per cent of salt seemed to keep equally well, but the proportion of 0.75 to 1 per cent is recommended, as a higher percentage tends to hide the finer flavors.

The influence of the holding system of pasteurization was studied in cream cheese from milk unpasteurized and from milk initially heated by running it through a pasteurizer at about 62° for 35 minutes or longer. The samples were stored at 20, 15, and 10 and 5°. The results seemed to indicate that for about the first 10 days the preference was in favor of the pasteurized product for all temperatures. From 10 to 15 days the preference was for the pasteurized cheese held at 15 and 5°, and for the unpasteurized cheese at 10 and 20°. In nearly every case the texture of the pasteurized product was judged superior to the unpasteurized.

Other results secured showed that homogenization of milk for making these types of cheese can not be recommended, and that there was very little difference in the keeping qualities of cream cheese from milk pasteurized either by the flash or the holding system. Practically no difference was observed in the keeping qualities of cheese made with powdered or scale pepsin. The addition of pimento peppers at the rate of 1 part to 10 or 20 parts of cream cheese greatly prolonged the keeping quality.

Experiments in dairy products manufacture, A. C. BAER (*Oklahoma Sta. Rpt. 1917, pp. 27, 28*).—The results of experiments showed that a satisfactory product can be made from sweet butter and milk, skim milk, or skim milk powder and water if these ingredients are of good quality and are properly emulsified. Pasteurization of the mixed ingredients gave uniformly a better ice cream with a higher overrun and a lower bacterial count than when the cream and milk were pasteurized separately. The overrun from the emulsified product was on the average 5 per cent higher than that from pasteurized natural cream not emulsified. It was found further that emulsification of cream and ice cream lowered the bacterial count, and that the addition to milk and cream, emulsified or not, of 2 per cent of solids, either in the form of skim milk powder or condensed milk, improves the quality of the product. Directions are given for testing ice cream for butter fat, and the very successful use in this connection of equal parts of sulphuric acid and glacial acetic acid is reported.

In connection with tests in the manufacture of butter, a product made from cream of clean flavor and under 0.4 per cent acidity brought from 1 to 3 cts. per pound more on the wholesale market than was secured for butter churned from cream with slightly undesirable flavors or odors and above 0.4 per cent in acidity. Pasteurization of cream by the holding method at 145° for 30 minutes produced a marked improvement in the butter from both kinds of cream.

Factors which influence the yield and consistency of ice cream, M. MORTENSEN (*Iowa Sta. Bul. 180 (1918), pp. 259–283, figs. 2*).—Results are given of tests of the influence that pasteurization, aging, and homogenization of cream, use of binders, temperature of circulating brine, and amount of mix in the freezer have upon the yield and texture of ice cream. A comparison is also made of the results obtained in figuring the daily ice-cream yield by weight and by volume, as well as the influence of holding ice cream on uniformity in fat content. The bulletin closes with a discussion of some of the cost items in ice-cream manufacture.

Tests of the effects of pasteurization and aging of cream on its viscosity show in general that the viscosity of the cream decreases with pasteurization and increases as the fat content of the cream increases with aging. The influence of aging the cream on the body and texture of ice cream was studied with raw, pasteurized, and homogenized cream. With raw cream the texture of ice cream made from fresh cream was slightly inferior to that made from aged cream. The yield from 24-hour and 48-hour old cream was about 6.5 per cent higher than that from fresh raw cream. With pasteurized cream the average yield was 4.72 per cent higher from cream 24 hours old than from fresh cream, and there was a further increase of 3.58 per cent when the cream was aged to 48 hours. The body of the ice cream made from fresh cream was weak and coarse, that from 24-hour-old cream was fairly satisfactory, and that from the 48-hour-old cream was a trifle light. In the tests with homogenized cream the yield of ice cream was 3.99 per cent higher from 24-hour-old than from fresh cream, and a further gain of 2.09 per cent was obtained when 48-hour-old cream was used. The body of ice cream made from both fresh and aged homogenized cream was very good.

Gelatin, milk powder, starch, and two commercial powders were tested as fillers or binders for ice cream. The amount of filler used apparently did not affect the yield of ice cream.

In tests of the effect of temperature of circulating brine on the yield of ice cream it was found that a temperature of about 6° F. for the circulating brine is the most desirable when using a 20 per cent raw cream. For pasteurized cream a temperature of from 8 to 10° gave the best results, while for emulsified cream about 10° and for homogenized cream 14° proved the most satisfactory. The amount of mix in the freezer influenced the yield obtained. The most satisfactory results were obtained from a horizontal freezer when it was about half full of mix.

It is stated that the daily overrun should be figured by volume, but as a check the overrun should occasionally be determined by weight. The holding of ice cream was found not to influence the distribution of fat in the cream. With ice at $3 and salt at $7 per ton, the cost of salt and ice used for freezing in these tests was 0.58 ct. per gallon of ice cream frozen to 27° and 0.75 ct. for that frozen to 26°. For packing the cost was 1.44 cts. per gallon for 5-gal. containers. It is suggested that in factories where ice and salt are used for freezing purposes the waste brine should be collected in a cooling tank and used to cool the milk and cream handled.

VETERINARY MEDICINE.

Tolerance and immunity, J. L. Marchand (*Jour. Lab. and Clin. Med.*, *3* (*1919*), *No. 10*, *pp. 571–601*, *figs. 2*; *abs. in Vet. Rev.*, *2* (*1918*), *No. 4*, *pp. 481*, *482*).—This is a general discussion of the subject, with clinical cases cited.

A study of the mechanism of the agglutination and absorption of agglutinin reaction, together with an examination of the efficacy of these tests for identifying specimens of the meningococcus isolated from 354 cases of cerebrospinal fever, W. J. Tulloch (*Jour. Hyg.* [*Cambridge*], *17* (*1918*), *No. 2–3*, *pp. 316–349*).—This is a theoretical discussion of the problem of agglutination from the standpoint of Bordet that in the process three separate systems react with one another, the antigen, the antibody, and the menstruum in which these are suspended, and that the reaction is divisible into two phases, the union of antigen with antibody and the flocculation of the antibody-antigen complex.

The points discussed under the first phase are (1) the influence of the reaction of the menstruum in which the reagents are suspended: If the reaction be too acid or too alkaline, union of antigen with antibody is inhibited, and, no complex being formed, the system is not susceptible to the flocculating action of electrolytes. (2) Influence of the electrolytes of the menstruum: Evidence that formation of the "antibody-antigen couple" is conditioned by the presence of dissolved salts in the menstruum, and that results obtained depend largely upon the nature of the electrolytes in the fluids employed for suspending the reagents. (3) Influence of the presumably inactive constituents of the antigen and antibody colloids upon the process of sensitization: It is considered that presumably inactive substances may be present in such quantity or in such a physical state that they protect the united antibody-antigen complex from flocculation. (4) Quantitative relationship between antigen and antibody in the process of agglutination: The relationship is considered to obey the same laws as those governing the phenomenon of adsorption or surface condensation. (5) Analogies between the union of antibody with antigen and certain experiments of colloidal chemistry: The complexity of the reaction is pointed out and the consequent necessity of observing special care in carrying out agglutination tests. (6) Influence of the physical state of the reacting systems upon the union of antibody with antigen: If either of the reaction colloids be denatured by heat prior to being mixed, agglutination may not take place. It is considered that it is the process of flocculation and not that of the union of antigen with antibody which is thus inhibited.

In the discussion of the second phase of the agglutination test, the demonstration of the formation of a complex by its flocculation, the following points are considered: (1) Influence of the reaction of the suspending fluid in which the interacting bodies are dispersed, upon the process of flocculation, and influence of the valency of the electrolytes upon the process in presence of acid and alkali. Experiments are reported which show that hydroxid ion interferes with the process of flocculation, a relatively small concentration having a marked inhibitory effect. If replaceable hydrogen ion be present, this inhibitory effect is negatived. (2) The relation which exists between the degree of sensitization and the precipitating value of the electrolytes present in the menstruum: An organism can form, along with its own antibody, a variety of complexes differing inter se in their susceptibility to flocculation. These complexes are probably not different in kind but only in degree. (3) Effect of other physical factors upon the second phase of agglutination: The surface tension and viscosity of the menstruum have been found to have little effect on flocculation. The temperature affects the flocculation by producing a continuous movement of the interacting bodies in the suspension and by encouraging or inhibiting, owing to its altering the physical state of certain complexes, their precipitation by electrolytes.

The theoretical discussion is followed by practical suggestions for carrying out the agglutination test, and by a summary of results obtained in applying the test to the investigation of the organisms which produce primary meningitis in man.

Experimental paratyphoid B fever. The mechanism of immunity in paratyphoid B by ingestion. Vaccination by ingestion, A. BESREDKA (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 5, pp. 212–214*).—The author has found it possible to produce human paratyphoid B in laboratory animals (rabbits) by ingestion of the organism after sensitization of the alimentary tract with ox bile. The ingestion of heated cultures after sensitization with bile renders the animal refractory to paratyphoid infection. This acquired immunity, as well as that possessed naturally by the animal, depends upon local intestinal immunity.

A filterable toxic product of the hemolytic streptococcus, A. H. CLARK and L. D. FELTON (*Jour. Amer. Med. Assoc., 71 (1918), No. 13, pp. 1048, 1049*).—"It has been found that hemolytic streptococci grown in rabbit's blood diluted with Lock's solution yield a filtrate that is toxic for rabbits occasionally in doses as low as 0.5 cc. per kilogram. The formation of this toxic material is dependent on the presence of hemoglobin. It is destroyed by heating to 50° C. for 30 minutes, it is dialyzable, it requires a certain incubation period in the animal before exerting its toxic effects, it is nonhemolytic in vivo or in vitro, and it slowly loses its toxicity on standing at ice-box temperature. An immunity can be rapidly established against it, and the blood of immune rabbits when injected with the toxin has the power of neutralizing its toxic effects. Rabbits immune against the toxic substance are resistant to living streptococci."

Antigangrenous serum therapy by a multivalent serum, H. VINCENT and G. STODEL (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 6, pp. 245–247*).—The theory of the action of the multiple serum for gas gangrene previously noted (E. S. R., 39, p. 885) is discussed, and the method employed by the authors in the preparation of the serum is described.

The method consists essentially of cultivating each pathogenic organism on agar and then making a mixed emulsion in physiological salt solution. Flasks containing the microbial suspensions are kept in the incubator at 38° C. for from two to four days or more. The culture is then injected into the veins of horses in increasing doses from an initial dose of 10 cc. At the end of three months these horses can furnish a serum which has been shown to be very successful in serious cases of gas gangrene.

The results of antigangrenous serum therapy, H. VINCENT and G. STODEL (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 8, pp. 305–308*).—Case reports are given of the successful use of serum therapy, noted above, in severe cases of gas gangrene.

Wounds of animals and their treatment, R. H. SMYTHE (*London: Baillière, Tindall & Cox, 1918, pp. XI+194, pls. 16, figs. 14*).—The several chapters of this work deal with the pathology of wounds, wound infection, general treatment of wounds, surgical treatment of wounds, some complications and sequelæ of wounds, wounds of the head and neck, wounds of the trunk, open joint and wounds of bursæ and tendon sheaths, wounds of the limbs, wounds of the feet among horses and cattle, fistulæ and sinuses, castration wounds, uterine and vaginal wounds, wounds involving bone tissue, war wounds, remarks on the use of vaccines in wound treatment, and dietetics and hygiene.

Report of the committee on standard methods of examining disinfectants, E. B. PHELPS ET AL. (*Amer. Jour. Pub. Health, 8 (1918), No. 7, pp. 506–521, fig. 1; Jour. Amer. Leather Chem. Assoc., 13 (1918), No. 10, pp. 477–502, fig. 1*).—This report was presented before the laboratory section of the The American Public Health Association, October 20, 1917, accepted, and ordered published, pending final adoption.

Askaron, a toxic product of helminths, particularly of ascarids, and its biological action, T. SHIMAMURA and H. FUJII (*Jour. Col. Agr. Imp. Univ. Tokyo, 3 (1917), No. 4, pp. 189–258, figs. 4*).—A detailed report of studies of a highly toxic, albuminous peptone which the authors have isolated from fluid from the body cavity and the pulverized ascarids (*Ascaris lumbricoides* from man and swine, and *A. megalocephala*), to which is given the name askaron. It also appears to occur in other helminths, including *Filaria immitis*, Gastrophilus larvæ, *Sclerostomum vulgare, Oxyuris curvula*, and *Trichocephalus depressiusculus*. Of the experimental animals, horses are the most resistant to the askaron, followed by guinea pigs, dogs, and rabbits, while rats and mice are refractory. The symptoms and anatomical changes and resistance to askaron poisoning are similar to those of anaphylactic shock.

Preparation, control, and action of anthrax serum, H. E. REESER (*Meded. Rijksseruminricht., 1 (1917), No. 5–6, pp. 206–307, fig. 1*).—This is an historical review of the literature on the subject. A bibliography of 137 titles is appended.

Blackleg, with new methods for its prevention and treatment, G. H. HART (*California Sta. Circ. 205 (1918), pp. 8, fig. 1*).—This circular gives general information on the subject of blackleg, including cause and method of infection, symptoms, post-mortem appearance, differential diagnosis, treatment, and prevention.

Palpebral malleinization, DOUVILLE, trans. by M. DORSET (*Jour. Amer. Vet. Med. Assoc., 53 (1918), No. 5, pp. 587–596*).—The method of intradermal malleinization described is a combination of the procedure of Lanfranchi for glanders (E. S. R., 32, p. 374) and of Moussu for tuberculosis (E. S. R., 32, p. 477). The technique to be followed is outlined, and the phenomena following the injection, including doubtful reactions, are described.

The author concludes that at the present time intradermal malleinization is the most simple, the most expeditious, the surest, and the most practical method to use in checking glanders. Experimental evidence has shown that tolerance to mallein does not exist, that consequently a palpebral mallein test may be followed without delay by a subcutaneous injection, and that after a subcutaneous test, even though positive, the subject remains sensitive to the intradermal test.

Epizootic lymphangitis (*Vet. Rev., 2 (1918), No. 3, pp. 300–303*).—A review of nine recent papers on the subject, two of which have been previously noted (E. S. R., 38, p. 689; 39, p. 185).

Ulcerative lymphangitis (*Vet. Rev., 2 (1918), No. 3, pp. 299, 300*).—A review of recent literature on the subject.

The rat and poliomyelitis.—An experimental study, H. L. Amoss and P. Haselbauer (*Jour. Expt. Med., 28 (1918), No. 4, pp. 429–434*).—The authors' conclusions, based upon the investigations here reported, are as follows:

"The central nervous organs and other viscera of 6 rats, collected in a district in Greater New York in which many cases of epidemic poliomyelitis occurred, have been proved incapable of inciting, on inoculation, experimental poliomyelitis in *Macacus rhesus* monkeys. The virus of poliomyelitis injected into the brain of white rats does not survive there as long as four days in a form or in amounts sufficient to cause infection when inoculated intracerebrally into monkeys.

"The failure of the virus injected into the brain of rats to incite infection in monkeys is not due to the quantity introduced, since at the expiration of 1.5 hours after the injection the excised inoculation site, when injected into the monkey, caused typical experimental poliomyelitis. It does not appear probable, therefore, that the rat acts in nature as the reservoir of the virus of poliomyelitis."

Spirochæta hebdomadis, the causative agent of seven-day fever (nanukayami), I, Y. Ido, H. Ito, and H. Wani (*Jour. Expt. Med., 28 (1918), No. 4, pp. 435–448, pl. 1, figs. 4*).—"A new species of spirochete which we have called *S. hebdomadis* has been described as the specific etiological agent of seven-day fever, a disease prevailing in the autumn in Fukuoka and other parts of Japan. This spirochete is distinguishable from *S. icterohæmorrghagiæ*, to which it presents certain similarities. Young guinea pigs are susceptible to inoculation with the blood of patients and to pure cultures of the spirochete, and those developing infection exhibit definite symptoms suggestive of those of seven-day fever in man.

"The blood serum of convalescents from seven-day fever contains specific immune bodies acting spirochetolytically and spirocheticidally against the specific spirochetes, but not against *S. icterohæmorrhagiæ*.

"The field mouse (*Microtus montebelli*) is the normal host of the spirochetes, which have been detected in the kidneys and urine of 3.3 per cent of the animals examined. The endemic area of prevalence of seven-day fever corresponds with the region in which field mice abound."

An improved method for recovering trypanosomes from the blood of rats for antigen purposes in connection with complement fixation, F. H. Reynolds and H. W. Schoening (*Jour. Agr. Research [U. S.], 14 (1918), No. 13, pp. 573–576*).—The authors, of the Bureau of Animal Industry, U. S. Department of Agriculture, point out the undesirable features of the Watson method, previously noted (E. S. R., 34, p. 186), for recovering trypanosomes from the blood of infected rats, and describe a new method which is said to have given good results. The technique of the method is as follows:

Blood from infected rats collected in a 1 per cent sodium-citrate solution in physiological salt solution to prevent coagulation is filtered through cheesecloth to remove clots, fibrin, etc., poured into tubes, and centrifuged for about 20 minutes at 2,100 revolutions per minute. This precipitates all the corpuscles and most of the trypanosomes, leaving an upper stratum of blood serum and citrate solution containing some of the organisms. This fluid is drawn off and again centrifuged to recover the remaining organisms. To the precipitate of corpuscles and trypanosomes is added sufficient distilled water to produce complete hemolysis of the rat erythrocytes. After about 20 minutes the mixture is centrifuged for about half an hour. The supernatant liquid is then discarded, physiological salt solution is added to the mass of trypanosomes, and the material vigorously shaken to disintegrate and distribute the trypanosomes evenly through the solution. After centrifuging again, the salt solution is poured off, and an amount of preserving fluid (physiological salt solution and glycerin) equal to about twice the amount of trypanosomes is added. The mixture is then agitated until a uniform suspension is acquired, when it is stored at a low temperature until used.

Experimental evidence is given indicating that the use of distilled water in laking the red blood cells has no detrimental effect on the antigenic value of the trypanosomes. The following advantages of the new method are pointed out:

"The antigen is freed of all erythrocytes, all the trypanosomes present in the blood are recovered, the keeping quality is improved, the time consumed is about 1½ hours, with practically no effort, as compared with 4 or 5 hours, and the antigenic power is increased and the anticomplementary action diminished."

Bovine tuberculosis, A. C. Fontes (*Tuberculose Bovina. Rio de Janeiro: Author, 1917, pp. 32*).—This is a report presented to the executive committee of the Live Stock Congress in Rio de Janeiro, May, 1917. A review of literature on the subject of bovine tuberculosis is given, together with statistical data collected at slaughterhouses in regard to the relative localization of the lesions.

Prophylaxis of bovine tuberculosis in Argentina, A. F. Beyro (*An. Soc. Rural Argentina, 52 (1918), Nos. 1, pp. 12–21; 2, pp. 80–87; 3, pp. 175–188; Rev. Soc. Med. Vet. [Buenos Aires], 3 (1918), No. 5, pp. 139–181; abs. in Vet. Rev., 2 (1918), No. 4, p. 487*).—The author discusses the extent of bovine tuberculosis in Argentina, the economic loss caused by the disease, and plans to serve as a basis for an efficient prophylaxis of the disease. From available figures for the year 1915 and later, it is estimated that about 3.2 per cent of the cattle in Argentina are tubercular and that the percentage is increasing. The prophylactic measures suggested are similar to those in use in the United States.

Tuberculosis in the camel, F. E. Mason (*Jour. Compar. Path. and Ther., 31 (1918), No. 2, pp. 100–102; abs. in Vet. Rev., 2 (1918), No. 4, p. 489*).—Continuing the work previously noted (E. S. R., 37, p. 690), the author has reported a case of congenital tuberculosis in the camel. Tubercular lesions were found in an aborted fetus from which typical tubercle bacilli were isolated. The tuberculin test gave a positive reaction with the cow camel which had aborted. A case of tuberculosis in an Algerian camel is also noted.

[Live stock diseases in Louisiana] (*Bien. Rpt. Live Stock Sanit. Bd. La., 5 (1917–18), pp. 16–60, figs. 13*).—Descriptions are given of several of the more important infectious live-stock diseases in Louisiana, including anthrax, blackleg, staggers, glanders, hog cholera, hemorrhagic septicemia, and rabies. Information in regard to anthrax is given in the form of a popular questionnaire by Dalrymple and Flower.

Common diseases of the digestive organs of horses and cattle, J. H. Reed (*Ontario Dept. Agr. Bul. 264 (1918), pp. 39*).—A practical discussion for the stock owner.

Contagious abortion of cattle (*Kansas Sta. Circ. 69 (1918), pp. 16*).—This circular summarizes available information on the subject of contagious abortion of cattle. The nature, cause, symptoms, complications, and methods of spread of the disease are outlined. The control of the disease is discussed fully under the three principles of preventing the dissemination of infection, developing herd immunity, and treating affected animals.

Studies in bovine mastitis.—II–IV, F. S. Jones (*Jour. Expt. Med.*, 28 (1918), *Nos. 3, pp. 253–267; 6, pp. 721–733, 735–748*).—In continuation of studies previously noted (E. S. R., 39, p. 890), the author first takes up the relation of hemolytic streptococci to udder infections. He finds that "hemolytic streptococci produce more or less severe inflammations of the udders of cows. Frequently infected quarters are swollen, firm, hot, and tender. In a number of instances it has not been possible to detect gross changes in the mammary gland. The streptoccoci isolated from the invaded quarters have produced clear zones of hemolysis immediately surrounding the colonies when cultivated in horse blood agar plate cultures. The hemolytic zone has varied from a clear, narrow band up to zones 1.7 to 2 mm. wide.

"When the streptococci are classified according to their action upon carbohydrates, they fall into two broad groups; the larger consists of 19 strains fermenting dextrose, lactose, saccharose, maltose, and salicin, and a smaller number, comprising 10 species, produces acid in dextrose, lactose, saccharose, and maltose and fails to ferment salicin. One of the nonsalicin fermenting strains did not attack saccharose. In no instance was acid production noted in raffinose, inulin, or mannite.

"All streptococci except three were agglutinated by an antiserum obtained from a rabbit immunized with a single strain.

"Freshly isolated cultures when injected intravenously into rabbits possess but slight pathogenicity. Localizations in the joints occurred in two instances. The others either failed to affect the general condition of the animals or produced only a slight febrile reaction."

Discussing infection of the udder with micrococci and other microorganisms, the author finds that "aside from the streptococci, micrococci have been the next most frequent group of organisms isolated from inflamed udders. They produce various types of disease. Some give rise to only a mild catarrh of the larger milk ducts and cistern, while others produce more or less severe parenchymatous inflammation. On the whole, the prognosis is more favorable with micrococci infection than with that associated with streptococci. Cases of considerable severity have, however, been attributed to staphylococci.

"Micrococci similar in many respects to those associated with mastitis have been found to occur in the normal udder. This has led Savage to question their true etiological significance. In many instances micrococci may gain access to the udder and produce slight disturbances that are entirely overlooked. Even more severe changes may follow infection. After recovery the organisms still remain in the milk. This was observed in the case of cow 60 infected with staphylococci.

"One frequently observes the elimination of streptococci from the udder even after apparent recovery from an attack of streptococci mastitis. Doubtless streptococci and micrococci observed in these udders would be classed as belonging to the normal flora. Even though micrococci do occur in supposedly normal udders, Evans has shown that many are pathogenic for rabbits. The introduction of these organisms into the udders of nonresistant individuals might well give rise to more or less intense inflammation. The multiplication would doubtless be rapid until resistance had been established.

"In addition to the micrococci two other groups of rod-shaped organisms have been found associated with udder inflammation. In two instances *Bacillus coli* has been isolated from cases of mastitis and in another *B. lactis ærogenes*. In four, tiny motile Gram-staining microorganisms have been obtained in pure culture. Two of these strains . . . have been identified as *B. pyogenes*."

Taking up the sources of infection in streptococcic mastitis, the author finds that "the principal sources of streptococci infection, aside from clinical cases, are apparently normal cows which carry the virus in the udder. These carriers may be grouped as follows: (a) Those that have been infected recently and have not yet developed symptoms; (b) those that have suffered from inflammation of the udder and after recovery still harbor streptococci; and (c) those that have had no clinical history of mastitis. There is some evidence to lead one to regard the latter group as naturally immune.

"A milker may readily carry streptococci on his hands from an infected to an uninfected cow.

"The vaginæ of 34 of the 64 cows examined contained nonhemolytic streptococci. Of the 34 strains isolated 32 differed in their cultural characters and agglutination affinities from those associated with mastitis. The other two strains may be regarded as of etiological significance. In no instance have hemolytic streptococci been isolated from the vagina."

Occurrence of coccidioidal granuloma (oidiomycosis) in cattle, L. T. GILTNER (*Jour. Agr. Research* [*U. S.*], *14* (*1918*), *No. 12*, *pp. 533–542*, *pls. 2*).—In this report of work by the Bureau of Animal Industry of the U. S. Department of Agriculture, reference is first made to the occurence of coccidioidal granuloma, due to *Coccidioides immitis*, in man. This disease does not appear to be widely distributed, nearly all cases reported having been in patients living in the San Joaquin Valley, Cal.

In the present paper the author records its occurrence in the bovine, it having been encountered in the bronchial and mediastinal lymph glands at an abattoir at San Diego, Cal. The parasite observed in pus from the glands appears to be identical with that found in the lesions of human cases. The lesions observed in cattle at the time of slaughter in the abattoir appear to be confined largely to the bronchial and mediastinal lymph glands. "These tissues may be the seat of large areas of suppuration or several smaller purulent foci, all of which are usually surrounded by considerable granulation tissue and a fibrous capsule. Upon incising an affected gland there may be squeezed out a thick yellowish and tenacious pus which at once suggests actinomycosis. In fact, the similarity of the lesions produced in the lymph glands by *C. immitis* and Actinomyces is so striking that the one affection may be easily mistaken for the other upon gross inspection alone. However, microscopic examination of fresh smears of pus at once establishes a diagnosis; in the one case spheres in various stages of development are present in quite large number, and in the other the colonies of the ray fungus are detected."

Studies of its cultural characteristics and the results of inoculation of experimental animals are reported. It was found that the infection may be transmitted experimentally to guinea pigs, rabbits, dogs, cattle, sheep, and swine. Cattle affected with this disease showed no response to subcutaneous allergic tests. Neither specific complement-fixing bodies nor agglutinins were detectable in the serums of affected animals.

A list of 16 titles to the literature cited is appended.

Stomach worms of sheep, W. L. CHANDLER (*Michigan Sta., Quart. Bul., 1* (*1918*), *No. 1*, *pp. 19*, *20*).—Preliminary investigations in Michigan indicate a high percentage of stomach worm infestation in sheep. All of the animals examined were found to be quite heavily infested with both the twisted wireworm (*Haemonchus contortus*) and one of the smaller stomach worms (*Ostertagia circumcincta*), while a number of other species were present in the stomach.

Diseases of swine, G. MOUSSU (*Maladies du Porc. Paris: Asselin & Houzeau, 1917*, *pp. 249*, *pls. 9*, *figs. 76*; *rev. in Jour. Amer. Vet. Med. Assoc.*, *53* (*1918*), *No. 3*, *pp. 310*, *311*; *Vet. Rev.*, *2* (*1918*), *No. 2*, *p. 212*).—A small handbook.

The prevention and treatment of hog cholera, J. H. McNeil and T. W. Munce (*N. J. Dept. Agr. Bul. 13 (1918), pp. 573–594*).—This is a general discussion of the subject.

Shote pox, Velu (*Rev. Gén. Méd. Vét., 27 (1918), No. 316–317, pp. 136–145, figs. 4; abs. in Vet. Rev., 2 (1918), No. 4, pp. 450, 451*).—The etiology, symptomatology, pathologic anatomy, diagnosis, prognosis, and prophylaxis of shote pox are discussed. Inoculation by scarification of variolitic pulp has been used for two years by the author with excellent results.

Uremia of acarian origin in horses, Leneveu (*Rec. Méd. Vét., 93 (1917), No. 17, pp. 477–481; trans. in Vet. Jour., 74 (1918), No. 512, pp. 69–72; Vet. Rec., 30 (1917), No. 1532, pp. 200, 201*).—A report upon a condition observed in horses affected with generalized mange. In studies of 20 animals affected with generalized mange, albuminuria was found in eight.

A Physaloptera from the dog, with a note on the nematode parasites of the dog in North America, M. C. Hall and M. Wigdor (*Jour. Amer. Vet. Med. Assoc., 53 (1918), No. 6, pp. 733–744, figs. 6*).—A new species taken from the dog at Detroit, Mich., is described as *Physaloptera rara*.

RURAL ENGINEERING.

The gas tractor in eastern farming, A. P. Yerkes and L. M. Church (*U. S. Dept. Agr., Farmers' Bul. 1004 (1918), pp. 27, figs. 3*).—This publication summarizes detailed reports received from over 250 experienced tractor owners in New York State during 1917 and the spring of 1918. The operating conditions upon which the reports were based were rolling country with a comparatively heavy stony loam soil and heavy clay subsoil. Very diversified farming was practiced on all farms reporting, at least half a dozen different field crops being grown. More than one-third of the entire acreage was devoted to hay.

The reports indicated that the greatest advantage of the tractor lies in its ability to perform the work in a shorter time than when horses are employed. The saving in man labor was considered next in importance, and the ability to do better work in plowing and preparing the soil was placed third. Under disadvantages the reports indicated the inability to use the tractor satisfactorily until the top soil is well dried. On heavy soil packing of moist soil resulted, and unsatisfactory work on hilly and rough land, especially in stony fields, was frequently the case. It is noted that 84 per cent of the cases reporting indicated that the tractor was a profitable investment, and of this number over one-third increased the acreage farmed.

With reference to size of outfit the general conclusion is drawn that the 2-plow tractor does not possess in an adequate degree the greatest advantage of tractors in general, and that the 3-plow tractor is distinctly the favorite among owners of farms of 151 or more crop acres. The reports indicated an annual repair charge during the first three years of use of a tractor on New York farms of nearly 4 per cent of the first cost. It is thought that this will increase during later years of operation.

The area covered per day of ten net working hours in plowing with the tractors used on New York farms was 4.5 and 6.25 acres for the 2- and 3-plow outfits, respectively. The average cost per acre plowed for gasoline, oil, and grease was about 99.5 cts. where gasoline was used, and 49 cts. where kerosene was used, with an allowance of 2 cts. per acre for gasoline used in warming up. The approximate costs of plowing an acre with 2- and 3-plow tractors, based on average costs of $775 and $1,050, respectively, and a life of 8½ years of 54 working days per year, are given as $2.26 and $2.06, respectively, for gasoline and $1.76 and $1.56 for kerosene.

The average life of a tractor is estimated to be not longer than 8½ seasons from the practical standpoint. Other general data are reported.

Power farming in Idaho, J. C. Wooley (*Idaho Sta. Bul. 111 (1918), pp. 11, figs. 4*).—Data from reports of 127 tractor owners in Idaho on tractor operation are summarized. These indicate that when selected to suit the farm and intelligently and carefully operated the tractor is a profitable investment in Idaho. To realize this the farmer must be able to make all minor repairs himself and to get repairs and expert help quickly for larger installations. Dependability is considered the largest factor in the success of the tractor. The 3-plow size is favored by a majority of Idaho owners. The reports indicate that proper care of lubrication will prolong the life of the tractor and that the best quality of oil is the cheapest. The tractor motor should pull its rated load the greater portion of the time, but overloading causes trouble. Taking off a plow may enable the tractor to operate at its rated speed and increase the season's accomplishment.

The tractor that displaces half its value in horses is considered a profitable investment in Idaho.

Getting rid of the stumps (*Wisconsin Sta. Bul. 295 (1918), pp. 32, figs. 30*).—This is a compilation of data by F. M. White and E. R. Jones from notes by C. Livingston, L. F. Livingston, A. Mathewson, and J. Hussey on stump removal practice in Wisconsin.

The stump puller and dynamite used together are considered to give the most successful and economical results in Wisconsin. It is noted that in blasting stumps it is rarely necessary to use a dynamite of higher grade than 20 per cent.

With reference to expense, it is noted that the stump and not the acre is the unit of measure and that the cost varies with the kind, number, and condition of the stumps, the type of soil, and the skill of the workmen. Types of pullers and pilers used are described.

Public Roads (*U. S. Dept. Agr., Public Roads, 1 (1918), No. 4, pp. 52, figs. 39*).—This number presents several articles and notes dealing with various phases of road construction and maintenance, including the following: The Location and Building of Roads in the National Forests, by A. E. Loder, and War Brings Bridge Building Back to Early Practices, by O. L. Grover.

The use of lumber on California farms, M. B. Pratt (*California Sta. Bul. 299 (1918), pp. 89–121, figs. 10*).—This bulletin gives popular information regarding the properties of different woods available in California and the relation of these properties to different uses made of lumber on the farm. It is introductory to plans for farm structures designed to meet the demands made for farm buildings in the State. A key for identification of woods commonly used by California farmers is included, together with a list of publications on the subject.

The round barn, W. J. Fraser (*Illinois Sta. Circ. 230 (1918), pp. 3–52, figs. 52*).—This is a revision of Bulletin 143 of the station (E. S. R., 23, p. 190). The advantages and disadvantages of the round barn are enumerated and a comparison is made of round and rectangular barns based on Illinois conditions. It is shown that a 100-cow rectangular barn requires one-fourth to over one half greater expenditure for lumber than is required by a comparable round barn and that there is a saving in the necessary carpenter work in favor of the round barn.

General data on the arrangement and construction of round barns are also given.

It is the conclusion that the round barn means economy of building expenditure, increased mow capacity, greater convenience, and an attendant lessening of barn labor.

Water systems for farm homes, G. M. WARREN (*U. S. Dept. Agr., Farmers' Bul. 941 (1918), pp. 68, figs. 50*).—This is a rather extensive compilation of data presented in easily usable form, covering practically every detail of the subject of farm home water supply systems. Information is given regarding water sources and supplies and water purification, and also regarding the mechanical features of practical water-supply apparatus, including power equipment for pumping. A specially noteworthy feature is the number of diagrammatic illustrations.

RURAL ECONOMICS.

Rural reconstruction in Ireland, L. SMITH-GORDON and L. C. STAPLES (*London: P. S. King & Son, Ltd., 1917, pp. XIII+279*).—This is an account of the forces at work since 1880 for the agrarian reorganization of Ireland. There are now cooperative creameries, producers' cooperative societies, credit societies to overcome the evils of former money-lending methods, and societies for the collective purchase of farmers' supplies. They are all organized on the principle that farmers can act collectively through the local neighborhood unit with individual protection through the one-man-one-vote manner of control. The business is done with one another instead of with customers, and profits are divided among the members.

The Irish Agricultural Organization Society, established in 1894, finds its chief work in the supervision of all existing cooperative societies. Experts are assigned from this society to give technical advice on the various types of work, such as banks, poultry, and home industries. Cooperation has been most successful in Ireland in those districts in the north and west which are said to have suffered most severely from an unfair tenant system and unjust taxation. The movement has resulted in the development of social consciousness and the recognition of common interests and capacities for a social program, as well as in the development of greater individual powers as wealth producers and business men.

The future of the movement is deemed to lie in the policies to be adopted by the society, and the authors believe that it will accomplish most if it conducts an educational program to teach true cooperation to the existing societies instead of confining its energies to organizing new branches. They feel that "the changes in economic organization brought about by the cooperative movement herald a day of returning prosperity in Ireland."

Report of the Agricultural Policy Subcommittee of the Reconstruction Committee (*London: Min. Reconstruction, 1918, pp. 136*).—This report has been discussed editorially (E. S. R., 39, p. 402).

The most pressing agricultural development problem in the United States, C. V. PIPER (*Proc. Soc. Prom. Agr. Sci., 38 (1917), pp. 73–78*).—This problem concerns the vast area of undeveloped coastal plain land from Norfolk, Va., to Galveston, Tex., excluding the great alluvial land of the Mississippi Valley. The soils of this area are predominantly sands or sandy loams, and except for 30,445,000 acres of swamp were covered largely with pine timber. The author states that four general types of farming have been developed on the cut-over pine land, but that profitable utilization of these lands in the immediate future is possible only by either reforestation or cattle-raising. He discusses these two solutions, and concludes that reforestation is the less feasible and that these great areas can not be developed unless the pasture problem is solved.

A farm survey of Montana, E. L. Currier (*Mont. Col. Agr. Ext. Serv.* [*Pub.*], *No. 25* (*1918*), *pp.* [*18*]).—This survey of the agricultural resources of Montana was prepared under the direction of teachers and county superintendents following a personal canvass of 30,964 farms. A series of tables shows, by counties, the acreage and production in 1917 and the acreage planted in 1918. The farm labor situation is discussed, and a table gives statistics for live stock on the farms in 1917 and 1918.

How farmers acquire their farms, W. J. Spillman (*Proc. Soc. Prom. Agr. Sci., 38* (*1917*), *pp. 87–90, figs. 2*).—This article gives tables and comments regarding the history of the methods pursued by the present farm owners in various sections of the middle West in acquiring ownership of their farms.

Of 417 farm boys in Illinois, 24 per cent went through four stages before becoming farm owners—laborer on father's farm, hired man, tenant, and owner. Thirty-six per cent omitted the hired-man stage; these remained at home about three years longer and the father provided them with working capital to become tenants; they saved a year and a half, as compared with the first group, in time required to pass through these stages. Thirty-two per cent remained on the father's farm until they could become farm owners.

Other tables show that in Kansas 72 owners worked as hired men an average of 7.56 years before becoming tenants, 4 to 5 years being the most frequent length of service in this capacity. In Nebraska 195 owners averaged 10.4 years as tenants before becoming owners, the major portion of them from 4 to 10 years.

Handling the 1918 wheat harvest in Kansas, E. C. Johnson (*U. S. Dept. Agr., Off. Sec. Circ. 121* (*1918*), *pp. 7*).—The methods employed for meeting the labor shortage in harvesting the 1918 wheat crop in Kansas are described.

Annual report of Bureau of Marketing, 1918, L. Lanier (*Bien. Rpt. Comr. Agr. and Immigr.* [*La.*], *18* (*1916–17*), *pp. 5–18*).—This is the initial report of a newly inaugurated division of the Department of Agriculture and Immigration of Louisiana. Its purpose is announced as, by means of the Weekly Market Bulletin and in other ways, to get the producer and the consumer together for the exchange of farm products raised in the State. The report shows that the offerings listed during the first year amounted to $2,145,707.

Rules and regulations of the Secretary of Agriculture under the food products inspection law of October 1, 1918 (*U. S. Dept. Agr., Off. Sec. Circ. 120* (*1918*), *pp. 8*).—The text is given of the rules and regulations promulgated under the food products inspection provisions of the 1919 agricultural appropriation act (E. S. R., 39, p. 308).

The bank of France and rural credit, F. David (*Vie Agr. et Rurale, 8* (*1918*), *No. 29, pp. 41–44*).—This article discusses various French laws enacted in times of peace providing funds for the promotion of agriculture, and the need for further modification of the laws to supply increased rural credit, specially for farmers in the invaded territory.

Agricultural cooperation in France, G. Blanchard (*Egypte Contemporaine, No. 40* (*1918*), *pp. 361–387*).—This is a discussion of the agricultural cooperative movement in France, with a comparison of its early aims and its present commercial functions. While at first "le syndicat agricole" was a purely academic body, there are now in France cooperative societies for purchase, sale, production, credit, and insurance. It is stated that the cooperative purchase societies have attained brilliant success, due to Government aid, and that the credit and insurance societies have made satisfactory progress, but that the other types although fairly well developed have been surpassed by similar societies in Germany, Italy, Belgium, and Russia. It is estimated that in France in 1914 there were 28,000 agricultural cooperative associations, with a total of 120,000 in the world.

The cooperative movement in France before and during the war, C. Gide (*Cooper. Consumer, 4* (*1918*), *No. 8, pp. 115–118*).—The article summarizes some of the accomplishments of cooperative societies in France, with special reference to their status since the outbreak of the war.

[Report of cooperative societies], J. Retief (*Union So. Africa Dept. Agr. Rpt. 1916–17, pp. 117–129*).—This reports detailed information with regard to the 20 cooperative agricultural societies registered in South Africa. Seventeen of these are in the Transvaal, and devote their efforts chiefly to the sale of produce—mostly maize—and the supply of farming requisites. A summary of the transactions for the last three years is given for each society, and a financial and administrative report for the year ended December 31, 1916.

Women's rural organizations and their activities, Anne M. Evans (*U. S. Dept. Agr. Bul. 719* (*1918*), *pp. 15, figs. 3*).—The success of organized farm women in developing home life and agricultural opportunities and in promoting community life in the country is here discussed. The author illustrates the extent to which parts of certain national women's organizations have become established in rural districts, and describes many specific cases to show the work that is being done throughout the United States by farm women's clubs.

Monthly Crop Report (*U. S. Dept. Agr., Mo. Crop Rpt., 4* (*1918*), *No. 10, pp. 117–132, fig. 1*).—Contained in this report are the usual data concerning production, farm value, and acreage of principal crops; estimated crop conditions Oct. 1, 1918, with comparisons; average prices received by producers; and range of prices of agricultural products at important markets. It records a tribute to the American farmers' service in the war crisis, and has special articles on snapped and bolly cotton; cotton condition Sept. 25, 1918; prices paid for picking cotton; normal crop condition and its interpretation; cost of estimates of hauling by wagon and motor truck, 1918, by F. Andrews, as to distance, round trips per day, load, and cost per ton per mile of wagon and motor truck hauls from farms to shipping points; statistics on the hay crop baled; data on the estimated wheat surplus and deficiency, by States; yearly average, total, and per capita consumption of specified cereals by leading countries 1902 to 1911; production and farm prices of cotton, wheat, corn, and wool in the United States 1908 to 1918; average yield of wheat in leading European countries, 1890 to 1915; commercial production of cabbage; kraut and cucumbers contracted for by manufacturers; and miscellaneous data.

[Agricultural statistics of British Guiana], J. B. Harrison (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1916, pp. 25–29*).—This report continues data previously noted (E. S. R., 37, p. 291), adding statistics for the year 1916.

AGRICULTURAL EDUCATION.

Agricultural instruction in the high schools of six Eastern States, C. H. Lane (*U. S. Bur. Ed. Bul. 3* (*1918*), *pp. 73, figs. 7*).—This is a report of a study made by agreement between the Bureau of Education and the States Relations Service, on the character and methods of administration, in the classroom and laboratory and out of doors, of agricultural instruction in the high schools of Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, and Vermont.

Entomological education in the United States, E. S. Cogan (*So. African Jour. Sci., 14* (*1918*), *No. 8, pp. 345–349*).—The aim of this article is to give a general idea of the courses offered in entomology in this country and where they may be best obtained. Particular reference is made to the work of the Massachusetts Agricultural College, Cornell University, Ohio State University, University of California, and University of Illinois.

Civic and social training in the agricultural schools, J. McCaig (*Agr. Gaz. Canada, 5 (1918), No. 6, pp. 618–620*).—At a meeting of the instructors of the provincial schools of agriculture and officials of the Department of Agriculture of Alberta, held in Edmonton on March 30 and April 1, 1918, it was decided to make some additions to the courses for these schools so that they will take account of the conjunctive and community needs of the student, as well as personal efficiency. The subject of civics has been introduced into the first year of the courses for both boys and girls. This will be a brief study of such matters as the community idea, the services furnished by such organizations as the Local Improvement District, the municipality, the provincial government, the Federal Government, and also the duties and privileges of citizenship in relation to these. The object is to inculcate in students the realization of the character of the State as a vital organism. The method of approach will be wholly through concrete materials and critical "close-to-home" discussion. The training of the second year boys is to be broadened by the addition of a very elementary type of rural economics, including such matters as a study of the setting of agriculture among the great industries, the returns from agriculture as a business, its independence through being partly self-sufficing and its dependence on seasonal changes, agriculture as a mode of life, the factors of production, the special types of farm enterprises, different kinds of tenure, etc.

The new interest being established on behalf of the girls is called rural organization, but the method of approach is intended to be quite concrete and the teaching will deal with the phenomena of country life and constitutions, both as they are found and as they should be. The course as laid out is for the purpose of discussing ways of realizing on the institutional and social resources of the country, to develop a broader human and social sense, and to develop leadership in improving organizations. The topics include the study of the resources of the school in relation to attendance, consolidation, sanitation, medical inspection, children's clubs, and the church; also a discussion of voluntary organizations, such as the institutes, Red Cross, mothers' clubs, etc., as well as cooperative associations for production, buying, and selling, etc.

Report of the director of elementary agricultural education, R. P. Steeves (*Rpt. Agr. New Brunswick, 1917, pp. 65–80, pls. 2, fig. 1*).—This is a report on the work of this division of the New Brunswick Department of Agriculture for the year ended October 31, 1917, including school gardens and their summer supervision, rural science schools for the training of teachers, school fairs, home project work with potatoes and poultry, and food production.

It is noted that nature stury and agriculture as a study in the schools, with practical methods of instruction and requiring a garden, is optional by boards of trustees even though their teachers have special qualifications for it. Instruction in agriculture was given in 87 districts in the school year ended June 30, 1917, and since then 20 schools have reported taking up nature study and agriculture with school gardening as a permanent feature of their work. The total amount of grants paid to teachers and trustees for agricultural instruction was $4,494. It is advocated that every school, whether consolidated, graded, or ungraded, have a garden at least one acre in extent, as it is believed that the educational feature of the work logically makes the garden at school a necessity, and the garden at home may then be an expansion and application of the training given in the school garden.

Seventeenth annual general report of the Department of Agriculture and Technical Instruction for Ireland, 1916–17 (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 17 (1916–17), pp. VI+234*).—This is the usual annual report of the department's administration and funds, and details of operations during the year 1916–17, including agricultural and technical instruction.

Report of the joint committee of the university, agricultural department, and education department on agricultural education [in Western Australia] (*Perth: Govt., 1918, pp. 27*).—This report of a joint committee appointed in May, 1917, deals with what is being done at the present time by the different agencies concerned with agricultural education in Western Australia and what further developments are needed in order to establish a well coordinated system of agricultural education. Among the principal findings of the committee are the following:

Courses in elementary agricultural science should be provided in primary schools, with special attention given to the subject in rural centers. In secondary schools there should be more advanced courses in agriculture. A school of agriculture, such as that situated near Narrogin, is a useful type of institution for giving instruction in the practice as well as the science of agriculture to junior students, and the number should be enlarged as the demand increases. Provision should be made for the training of teachers in agricultural science for such schools. An agricultural college affiliated with the University of Western Australia should be established as soon as circumstances will permit, when the two-year university diploma course in agriculture should be discontinued. The university should continue to grant degrees in agriculture, and scholarships or cadetships should be established to encourage students to take the degree. There should be a standing committee for agricultural education to coordinate the efforts of all institutions dealing with the subject.

It is further recommended that the State activities in agricultural research should be centered at the agricultural college, and that the existing Government farms should cooperate as branch stations. The control of agricultural research should be entrusted to a special committee. There should be a system of country lectures to farmers under the joint control of the department of agriculture and the university, as well as a system of regular instruction by correspondence in various subjects connected with agriculture. Associations of farmers to discuss technical and practical subjects should be encouraged and organized on similar lines to those adopted in South Australia. In order to improve agricultural methods cultural and cropping competitions in local centers should be encouraged by the department of agriculture. The publication of an official journal by the department should be resumed, and the Federal Government should be urged to give financial assistance to the States for the purpose of higher education in agriculture.

Notes supplied the committee on (1) nature study and elementary agriculture in the schools of the education department, (2) agricultural science in the primary school, (3) the Narrogin school of agriculture, (4) the University of Western Australia and agricultural education, (5) the education of the farmer on the farm, (6) agricultural lectures and demonstrations, (7) agricultural research, and (8) federal grants for agricultural education in Canada and the United States are appended.

Reference material for vocational agricultural instruction, C. H. LANE (*Fed. Bd. Vocat. Ed. Bul. 14 (1918), pp. 25, figs. 5*).—This bulletin gives directions for cataloguing and filing publications in building up working libraries of reference material for vocational agricultural instruction in secondary schools and discusses the teaching material available from the U. S. Departments of Agriculture, Interior, Treasury, and Labor, and the U. S. Food Administration.

Effective farming, H. O. SAMPSON (*New York: The Macmillan Co., 1918, pp. XXIII+490, pl. 1, figs. 210*).—The aims of this text are to "present instruction in practical agriculture in such a way as to be readily understood by both pupil and general reader, and to be directly adaptable at the same time to the needs of the classroom and laboratory." The introductory chapter gives a general view, including agriculture a fundamental, agriculture as art, science, and business, divisions of agriculture, and farm possibilities. The succeeding chapters deal respectively with plant study, soils, soil fertility, Indian corn or maize, small grains, grasses and sorghums, legumes, potatoes, sugar cane, cotton, and tobacco, fruit growing, vegetable growing, feeding farm animals, horses, beef and dual-purpose cattle, dairy cattle, dairying, sheep, swine, poultry, farm machinery, and farm management. Each chapter is followed by review questions, practical exercises, and references to literature. A directory and classification of the publications of the U. S. Department of Agriculture and the addresses of the experiment stations and of publishers of agricultural books are appended.

Teaching food values, C. F. Langworthy (*Jour. Home Econ., 10 (1918), No. 7, pp. 295–302*).—The author presents a food group generalization made by the U. S. Department of Agriculture, based upon an extended study of dietary and other data. This has proved convenient for popular instruction, and in addition offers an easy way of introducing the subject of food and nutrition in more formal teaching.

Food preparation: A laboratory guide and note-book for high school classes in domestic science, Beth W. Josserand (*Peoria, Ill.: The Manual Arts Press, 1917, rev. ed., pts. 1, pp. 148, figs. 3; 2, pp. 142, figs. 2*).—This loose-leaf laboratory guide is stated to be the result of years of study of the problem of successful presentation of subject matter to classes and of the most economical use of the time of students. Part 1 contains chapters on equipment and rules, the body and its foods, and introductory work in manipulation of materials, water, mineral matter, proteins, and fats. Part 2 deals with carbohydrates, menus and serving, and preservation and canning.

Thrift in the household, Dora M. Hughes (*Boston: Lothrop, Lee & Shepard Co., 1918, pp. 288*).—A discussion of thrift as applied to food and clothing, with many suggestions for the economical and efficient use of the resources of the ordinary home.

Pig raising: A manual for pig clubs, A. W. Nolan and J. H. Greene (*Chicago and New York: Row, Peterson & Co., 1918, pp. 79, figs. 16*).—This book contains a pig raising calendar, practical exercises, class work in swine raising, and an outline for a home project notebook. A model constitution for boys' and girls' clubs, parliamentary practice hints and suggestions, suggestive programs for agricultural clubs, and references to books are appended.

A study of shade trees for grades seven and eight, Fannie Ragland (*Nature-Study Rev., 14 (1918), No. 3, pp. 110–120, fig. 1*).—The author suggests questions, references to literature, and conclusions for working out a course of study on shade trees.

Receptacles for school fair exhibits (*Agr. Gaz. Canada, 5 (1918), No. 6, pp. 599–607, figs. 3*).—In this series of articles, by agricultural education officials, are described receptacles for school fair exhibits in use in the Provinces of Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia.

Camp Liberty.—An analysis of the social adjustments of city boys in a farm labor camp, C. E. Artman (*Survey, 40 (1918), No. 6, pp. 149–154, figs. 7*).—The organization, motives, and work of this camp, previously noted (E. S. R., 39, p. 693), are described by its director, who also briefly states the results and ends attained.

MISCELLANEOUS.

Director's report for 1917, W. H. Jordan (*New York State Sta. Bul. 445 (1917), pp. 821–844*).—This contains the organization list and a review of the work and publications of the station during the year.

Twenty-sixth Annual Report of Oklahoma Station, 1917 (*Oklahoma Sta. Rpt. 1917, pp. 40, fig. 1*).—This contains the organization list, reports by the director and heads of departments, a meteorological summary, and a financial statement for the fiscal year ended June 30, 1917. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of Porto Rico Station, 1917 (*Porto Rico Sta. Rpt. 1917, pp. 40, pls. 4*).—This contains the organization list, a summary by the agronomist in charge as to the general conditions and lines of work conducted at the station during the year, and reports of the chemist and assistant chemist, horticulturist, assistant horticulturist, plant pathologist, entomologist, assistant in plant breeding, specialist in farm management, and agricultural technologist, and a progress report on citrus scab. The experimental work reported is for the most part abstracted elsewhere in this issue.

Quarterly bulletin of the Michigan Experiment Station (*Michigan Sta., Quart. Bul., 1 (1918), No. 1, pp. 40, figs. 7*).—This contains several articles abstracted elsewhere in this issue, together with the following: Fall Care of the Flock, by G. A. Brown; Care of Fall Litter and Sow, by W. E. J. Edwards; Relation of Farm Wells to Typhoid Fever, and Vinegar, both by Zae Northrup; Plant Physiological Investigations, by R. P. Hibbard; Sealing the Silo, by A. C. Anderson; Methods of Combating Flies, by J. E. Burnett; Entomological Notes, by H. R. Pettit; Fuel Conservation and Taxation of Farm Woodlots, both by A. K. Chittenden; Grow Rosen Rye, Plant Wheat on Time, Select Seed Corn Early, and Select Seed Beans in Fall, all by J. F. Cox; An Emergency Silo, by H. H. Musselman; Horticultural Notes and Laws Governing the Packing and Labeling of Fruits and Vegetables for State and Interstate Shipments, both by C. P. Halligan; Infectious Abortion in Cattle, by E. T. Hallman; and a list of available bulletins.

Monthly Bulletin of the Western Washington Substation (*Washington Sta., West Wash. Sta. Mo. Bul., 6 (1918), No. 7, pp. 90–104*).—This number contains brief articles on the following subjects: Are Dairymen Prosperous? by W. A. Linklater; Hotbeds and Cold Frames, by J. L. Stahl; Seeding Down to Clover and Grass, by E. B. Stookey; How Some of our Common Plant Diseases and Insect Pests Pass Through the Winter, and What Can be Done Toward Controlling Them at That Time, by A. Frank; Males that Head the Breeding Pens, by Mr. and Mrs. G. R. Shoup; Bringing War Pullets into Laying, by G. R. Shoup; and The Washington Egg Advertising Campaign, by Mrs. G. R. Shoup.

NOTES.

Arizona University and Station.—D. W. Working, agriculturist in the Office of Extension Work in the North and West, States Relations Service, U. S. Department of Agriculture, has been appointed dean of the college of agriculture and director of the station, to enter upon his duties March 1.

Homer Derr has been appointed supervisor of agricultural education under the Smith-Hughes Act; F. R. Kenney, formerly associate professor of poultry in the extension service of the Iowa College, as associate professor of poultry husbandry; and A. F. Kinnison as assistant horticulturist in the station.

Delaware College and Station.—A. E. Grantham, agronomist, has been appointed acting director of the station during the absence in France of Director Hayward. E. A. Hodson has been appointed assistant professor of agronomy beginning February 15; R. A. Nehf assistant horticulturist in the station beginning February 15, and M. G. Thomas assistant animal husbandman beginning February 1.

Idaho Station.—Charles W. Hungerford has accepted a position in the department of plant pathology, beginning February 15.

Kansas College and Station.—Harry Umberger, State leader of county agents, has been appointed acting dean of agriculture. H. B. Winchester, formerly assistant in animal husbandry in the Iowa Station, has been appointed assistant in feeding investigations and has entered upon his duties.

Kentucky University and Station.—The station has purchased a small foundation herd of Hereford cattle and has taken steps to begin a herd of Shorthorns. A refrigerating plant, abattoir, and incinerator, for teaching and experimental work in meats and meat curing, have been erected on the station farm.

Maryland College and Station.—Richard Wellington, head of the section of fruit and vegetable investigations in the Minnesota University and Station, has been appointed in charge of vegetable work, beginning March 15.

Massachusetts College and Station.—The entire personnel of the college, station, and extension staff have been made members of the State Retirement Association. Each member contributes five per cent of his salary up to a maximum salary of $30 per week until reaching the retiring age, which may be at 60 and must occur at 70 years of age. Upon retirement the State duplicates his accumulations and makes payment in the form of a monthly pension. Should a member sever connection with the service before retirement his accumulated savings are returned to him.

John D. Willard has been appointed extension professor of agricultural economics vice E. Farnham Davis, resigned to resume commercial work in California.

Mississippi Station.—H. K. Gayle, animal husbandman, resigned January 15 to become manager of a syndicate farm in north Louisiana.

Oklahoma College and Station.—Dr. Hilton I. Jones, head of the department of chemistry at Dakota Wesleyan University, has been appointed head of the department of chemistry vice Dr. L. Charles Raiford, whose resignation has been previously noted. Dr. A. J. Stiner has been appointed assistant veterinarian, and P. G. Malone, college editor.

South Dakota College.—Dr. E. C. Perisho has resigned as president to accept a position with the Y. M. C. A. in reconstruction work in Europe. W. E. Johnson, president of the Northern Normal School at Aberdeen, has been appointed to succeed him A. H. Kuhlman has been appointed associate professor of animal husbandry.

Texas Station.—The new station building, to be known as the research administration building, is nearing completion and will be occupied this spring. This is a modern building for laboratory and office purposes, and with the present building will provide ample space for the present needs.

H. H. Laude, superintendent of the Beaumont Substation, was transferred January 28 to the main station as agronomist to take charge of rice investigations, and has been succeeded by A. H. Prince.

Virginia Truck Station.—Gilbert S. Watts, a 1918 graduate of the Pennsylvania College, has been appointed assistant horticulturist beginning January 1.

Hampton Institute.—Charles K. Graham, director of the agricultural department and agricultural extension work, has resigned because of ill health. J. L. B. Buck has been designated as acting director.

Washington College and Station.—The legislature has appropriated $175,000 for a new dairy building and equipment, $55,000 for the completion of the agricultural building, $75,000 for a new dormitory, $35,000 for buildings and equipment and other expenses at the new irrigation substation at Prosser, $80,000 for land, stock, and a new dairy barn at the Puyallup substation, and $61,963.34 as an offset to the Federal funds for extension work. These appropriations are in addition to the college funds derived from the millage tax.

Harry H. Hill, of the University of Minnesota, has been appointed instructor in dairy manufactures. C. Edwin Hill, assistant in forage crop work at the substation at Moro, Oreg., has been appointed superintendent of the substation at Waterville.

Wyoming University and Station.—The farm at Lander leased by the university for the past 10 years to the State Horticultural Society has been taken over, and is to be developed in cooperation with the society as a substation. The horticultural work will be continued, and agronomy and animal husbandry studies will be undertaken.

A recent act of the legislature brings the farms formerly controlled by the State farm board under the administration of the director of the station, assisted by an advisory committee appointed by the governor. This will make possible substation work in various sections of the State. Provision has also been made for organizing the extension club work and the work in home economics on the basis of county agent work, with State appropriations to aid the counties in their extension programs.

A new hog house costing $3,500 has been erected at the stock farm for experimental work with swine. Considerable farm machinery has also been added.

C. P. Arnold of Laramie, W. C. Deming of Cheyenne, and E. D. Croft of Cowley, have been appointed to the board of trustees.

Superior Council of Agronomic Stations and Laboratories in France.—Under a decree of the French Minister of Agriculture of August 12, 1918, a Superior Council of Agronomic Stations and Agricultural Laboratories has been established. This council consists of 25 members chosen for terms of from one to three years, 9 being selected by the Academy of Sciences, 6 by the Academy of Agriculture, 6 by the council itself, and 4 by the Minister of Agriculture to represent his department. The inspector general of stations and laboratories is to meet with the council in an advisory capacity.

The council is to look after the proper operation of the stations and laboratories, guiding and directing their efforts with a view to obtaining their greatest possible usefulness. It considers all questons relating to scientific investigations carried on in these institutions, and above all stimulates and promotes the formulation of general and specific research plans. It studies and points out the improvements and reforms which may be introduced and gives its opinion on the organization of the institutions now existing, on the foundation of new stations and laboratories, and on the assistance that may be obtained from the departments, towns, and individuals. It coordinates the yearly reports issued by the institutions on the investigations performed by them and decides as to the papers and results to be published. It examines the accounts of the institutions as well as their projects and the ways and means to execute them, and also passes upon the budget of expenditures and receipts. It provides the mode of selection of the personnel, draws up lists of available candidates, and suggests promotions, compensations, changes, and dismissals. It calls stated meetings for the directors of the stations and laboratories, and the various specialists. It examines the projects of private institutions and investigators and proposes grants and allowances. It is to direct the publication of a quarterly bulletin, pamphlets for popular use, and reviews of memoirs, brochures, or documents published in all countries, the knowledge of which would be likely to enlighten the personnel of the stations and laboratories regarding new methods of investigations and thus promote new studies and researches. It also will issue an annual summary of its work.

Agricultural History Society.—An association to be known as the Agricultural History Society was organized at Washington, D. C., February 14, 1919. The object of this society is to "stimulate interest, promote study, and facilitate publication of researches in agricultural history." This affords a wide field for a line of study not heretofore covered, including the history and development of various agricultural crops, of methods and practices employed in agriculture, various agricultural movements, the relations and effects of conditions of production, and the like. An interesting and profitable field for study is believed to be open. It is designed to make the society national in scope, with provision for local sections or meetings as interest grows. Membership is open to persons interested in the field covered by the society, and correspondence with the secretary to that end is invited.

The officers of this society are as follows: Dr. Rodney H. True, Bureau of Plant Industry, Washington, D. C., president; Wm. J. Trimble, Agricultural College, North Dakota, vice president; Lyman Carrier, Bureau of Plant Industry, Washington, D. C., secretary-treasurer; and R. W. Kelsey, Haverford, Pa., and O. C. Stine, Office of Farm Management, Washington, D. C., additional members of the executive committee.

EXPERIMENT STATION RECORD.

CONTENTS OF VOL. 40, No. 2.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

[1] On leave of absence for military service.

METEOROLOGY.

SOILS—FERTILIZERS

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

U. S. Department of Agriculture—Contd.

U. S. Department of Agriculture—Contd.

[1] Printed in scientific and technical publications outside the Department.

U.S. Department of Agriculture—Contd.

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U.S. Department of Agriculture—Contd.

Scientific Contributions—Contd. Page.

EXPERIMENT STATION RECORD.

Vol. 40. FEBRUARY, 1919. No. 2.

Two reports have recently come to hand which are worthy of special mention. One of these is an account of the Rothamsted Experiment Station in war time, covering the three years 1915 to 1917. It is the first report of the kind to come from any of the stations in the war zone beyond occasional references to their activity, and hence it is of unusual interest in reflecting the effects of the war and the response to its demands. The very brevity and condensation of the report suggests the war's influence, but it does not prevent reflection of the aggressive attitude of the station and its readiness to meet new problems, or the manner in which it was turned to for aid in the great crisis. As a reviewer has said, it "is a striking record of triumph over war-time difficulties and of adaptability to the circumstances and needs of the times."

We learn that at the outset the station's staff was rapidly depleted, two-thirds of its members joining the military forces or entering Government work for which their experience especially qualified them. Two of the former lost their lives and four of those who remained with the station died, so that of the band of workers collected and trained by Lawes and Gilbert only two are now left. Women were brought in to take the places of the men who left the station, and in this way the more important lines of inquiry were continued and new problems arising with the shifting conditions were cared for.

At an early stage the staff was called upon by the Board of Agriculture to carry on a considerable amount of advisory work, and later by the Ministry of Munitions. As the food problem became more urgent the demand for help increased, and when the Board of Agriculture was enlarged in 1917 the Food Production Department called the director of the station into service for a definite portion of his time. He was also engaged on various other committees, such as the Electro-culture Committee of the Board of Agriculture, the National Salvage Council, the Munitions Inventions Panel, and the Advisory Committee on Agricultural Science.

The list of inquiries conducted at the request of the various branches of the Government is a long and varied one. The subjects fall mainly under the heads of reclamation schemes, fertilizer problems, utilization of waste materials, and food problems. There were naturally a large number of tests of fertilizing materials, some new and many old. There was a search for sources of potash, studies of methods of conserving and utilizing army stable manure, of saving drainings from farmyard manure, and of employing urine for fertilizing purposes. The possibility of using peat in the manufacture of ammonia and of niter cake in making superphosphate was inquired into, and the value of sulphate of ammonia made by the use of niter cake was tested. Monthly notes to farmers on fertilizers were prepared for the Journal of the Board of Agriculture, and numerous popular articles on the subject were contributed.

A large number of waste products from manufacturing establishments were tested for the Board of Agriculture and the Food Production Department, and experiments were made on the fertilizing value of city wastes and by-products from munitions factories. Another line of food production problems assigned to the station related to the question of cultivating the royal parks, the possibility of utilizing other areas, the causes of infertility of certain tracts of land, and the soils of Foulness Island.

It is evident, therefore, that the station served in the capacity of consulting expert to the Government on a wide variety of questions important to the time. But fortunately it was not necessary to restrict its activity to this field. It was found possible to keep up the long-time experiments for which it is famous, and, in addition to undertake several special lines of investigation on topics arising out of the emergency or changed conditions.

It is especially interesting to read of the progress of these more intensive investigations at Rothamsted, and to note the manner in which its program was modified to meet conditions in those trying times. The efforts in that direction indicate no change of attitude on the importance of thorough and fundamental inquiry or the need of looking to the future in planning investigations. Normally the station concerns itself mainly with investigations of the soil and the growing crop. During the war its lines resolved themselves into four groups—the economical use of manure, the plowing up of grassland, the control of soil organisms, and the nutrition of plants.

The organization of research around definite problems and the concentration of attack upon them from various sides is well illustrated in the studies bearing on the breaking up of grassland. When it became evident that the policy of plowing up these lands must ultimately be adopted, the station broke up a field which had been in grass for ten years and sowed a variety of crops. This developed a series of problems, such as the depredations of birds and insects which had been harbored by the hedge rows, the coming in of weeds, and the liability to loss of the elements of stored-up fertility. Wireworms began to appear in numbers which caused apprehension, and provision was made for studying their life history, morphology, and control, especially by means of sterilization—an old subject at Rothamsted in soil investigation. A further set of difficulties arose out of the weed flora, and with characteristic thoroughness the observations on the viability of weed seeds in grassland were extended to other fields which had been in grass for 30, 60, and up to 200 years. It is interesting to note that soil from fields 30 years old gave a copious weed flora, that from fields 60 years old showed less, while none developed in the soil of fields which had been in grass for 200 years.

An important feature of this problem of plowed up grassland was the rate at which the stored-up fertility was utilized or became dissipated. This fertility was found to be liberated by exposure to the air, the decomposition of the organic matter proceeding more rapidly than the crops were able to take up the nitrogen compounds set free. The result was waste, the nature and cause of which was studied from both the chemical and bacteriological sides.

So long as the land lies in grass the soil contains considerable carbonic acid and a reduced percentage of oxygen, so that conditions are not particularly favorable for aerobic organisms; but as soon as it is plowed up the conditions become more favorable. The nitrogen compounds are broken down in the first instance to ammonia, but the evidence is that the process is not a simple bacteriosis as formerly believed. The loss of nitrogen is thought to be partly due to a definite evolution of gaseous nitrogen which occurs neither in entire absence of air nor in complete access of it, but only under intermediate conditions of aeration. This indicates that it is due neither to a simple oxidation nor to a simple reduction, but to some more complex action. The application of the findings to the soil problem under consideration is not simple and will require further investigation.

Another line of study centered on the handling of barnyard manure, on which the above findings have a direct bearing. These studies related especially to the nature of the loss and how it arises. This was an appropriate war time problem in view of the need of conserving all sources of fertilizing material, and some important progress was made upon it. Attention was not confined to nitrogen but was directed to other constituents, notably the cellulose furnished by straw. Experiments showed that when this straw was applied unchanged to the soil, it might in large measure neutralize the effect of other components of the manure. But straw mixed with soil, chalk, and certain organisms living free in the soil resulted in a decomposition of the cellulose and the fixation of nitrogen from the air, so that a manure was finally obtained which contained considerably more nitrogen than the original components. Horse manure was found to contain something suitable for the process of nitrogen fixation, and also to yield an organism which works in conjunction with the nitrogen fixers, so that with straw and the appropriate organisms a considerable enrichment of the manure in nitrogen may be obtained.

These results are largely in the laboratory stage, but as pointed out, "if the plowing up of grassland continues, the country will be faced with a large production of straw for which an outlet must be found; considerable quantities of bulky, organic manure will also be required. If the nitrogen fixation plan prove feasible in practice it will afford a convenient solution of both problems."

In connection with study of the biochemical decomposition in the soil, the relation of rain, and especially of oxygen dissolved in rain water, was given attention. It is suggested that this dissolved oxygen accounts for a part of the favorable influence of summer showers in starting up the decomposition. Whether the depressing effect of the growing crop is due to its taking up the dissolved oxygen giving out carbonic acid or some other action is not yet clear.

Accounts of these and other investigations are published elsewhere in more detail, and many of them have been noted in abstract, but they are briefly referred to here as showing the activity of the station in the period covered and some of its outcome.

Reference to the future plans of the station illustrates the close relation it sustains to practical problems of British agriculture. Dr. Russell points out that since the farmer's task in the future will be to increase his yield, the problems connected with this will necessarily determine the program for future research work. Some of these questions as they relate to wheat production are now being faced by the station. "We must strengthen the straw, improve the tillering, regulate to some extent the development of grain, and control the pests. Until these are all solved we can not hope to get much further with increased wheat yields."

In spite of the new and special duties which the war brought to the station, time was found to prepare and publish an imposing list of papers, some 50 in number, together with several books. Among the latter was a revision of "The Book of the Rothamsted Experiments," published in 1905 under the authorship of Mr. A. D. Hall. In the new edition, issued in 1917, Dr. Russell brought down the data for a further decade and made the necessary alterations in the text.

The hope is expressed that when conditions become more normal it will be possible to arrange for a proper statistical survey of the mass of available data accumulated at Rothamsted. This, it is believed, would yield further information of high value to science and to practical agriculture, for "we have not yet learnt anything like all the lessons the Rothamsted fields can teach us."

The esteem and admiration in which this Nestor of the stations has long been held will be further heightened by its war time record. It has added to the debt of the Empire, and has shown anew its intensely practical character and its value as a national asset.

The increased interest in agricultural education and research which has been manifest in the midst of the war and following it has been referred to in previous issues. This has not been confined to the war-stricken countries of Europe, but has extended among others to Australia where, as already mentioned in these pages, an advisory council of science and industry appointed by the Governor General has submitted recommendations which include a program for enlarging investigation in agriculture. And now comes a report from the Department of Agriculture of Victoria dealing with agricultural education and agricultural development in America, with applications to that country.

The report is by Mr. A. E. V. Richardson, agricultural superintendent in the Victorian Department of Agriculture, and records the results of a personal study of agricultural institutions in this country and Canada on a six-months' mission. It is a highly intelligent and accurate exposition of the American view of agricultural education and the spirit and motive of agricultural institutions. It is appreciative not only of what has been accomplished but of what has been passed through in the process of development.

Mr. Richardson writes as one who has seen and understands, and who has weighed the results as now exhibited in full light of their evolution. This gives him advantage in making applications to his own country and adds force and conviction to his recommendations. Incidentally the comparisons he makes throw an interesting light on conditions at present prevailing in Victoria, which in many respects parallel in opportunity the situation in this country before our system for agricultural advancement had been put well under way.

Special interest naturally centers in the applications of his studies to Victoria. He explains that one great advantage which has come in America is a strong National sentiment toward agricultural education and agricultural development, which is lacking as yet in his country. He lays very strong emphasis on agricultural education, considered broadly, as an essential basis for development. He says: "The only way to secure a genuine and permanent increase in output from the land is to improve the farming methods of the country and apply the teachings of science to its agricultural production. In other words, the problem of agricultural development resolves itself ultimately into the problem of agricultural education. That is the clear lesson of experience in all the great agricultural countries of the world." But he cautions that a long time is required to realize on educational work, especially when the necessary force and the means for training such a force are lacking.

There is declared to be no State in the commonwealth so dependent on the development of intensive agriculture as Victoria; hence it is argued that education in agriculture is of prime importance to it. Unlike the adjoining States it has no large area of crown lands to dispose of for the settlers of the future. It is by far the most densely populated State, and land values are relatively higher than in any other. Hence intensive culture and diversification are pointed to as the chief avenues of progress, and these naturally lend special importance to education.

A lesson cited from American experience is that "no matter from what angle the problem of agricultural education be viewed, it resolves itself ultimately into the problem of providing a sufficiency of trained teachers, agricultural specialists, and extension workers, and using them as units in an organized scheme of instruction, investigation, and extension." It took this country a generation or more to learn this, but it is one of the most fundamental lessons out of our experience, and it will be a saving of time and disappointment if it can be profited by in newer countries.

With a view to training such a corps of workers, suggestions are offered for modifying and strengthening the course and facilities in agriculture of the university at Melbourne. The provision at present is held to be wholly inadequate to the modern ideas of college teaching, and until it can be enlarged the suggestion is offered that the staff of the Department of Agriculture be used and the facilities of the Werribee Research Farm or the Dookie Agricultural College employed for the necessary practical work. Scholarships in American institutions are advocated to provide trained specialists in technical subjects; and to encourage more men to prepare for this field the insurance of larger emoluments for services is urged. In this connection it is noted that the university council has asked that the Government appoint six graduates annually for a period of five years at a salary of fifteen hundred dollars a year.

Comparing the two agricultural colleges of Victoria with those in this country, it is shown that they differ fundamentally and that the former are really vocational schools giving as much attention to acquiring manual skill and dexterity as to technical and scientific training. The writer explains that "the Americans emphasize the fact that the true function of a college is to teach why things are done rather than how they should be done;" and that in the American colleges "practically the whole time is devoted to technical and scientific training and subjects which make for good citizenship."

The two existing colleges attract few farm boys, but might, it is urged, if the type of instruction were provided which is adapted to their needs. A strong plea is made for liberalizing their courses, for increasing and strengthening the staffs, and for enlarging the facilities for instruction. Citing the success of short courses in the United States and Canada, the encouragement of these in every possible way is advocated.

The plan does not end with the university and the agricultural colleges, but includes instruction of lower grades. A State supervisor of agricultural instruction is recommended for the high and elementary school work, and central district schools for preparing teachers for the elementary grades.

The report has much to say on the subject of experiment stations and agricultural investigation, which are regarded as absolutely fundamental to other educational development. The author holds that "the building up of a body of systematic knowledge by careful investigation and experiment is essential for the sound development of agriculture in any country," and that a comprehensive system for this must run parallel with the work of instruction and extension.

"The field for agricultural investigation in a new country such as ours is vast, and at the present time we are largely dependent for what may be termed the scientific basis for agriculture on principles established under climatic and economic conditions unlike our own.

"There is a wide field of work in the confirmation of what are supposed to be the basic principles of our great national industry. It was the systematic tests conducted by the American experiment stations on the growing of crops, management of soils, feeding of animals, which played such a large part in developing American agriculture. These stations demonstrated the practicability of very largely increasing the existing crop yields by measures within the reach of men of average intelligence, and at a cost which could be recovered with large dividends in increased crop production. The American stations played a large part in the development of American agriculture, and in creating sentiment towards agricultural education."

Unlike this country, the experiment stations in Australia are under the State departments of agriculture along with the inspection and other administrative functions. While this is not commented upon, attention is drawn to the association of research with teaching and extension in the agricultural colleges of this country. Experimental work in Victoria is centered in the research farm at Werribee, established some 6 years ago, which, in addition to being young, has felt the shortage of skilled assistance. Hence a vast amount of experimental and research work remains to be done, which it is felt should be begun at the earliest possible moment. Although the future progress of agriculture in Victoria lies in the intensification and diversification of agriculture, and particularly in the development of systematic stock feeding, it is explained that practically no local information is available on the merits or costs of different feeding systems, or of the available feeds. Similarly, lack of information is felt on the proper use of water in irrigation, crop rotation, fertilizers and their effects, and in many other directions. This leads the author to "plead for generous support for extending the scope of our agricultural investigations and providing facilities in the way of staff and equipment to carry out a vigorous policy of investigation."

Provision for farm surveys and for agricultural extension work is also advocated, but here again the lack of trained and experienced men is recognized as a practical difficulty at the present time.

Mr. Richardson has caught the idea that in America agriculture is regarded as both a business and a mode of life, and that the development of agriculture is a public concern; hence money spent upon it is not an outlay but an investment. This, he explains, is the reason why State and Federal Governments are content to make large appropriations for agricultural education as an underlying means of development. Based on this idea and the returns from it, he argues for a long-range policy which will look beyond the present and map out the requirements of the State, making provision for the steady realization of these plans in the future.

It does not necessarily follow that what is good policy for one country will be equally good for another, but the value of agricultural education and investigation has been given such wide and convincing demonstration as to show their soundness for new regions quite as surely as for the older settled ones. This excellent report will furnish a reliable basis for agricultural development through education and research.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The progress of chemistry during the last quarter of a century, W. McPherson (*Proc. Ohio Acad. Sci., 6 (1916), No. 5, pp. 370–387*).—This is a discussion of a few of the branches of chemical science in which remarkable developments have taken place during the past 25 years. Among the topics treated are the constitution of matter—radioactivity, solutions, colloids, the synthesis of organic compounds, asymmetrical syntheses, and fermentation. A few examples are given of the progress made in the application of chemistry to the industrial development of the Nation.

Annual report on the progress of chemistry for 1917, edited by J. C. Cain and A. J. Greenaway (*Ann. Rpts. Prog. Chem. [London], 14 (1917), pp. IX+264, fig. 1*).—This is the usual annual report (E. S. R., 37, p. 409).

Compendium of physiological chemistry, M. Arthus (*Précis de Chimie Physiologique. Paris: Masson & Co., 1918, 8. ed., rev., pp. XI+451, pls. 5, figs. 115*).—This book is intended to fill a place intermediate between treatises on chemical physiology and physiology. The chemical facts necessary for the study of physiology are presented in a concise form. Colored plates are included on the spectra of the hemoglobin of the blood under different conditions, on the nutritive value of different food materials, and on various tests of physiological chemistry.

The application of electrolysis in chemical industry, A. J. Hale (*London and New York: Longmans, Green & Co., 1918, pp. IX+148, pls. 2, figs. 57*).—This volume, in the series of monographs on industrial chemistry edited by E. Thorpe, includes sections on the general principles of electrolysis and methods of generating currents, the electrolytic refining of metals, the electrolytic production of hydrogen and oxygen, electrolysis of alkali chlorids, and the production of inorganic and organic compounds.

Contribution to the study of the replacement of platinum in electrolytic apparatus, P. Nicolardot and J. Boudet (*Bul. Soc. Chim. France, 4. ser., 23–24 (1918), No. 9, pp. 387–391*).—As a result of investigations as to a proper substitute for platinum in electrolytic apparatus, the authors recommend a gold alloy not attacked by nitric acid. It consists of 92 parts of gold, 5 parts of silver, and 30 parts of copper. For the anode the surface of the alloy should be coated with a very thin layer of platinum to protect against oxidation. This covering is not necessary for the cathode.

The proteins of the peanut, Arachis hypogæa.—III, The hydrolysis of arachin, C. O. Johns and D. B. Jones (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 491–500*).—In continuation of previous work (E. S. R., 37, p. 501), the authors report from the Bureau of Chemistry of the U. S. Department of Agriculture the following data on the hydrolysis of arachin, the principal protein of the peanut: Glycin none, alanin 4.11 per cent, valin 1.13, leucin 3.88, prolin 1.37, phenylalanin 2.6, aspartic acid 5.25, glutaminic acid 16.69, tyrosin 5.5, cystin 0.85, arginin 13.51, histidin 1.88, lysin 4.98, tryptophan present, and ammonia 2.03.

The hydrolysis of kafirin, D. B. Jones and C. O. Johns (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 323-334*).—The hydrolysis of kafirin, the alcohol-soluble portion of Kafir corn, previously noted (E. S. R., 37, p. 8), resulted in the following percentage of amino acids: Glycin 0, alanin 8.08, valin 4.26, leucin 15.44, prolin 7.8, phenylalanin 2.34, aspartic acid 2.27, glutaminic acid 21.23, tyrosin 5.49, cystin 0.84, arginin 1.59, histidin 1.12, lysin 0.95, tryptophan present, and ammonia 3.46, making a total of 74.87 per cent. Certain modifications of the usual methods of hydrolysis are noted.

Note on the preparation of gulonic lactone, F. B. La Forge (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 347-349*).—The cyanhydrin method of preparing one sugar from another having a lower number of carbon atoms has been simplified by the author at the Bureau of Chemistry of the U. S. Department of Agriculture in the preparation of gulonic lactone from xylose. The simplified method as described makes possible the elimination of the operation of boiling with barium hydroxid, the saponification of the nitrile of gulonic acid being effected with a slight excess of sulphuric acid. The resulting ammonium sulphate is allowed to remain in the solution as it does not interfere with the crystallization of the lactone on concentration.

The yield of chemically pure, recrystallized gulonic lactone from pure xylose amounted to 55 per cent of the weight of the xylose employed. It is considered that the method, with proper modifications, may be applied to the preparation of other sugars.

The distillation of cellulose and starch under reduced pressure, A. Pictet and J. Sarasin (*Helvetica Chim. Acta, 1 (1918), No. 1, pp. 87-96*).—This has been essentially noted from another source (E. S. R., 38, p. 708). Additional studies are reported leading to the conclusion that the grouping of atoms in levoglucosane preexists in the molecule of starch and of cellulose. The possible formulas for levoglucosane and their bearing on the structure of cellulose and of starch are discussed.

Chemical studies in some marine algæ, chief material of "kanten," H. Matsui (*Jour. Col. Agr. Imp. Univ. Tokyo, 5 (1916), No. 4, pp. 413-417*).—Chemical studies are reported of tengusa, yegonori, and ogonori, three algæ used in the manufacture of kanten, or Japanese agar-agar. The studies include qualitative tests showing that the algæ contain hexosans, pentosan, and methyl pentosan, but neither starch, mannitol, nor reducing sugars.

A study of the conditions essential for the commercial manufacture of carvacrol, A. W. Hixson and R. H. McKee (*Jour. Indus. and Engin. Chem., 10 (1918), No. 12, pp. 982-992, figs. 6; abs. in Chem. Abs., 13 (1919), No. 2, p. 162*).—A process for the manufacture of carvacrol from cymene is described in which spruce turpentine is used as a source of cymene. The method has been found practical on a large scale and is considered of commercial importance in view of the possibility of utilizing carvacrol as a substitute for thymol.

The fermentation organisms of California grapes, W. V. Cruess (*Univ. Cal. Pubs. Agr. Sci., 4 (1918), No. 1, pp. 1-66, pls. 2, figs. 15*).—This publication reports a study conducted at the California Experiment Station of the microorganisms occurring on California grapes. The report includes a general discussion of grape organisms and the results of laboratory studies on the properties of molds, bacteria, and yeasts from California grapes; on the influence of locality, degree of ripeness, and shipment from vineyard to winery upon the type and number of microorganisms; on the character and number of microorganisms on grapes as received at the winery during the seasons of 1911 and 1912; and on methods for the control of microorganisms on grapes for wine making.

Nineteen different organisms were isolated from California grapes, the majority of which were found to be types that are harmful in wine making. On the surface of the green grapes examined were found mostly molds, while as the grapes ripened wild yeasts made their appearance, the true wine yeasts being the last to appear. During storage and shipment, the organisms (particularly molds and wild yeasts) increased rapidly. It was found that this could be checked by crushing the grapes at the winery and adding moderate amounts of sulphurous acid (about 1 gal. of 6 per cent sulphurous acid solution per ton of crushed grapes).

The method, previously noted (E. S. R., 34, p. 207), of adding moderate amounts of sulphurous acid to the grapes after arrival at the cellar, with subsequent application of pure yeast, is again recommended as giving uniformly good fermentations and sound wines.

A method of dialysis of enzyms, O. A. VAL'TERA (*Izv. Ross. Akad. Nauk (Bul. Acad. Sci. Russ.), 6. ser., No. 13 (1917), pp. 1075–1088, fig. 1*).—A new method of dialysis is described in which a specially constructed apparatus with collodion sacks is employed. Experiments with the tryptase of yeast indicate that by the use of this method preparations may be obtained with a considerably higher activity at a diminished volume. The activity of the enzym is somewhat lowered in the process of dialysis, but the passage of either the enzym or the coenzym through the membrane is prevented.

The quantitative analysis of small quantities of gases, H. M. RYDER (*Jour. Amer. Chem. Soc., 40 (1918), No. 11, pp. 1656–1662, figs. 3; abs. in Chem. Abs., 13 (1919), No. 1, p. 11*).—A description is given of an apparatus designed for the quantitative analysis of small quantities of gases, of its manipulation, and of the results of tests made to determine its accuracy. The gases which can be handled in this way are water vapor, carbon dioxid, carbon monoxid, oxygen, hydrogen, nitrogen, and methane. The apparatus is designed to handle quantities varying from a few cubic millimeters to about 1 cc.

Notes on Folin's direct nesslerization method for the determination of nitrogen, L. LANGSTROTH (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 377–380, fig. 1*).—Two difficulties encountered by the author in the use of the Folin-Denis direct nesslerization method for nitrogen determinations (E. S. R., 36, p. 316) are pointed out. The first was in making known solutions of pure ammonium sulphate check with the standard when run through as in the procedure for total urinary nitrogen, and the second in boiling down the filtrate after precipitation of the blood proteins with *m*-phosphoric acid without loss from bumping. The first difficulty was found to be due to impurities in the sulphuric acid, and can be remedied by a preliminary digestion of the standard solution. It was found that the second difficulty can be avoided by heating with a microburner the filtrate in a hard glass tube held just far enough from the horizontal to bring the surface of the liquid half way between the bottom and the mouth of the tube.

Microchemical nitrogen determination, B. SJOLLEMA and C. W. G. HETTERSCHY (*Biochem. Ztschr., 84 (1917), No. 5–6, pp. 359–370, fig. 1; abs. in Chem. Abs., 12 (1918), No. 14, p. 1473*).—This is a critical discussion of the micro-Kjeldahl method for the determination of nitrogen and the direct nesslerization methods of Folin and Denis (E. S. R., 36, p. 316), together with suggestions for certain modifications in both methods.

The conclusion is drawn that in the authors' experience the micro-Kjeldahl is to be preferred to the direct nesslerization method, although good results can be obtained by both methods.

A study of sources of error incident to the Lindo-Gladding method for determining potash, T. E. Keitt and H. E. Shiver (*Jour. Indus. and Engin. Chem., 10 (1918), No. 12, pp. 994–996*).—A critical examination of the Lindo-Gladding method for determining potash is reported from the South Carolina Experiment Station, which indicates that there are two sources of error in this method: (1) The volume of the solution is decreased by the bulk of the precipitate formed on addition of ammonia and ammonium oxalate, which makes a plus error, and (2) the potash in solution is decreased by occlusion of potash by the heavy gelatinous precipitate formed. These two sources of error are partially compensating.

It was found impossible to wash out with hot water the potash occluded within the precipitates. It may, however, be separated to a certain extent by repeatedly dissolving the precipitate in hydrochloric acid, diluting to a large volume, precipitating with ammonia and ammonium oxalate, filtering, and determining the potash in the filtrates and washings. Both iron and calcium phosphate when precipitated with ammonia were found to occlude potash.

The quantitative determination of phosphorus by the nephelometric method, E. B. Meigs (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 335–346*).—The author has made a study at the Bureau of Chemistry of the U. S. Department of Agriculture of sources of error in the nephleometric determination of phosphorus, the results of which are summarized as follows:

"The greater the concentration of hydrochloric acid present when the strychnin sulphate is added, the greater will be the amount of material precipitated at that time and the greater will be the stability of the reagent. Reagents made up with strong hydrochloric acid, however, tend to minimize the differences in nephelometric value as between phosphate solutions of different densities. None of the reagents that are serviceable when used in the procedure described by Bloor [in the article previously noted (E. S. R., 35, p. 166)] are entirely stable; they all tend to form a spontaneous precipitate and to reach a state in which they show no difference in nephelometric value as between phosphate suspensions of different densities. The temperature at which the strychnin sulphate is added to the Na_2MoO_4-HCl solution in making up the reagent may have a considerable effect on its character."

The temperature at which the phosphate suspensions are precipitated is also considered to be a factor which may cause a lack of proportionality between differences in the densities of suspensions and the differences in their nephelometric values.

Determination of alkaline carbonates and bicarbonates in the cold in the presence of litmus and phenolphthalein. Analysis of a mixture of carbonates, W. Mestrezat (*Ann. Chim. Analyt., 23 (1918), No. 10, pp. 201–206*).—Certain modifications in technique are described, by means of which it is said to be possible to analyze with accuracy a mixture of alkaline carbonates and bicarbonates by titration in the cold, using litmus and phenolphthalein as indicators.

To determine bicarbonates with accuracy it is recommended that the solution be diluted with boiled water to bring the proportion of alkaline carbonates to a figure below 0.07 per cent calculated as sodium carbonate. In titrating with litmus, it is suggested that when the addition of $\frac{N}{10}$ acid to the alkaline liquid begins to produce a color change the liquid should be divided into two parts, one of which receives the acid and the other serves as a comparison. If the acid added brings about a change in color the operation is continued, the contents of the two flasks being mixed and then again divided into two portions.

The method, which is described in detail, is said to have given results in the analysis of alkaline hypochlorid solutions in which the chlorin has been combined with hyposulphite, as previously suggested (E. S. R., 39, p. 506). The total carbonic acid can be verified by the gasometric method (E. S. R., 39, p. 205).

The determination of carbon dioxid in carbonates, D. D. Van Slyke (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 351–354, fig. 1*).—The method described was devised primarily for use in determining carbonate in bones which had been dried and pulverized but not ashed. It is considered to be applicable to all carbonates, soluble or insoluble, in the absence of acids, such as hydrogen sulphid, that are highly volatile from water solution. The principle of rapid extraction of carbon dioxid from solution by means of reduced pressure, previously noted (E. S. R., 37, p. 804), has been combined with the precipitation of carbonic acid by standard barium hydroxid solution and titration of the excess of hydroxid.

Volumetric determination of sulphates, Vansteenberghe and Bauzil (*Ann. Chim. Analyt., 23 (1918), No. 10, pp. 210–214*).—The method consists essentially of a preliminary precipitation of the alkaline earth bases, a part of the phosphates, etc., by an excess of sodium carbonate. The sulphates are then precipitated in acid solution by a known volume of barium chlorid. The excess of barium chlorid is precipitated as barium carbonate with sodium carbonate and determined by alkalimetry with the use of $\frac{N}{10}$ hydrochloric acid.

The method is said to be rapid and accurate and applicable to solutions of metallic sulphates, as well as to the various body fluids (urine, blood, etc.).

The determination of tyrosin in proteins, C. O. Johns and D. B. Jones (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 319–322*).—An investigation of the method of Folin and Denis for the determination of tyrosin (E. S. R., 28, p. 805) is reported from the Bureau of Chemistry of the U. S. Department of Agriculture.

It has been found that tryptophan is completely decomposed during the hydrolysis of proteins with hydrochloric acid and that the decomposition products do not interfere with the determination of tyrosin. It has also been shown that oxyprolin does not interfere with the determination. Since tyrosin is decomposed to some extent during hydrolysis, it is not considered of advantage to continue the hydrolysis more than 12 hours.

The optical dispersion of oils from an analytical point of view, P. J. Fryer and F. E. Weston (*Analyst, 43 (1918), No. 510, pp. 311–317*).—Tables are given of the dispersion values at 40° C. of various oils and a few hydrocarbons, and of the effect of free acidity upon the dispersion of drying oils and of heat upon the refraction and dispersion of drying oils.

The dispersive power of fatty oils and fats was found to be inferior in discriminative value to the refractive index, practically all the oils and fats, with the exception of coconut, linseed, and tung oils, giving very similar dispersions. Coconut oil gave a distinctly lower, and linseed a higher, dispersion than the average. Free fatty acidity had little effect on the dispersive power. Oxidation increased both the refractive index and the dispersion, and polymerization in general increased the activity and lowered the dispersion.

The autooxidation of sugars, L. Berczeller and E. Szegö (*Biochem. Ztschr., 84 (1917), No. 1–2, pp. 1–36*).—A study is reported of the autooxidation of sugars in alkaline solutions in the presence of air, with and without the addition of various substances. Analogies are drawn between the oxidation of sugars in vitro and in vivo.

Volumetric determination of reducing sugars, W. B. Clark (*Jour. Amer. Chem. Soc., 40 (1918), No. 12, pp. 1759–1772, fig. 1*).—The method, contributed from the Bureau of Plant Industry, U. S. Department of Agriculture, is a simplification of Scales's method, previously noted (E. S. R., 34, p. 611), for titrating the reduced copper without removing it from the residual copper solution. The entire process is carried out in a single vessel with practical exclusion of the air from the time the reduction takes place until after the oxidation by the iodin. Concentrations of the solutions used and a definite method of procedure are described for quantities of reducing sugars up to 75 mg., and principles are pointed out for adapting the process to larger quantities of such sugars.

The accuracy of the method is said to be such that with care the results of duplicate determinations should not differ by more than 0.25 mg. of reducing sugar. The ratio of reducing sugar to copper is nearly constant, the greatest variation occurring in low values. Instead of using tables it is advised that each observer standardize his own procedure and then determine the ratio for that procedure.

Determination of aldehyde sugars by iodin in an alkaline medium: Applications, H. Colin and O. Liévin (*Bul. Soc. Chim. France, 4. ser., 23–24 (1918), No. 9, pp. 403–405; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 23, p. 745A*).—Suggestions are given for slight modifications in the Bougault method for the determination of aldehyde sugars by means of iodin (E. S. R., 37, p. 714), and comparative results are reported on tubercles, roots, and leaves obtained by the use of this method and the polarimetric method. The results in general were concordant, although with leaves the results are considered uncertain and always too high.

A method for the determination of starch, W. S. Long (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 172–174*).—The method is described as follows:

To 5 cc. of starch solution in a 100 cc. flask are added 5 cc. of a 5 per cent solution of potassium iodid and 20 cc. of $\frac{N}{500}$ solution of iodin in a 5 per cent potassium iodid solution. The flask is stoppered, shaken, and allowed to stand over night. The precipitated starch iodid is then filtered and washed thoroughly with a 5 per cent potassium iodid solution. The filtrate and washings are titrated with $\frac{N}{500}$ sodium thiosulphate solution, using starch solution as indicator.

The method is thought to be sufficiently accurate to be applicable to the determination of starch when occurring in small amounts, as in various food products.

The determination of pentosans, H. D. Steenbergen (*Chem. Weekbl., 15 (1918), No. 25, pp. 784–808*).—This is a review and critical discussión of various methods for determining pentosans. An extensive bibliography is given.

A study of some biochemical color tests.—I, The thiophone test for lactic acid. A color test for aldehydes, W. R. Fearon (*Biochem. Jour., 12 (1918), No. 3, pp. 179–183*).—The author proposes the term "hydrocnic" for biochemical color reactions, the products of which are decolorized by the addition of small quantities of water, and describes the thiophene test for lactic acid as a typical hydrocnic reaction. The reaction is due to the production from lactic acid of formaldehyde and acetaldehyde, which react with the thiophene in the presence of excess of sulphuric acid to give a cherry-red color. On the basis of this reaction a new color test for aldehydes is described as follows:

Two drops of a 0.2 per cent alcoholic solution of thiophene are added to 5 cc. of concentrated sulphuric acid (free from nitrous and nitric contaminations) and mixed. If a drop of a weak solution of an aldehyde be added, a red color develops and spreads through the acid. This color is discharged by a few drops of water but returns on the addition of more sulphuric acid.

The test is said to be very delicate with most aldehydes and to be given also with the substituted aldehydes such as chloral. The color varies slightly with the aldehyde. Formaldehyde gives a purple-red, acetaldehyde a cherry-red, and acrolein a rose-carmine color.

The measurement of the acidity of bread, E. J. Cohn, P. H. Cathcart, and L. J. Henderson (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 581–586, fig. 1*).—A simple method for determining the H-ion concentration of bread is described, which consists essentially of applying four drops of a 0.02 per cent solution of methyl orange in 60 per cent alcohol to the freshly cut surface of the bread near the center of the loaf. The color is observed after five minutes, and is compared with a color chart or with that produced in a loaf of bread of known acidity. Baking experiments upon dough of known but graduated acidities have shown that the range from orange to red corresponds to initial values of pH ranging from approximately 6 to 4.5.

Determination of pectins in spices, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 1–2, pp. 42–61*).—A method for the determination of pectins is described which consists essentially in removing the methyl esters other than the pectins by extraction with ether and distillation with steam. The pectins are then saponified with sodium hydroxid, and the methyl alcohol is obtained by distillation from the acidified solution.

Tables are given of the methyl alcohol and pectin content of spices and of materials used in their adulteration.

The photographic examination of fresh and preserved eggs, G. A. Le Roy (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 25, pp. 1026–1028, fig. 1; Ann. Falsif., 11 (1918), No. 111–112, pp. 10–18, figs. 4; abs. in Chem. Abs., 12 (1918), No. 10, p. 1086*).—The author describes the construction and operation of an apparatus for photographing eggs in such a way that the size of the air chamber may be accurately measured.

Determination of caffein in coffee, E. Vautier (*Ann. Chim. Analyt., 23 (1918), No. 10, pp. 207–210*).—The method consists in extracting 5 gm. of the finely ground sample, to which 5 cc. of ammonium hydroxid has been added, with ether for four hours in a Soxhlet apparatus. After removal of the ether by distillation, the caffein is separated from the fat by treatment with boiling water, and is then filtered, washed, and sublimed, and the sublimate heated in an oven at 100 C. for about 20 minutes.

A table is given showing the similarity in results obtained by this method and by the chloroform extraction method with samples of ordinary and decaffeinated coffee.

The testing of palm butter in the laboratory of the General Experimental Station of the A. V. R. O. S., with some hints for the manufacture of palm butter, F. C. van Heurn (*Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Alg. Ser., No. 2 (1918), pp. 37*).—An examination of various methods for determining the analytical constants of palm butter is reported.

For determining the moisture content, distillation with kerosene is considered the best method if the moisture content is higher than 4 per cent, while if less than 4 per cent heating at 105° C. for two hours is recommended. Kerosene is considered preferable to alcohol as a solvent for the fat in the separation of insoluble impurities. In determining the acid number, it was found necessary to use a very dilute solution of the fat in alcohol on account of the deep color of the concentrated solution. The author states that it is possible to produce a palm butter with a low acid number by immediately heating the fruit above 100° in the melted fat before the separation of the stones and by heating the fat to 100° before the final packing.

New tables for finding purity of massecuite, N. Claiborne (*Sugar* [*New York*], *20* (*1918*), *No. 11, pp. 454, 455*).—Tables based upon the total solids in the material used are given for finding the percentage of sirup or molasses required to give a massecuite of any desired purity, the purity of the molasses and sirup being known.

On a source of error in the use of picric acid in colorimetric estimations in biological fluids, Alice Rohde and Marion Sweeney (*Jour. Biol. Chem., 36* (*1918*), *No. 2, pp. 475–477*).—The authors conclude from blood sugar determinations with different samples of picric acid that a chromogenic substance other than sugar is present in the blood which certain picric acids fail to precipitate. Solid picric acid, after purification, may undergo a change in its precipitating value for chromogenic substances in the blood. It is, therefore, considered necessary to determine the precipitating value of picric acid before reliance can be placed upon color production in quantitative procedures for blood sugar.

A method for the estimation of potassium in blood, S. W. Clausen (*Jour. Biol. Chem., 36* (*1918*), *No. 2, pp. 479–484*).—An adaptation of the cobaltic nitrite method of Drushel (E. S. R., 19, p. 808) to the determination of potassium in small quantities of organic material is described. The modification consists essentially in heating potassium sodium cobaltic nitrite with dilute sodium hydroxid and estimating the nitrites thus formed by titration with dilute potassium permanganate.

Homemade beverages and vinegars, J. P. Arnold (*Chicago: North Chicago Printing Co., 1918, pp. 72*).—The theoretical principles involved in fermentation are discussed briefly, and recipes are given for the home manufacture of wines, cider, perry, beers, and vinegars.

The utilization without distillation of defective or acid ciders, perries, and lees, A. Truelle (*Vie. Agr. et Rurale, 8* (*1918*), *No. 37, pp. 189–191*).—The author suggests the utilization of defective ciders and perries in animal feeding and in vinegar making. The manufacture of vinegar is discussed in detail.

The use of hydrochloric or other mineral acids and special reagents for the preservation and ripening of forage in silo in warm climates, I. Giglioli (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 662–690*).—This is a compilation of the results of many investigations in different countries in regard to methods of treatment of silage. The methods considered in detail are treatment of the silage with steam, inoculation with lactic acid ferments, addition of molasses or sugar, treatment with special antiseptics, and treatment with special mineral acids or salts. An extensive bibliography is appended.

Potato drying, V. Peglion (*Pub. R. Accad. Lincei, Comitato Sci. Aliment.* [*Rome*], *No. 5* (*1918*), *pp. 11, figs. 3*).—This is a circular of information in regard to the potato-drying industry in various countries, together with descriptions of methods and machinery for the process.

METEOROLOGY.

Climate and types of farming (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 18* (*1918*), *pp. 2, 3*).—The influence of climate on types of farming in different parts of the United States is discussed, and the characteristic climatic features of five agricultural provinces east of the Rocky Mountains are noted.

"East of the Rockies the agricultural provinces have more or less definite climatic boundaries, extending in a general way in an east-west direction, conforming to the isothermal trend. In those regions there are five general provinces, as follows: The subtropical coast, the cotton belt, the corn and winter wheat belt, the spring wheat belt, and the hay and pasture region."

Monthly Weather Review (*U. S. Mo. Weather Rev., 46 (1918), Nos. 7, pp. 307–352, pls. 12, figs. 8; 8, pp. 353–400, pls. 14, figs. 13*).—In addition to weather forecasts, river and flood observations, and seismological reports for July and August, 1918; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during July and August, 1918; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 7.—Absoption and Radiation of the Solar Atmosphere, by S. Hirayama (reprinted abs.); Internal Temperatures of the Sun, by A. Véronnet (reprinted abs.); Halo Phenomena Observed During July, 1918, by W. R. Gregg; Report on Modes of Air Motion and the Equations of the General Circulation of the Earth's Atmosphere (illus.), by G. P. Paine; Influence of Forests Upon the Melting Snow in the Cascade Range (illus.), by A. A. Griffin; Snowfall on Mount Rainier, Wash. (illus.), by L. C. Fisher; and On Severe Winters, by G. Hellmann (reprinted abs.).

No. 8.—Volcanic Eruptions and Solar Radiation Intensities (illus.), by H. H. Kimball; Halo Phenomena Observed During August, 1918, by W. R. Gregg; South Carolina Meteor of April 23, 1918, by R. H. Sullivan; Photomicrographs of Snow Crystals, and Methods of Reproduction (illus.), by W. A. Bentley; Hot Spell of August, 1918, by A. J. Henry; Night-Temperature Studies in the Roswell Fruit District (illus.), by C. Hallenbeck (see below); Ice Storms in the Southern Appalachians, by V. Rhoades; Hourly Frequency of Precipitation in Central Ohio and Its Relation to Agricultural Pursuits (illus.), by H. H. Martin (see below); and Alleged Manufacture of Rain in Southern California, by F. A. Carpenter.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 5 (1918), Nos. 7, pp. 203, pls. 4, figs. 2; 8, pp. 204, pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1918, respectively.

Meteorological observations at Wisley, 1916, R. H. Curtis (*Jour. Roy. Hort. Soc., 43 (1918), No. 1, pp. 94–106, figs. 4*).—The meteorological conditions, especially temperature and rainfall, of each month of the year are summarized and compared with conditions in other parts of the United Kingdom, with particular reference to horticultural work.

The weather of the year was in general cold and wet, with a marked deficiency of bright sunshine and with more strong winds and gales than are usually experienced.

Night-temperature studies in the Roswell fruit district, C. Hallenbeck (*U. S. Mo. Weather Rev., 46 (1918), No. 8, pp. 364–373, figs. 8*).—The discussion in this article deals with an irregular area of about 1,200 square miles lying almost entirely west of the Pecos River. The influence of five factors is considered, especially in relation to the forecasting of frosts: "(1) The importation of warmer or colder air, (2) topographical influences, (3) air drainage, (4) mixture of the lower air with the air of higher levels, and (5) local inequalities in the heating and cooling of the ground and lower air."

Hourly frequency of precipitation in central Ohio and its relation to agricultural pursuits, H. H. Martin (*U. S. Mo. Weather Rev., 46 (1918), No. 8, pp. 375, 376, figs. 4*).—This article presents by months and seasons the peculiarities of the diurnal rainfall distribution at Columbus, Ohio, which is assumed to be typical of central Ohio, and a comparison is made with the rainfall distribution at Lincoln, Nebr., as reported by Kincer (E. S. R., 36, p. 717).

It is shown in general that the precipitation as measured at Columbus occurs for the most part in the form of light beneficial showers, and that the greatest amount falls between about noon and 7 p. m., with the actual maximum between 4 and 6 p. m. It is thought that this fact lessens evaporation and tends to increase the efficiency of the rainfall.

Frequency of subnormal rainfall in August (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 21* (*1918*), *pp. 2, 3, 7, fig. 1*).—A chart is given and briefly discussed which indicates for different sections of the United States the percentage of times in the 20-year period from 1895 to 1914 that the total rainfall in August was less than half the normal. The chart shows that "from the Rocky Mountains westward and in southwestern Texas deficiencies of this amount in the August rainfall are of frequent occurrence, except in most of Arizona and portions of the adjoining States, where the rainy season continues during this month. The large percentages of subnormal rainfall shown on the chart for this area are due to the fact that the amounts in this month are usually very small, but occasionally comparatively heavy falls occur which unduly magnify the monthly averages computed for a period of years. In portions of Arizona, the central Rocky Mountain area, the central Mississippi Valley, eastern Kansas, and from eastern Nebraska northeastward to central Wisconsin, and also along the central and east Gulf coast, as well as in parts of Georgia, the Carolinas, Virginia and Kentucky, Ohio, Pennsylvania, and Massachusetts, the August rainfall was less than half the normal only twice during the 20-year period under consideration; while locally in some of these areas deficiencies of this amount were not recorded during the entire period. East of the Rockies rather large percentages are found from Oklahoma southward, in northeastern Mississippi, southern Iowa, the western portions of the Dakotas, and in Montana; while in California, Oregon, and much of Nevada and eastern Washington the rainfall in August was less than half the normal from 50 to 80 per cent of the years comprising this period."

Problems of denudation, H. Jeffreys (*Phil. Mag. and Jour. Sci., 6. ser., 36* (*1918*), *No. 212, pp. 179–190; abs. in Sci. Abs., Sect. A—Phys., 21* (*1918*), *No. 250, pp. 410, 411*).—"The problem of denudation by rain freely running off a surface is treated dynamically. The movement of surface water is controlled by gravity and friction; hydrostatic pressure and inertia are negligible. Water, therefore, always moves along the lines of greatest slope. In mountainous regions the friction may be due to turbulence, but usually to viscosity. The motion is completely determinable given the form of the land and the rain distribution. In the case of viscous flow the rate of denudation is proportional to the product of the depth of water and the tangent of the slope. If this is constant the surface will sink at a uniform rate."

Hail protection, F. Courty (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *39* (*1918*), *No. 45, pp. 444–448*).—This is a summary of results of experiments from 1912 to 1917. The general conclusion from this review is that the evidence is not conclusive as to the effectiveness of cannonading as a protection against hail.

SOILS—FERTILIZERS.

Reconnoissance soil survey of the Lower San Joaquin Valley, Cal., J. W. Nelson, J. E. Guernsey, L. C. Holmes, and E. C. Eckmann (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 157, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 3,046,400 acres lying in the northern part of the San Joaquin Valley, in the physiographic division know as the Great Interior Valley of California, and occupying the central part of the State. The region consists chiefly of a broad basin-like valley, the slopes being for the most part less than 250 ft. in elevation. In the lower foothills along the margins of the survey, elevations of 1,000 ft. or more occur, while some of the northwestern part is below tide level. In general, the area is fairly well drained by the San Joaquin River and its tributaries.

With respect to their origin, the soils of the region have been grouped as residual from consolidated rocks, old valley-filling material from unconsolidated water-laid deposits, recent alluvial, wind-laid deposits, and miscellaneous materials. Old valley-filling material and recent alluvial soils comprise the greater part of the area. In addition to muck and peat, rough broken and stony lands, and riverwash and tailings, 51 soil types of 27 series are mapped.

Soil survey of Barry County, Mo., A. T. SWEET and E. W. KNOBEL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 44, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the University of Missouri, deals with the soils of an area of 506,240 acres situated near the southwestern corner of the State adjacent to the State of Arkansas. Topographically the county is a dissected plain sloping northwestward, the surface ranging from undulating and rolling in the northwestern part to rough and broken in the eastern and southern parts. The uplands attain a maximum elevation of from 1,300 to 1,550 ft. above sea level, while the depth of stream cutting ranges from 150 to 600 ft. Natural drainage is well established.

The upland soils of the county are residual in origin, those occupying the first bottoms and terraces of the larger streams alluvial, and those occupying the small, narrow valleys and strips along the outer edge of the main valley largely of colluvial origin. In addition to rough stony land, 16 soil types of 8 series are mapped. Baxter gravelly loam, Baxter stony loam, rough stony land, and Lebanon gravelly loam predominate, occupying 28.9, 15.5, 14.1, and 13.1 per cent of the total area, respectively.

Soil survey of Miami County, Ohio, E. R. ALLEN and O. GOSSARD (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 50, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Experiment Station, deals with the soils of an area of 261,120 acres situated in the southwestern part of the State. The topography of the area varies from an undulating to rolling terminal moraine in the eastern part of the county to a flat ground moraine in the western portion. Natural drainage is inadequate in the western part.

The soils of the county are chiefly of glacial origin and were formed largely from the underlying limestone formation and from Niagara limestone. Sixteen soil types of 12 series are mapped. Miami silt loam, Crosby silt loam, and Brookston silty clay loam, occupying 23.5, 18.2, and 14.8 per cent, respectively, of the total area, predominate.

Soil survey of Berkeley County, S. C., W. J. LATIMER, F. Z. HUTTON, C. LOUNSBURY, A. H. MEYER, and M. E. CARR (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 42, figs. 2, map 1*).—This survey deals with the soils of an area of 792,320 acres lying near the central part of the eastern boundary of the State in the Lower Pine Belt region of the Coastal Plain. The topography in general is level to gently undulating, the elevation ranging from tide level to 150 ft. above. Along the bluffs of the larger streams and their tributaries the upland is well drained, while back from the bluffs occur more or less extensive flat, poorly-drained areas.

The upland soils of the county are sedimentary in origin, having been derived from unconsolidated sands and clays. The soils of the first-bottom lands are of alluvial origin. Exclusive of tidal marsh, 20 soil types of 6 series are mapped. Coxville fine sandy loam and Norfolk fine sandy loam predominate, occupying 18.4 and 11.9 per cent of the total area, respectively.

Soil survey of Bell County, Tex., W. T. CARTER, JR., H. G. LEWIS, and H. W. HAWKER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 46, fig. 1, map 1*).—This survey deals with the soils of an area of 693,120 acres situated in the east-central part of the State and lying in the so-called Black Prairie and Grand Prairie regions of Texas. Although hilly, rough areas occur in certain sections of the county, the topography in general is gently rolling and is said to be representative of an area of about 17,000 square miles. Drainage is well established.

The upland soils of the area are residual in origin, being derived from calcareous clays and marls, soft and hard chalks, and hard limestones. Deposits of alluvial soils occur along the streams. Exclusive of rough stony land, 19 soil types of 12 series are mapped. Houston black clay, occupying 24.3 per cent of the total area, predominates.

Soil survey of Milwaukee County, Wis., W. J. GEIB and T. J. DUNNEWALD (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 32, fig. 1, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey, deals with the soils of an area of 154,240 acres lying in the southeastern part of the State and adjoining Lake Michigan. The topography of the county consists of a series of three broad, elongated ridges separated by two shallow, narrow lowland belts and running parallel to the lake shore. The surface in general is undulating to rolling, and an elevation of 840 ft. above sea level is attained in the western part. Natural surface drainage of the area is very incomplete.

The soils of the county consist of glacial deposits ranging in thickness from a few feet to almost 200 ft., about 90 per cent of the soil being heavier than loam. In addition to peat, 16 soil types representing 9 series are mapped. Miami silty clay loam occupying 37.7 per cent of the total area, Miami clay loam occupying 30.3 per cent, and Clyde clay loam occupying 12.6 per cent are the predominating types.

Soil survey of Door County, Wis., W. J. GEIB, C. THOMPSON, and H. V. GEIB (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 44, fig. 1, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey, deals with the soils of an area of 300,160 acres situated in the eastern part of the State and forming part of the peninsula separating Green Bay from Lake Michigan proper. The county lies in the glaciated limestone region, and the topography in general is undulating to gently rolling, while a line of rugged bluffs occurs along the western border, attaining an elevation of from 20 to 200 ft. above the lake. The mainland has an elevation of from 100 to 150 ft. above Lake Michigan. Owing to the heavy nature of the soil and subsoil, drainage is said to be deficient in many places.

The soils of the county are all derived from glacial or lacustrine material or both, and over a large part of the area they are shallow and quite stony. The surface formation consists of the late Wisconsin drift. Excluding rough stony land, peat, muck, and beach sand, 16 soil types of 7 series are mapped. Miami loam, Kewaunee loam, and Miami fine sandy loam, occupying 31.5, 17.9, and 10.2 per cent of the total area, respectively, are the prevailing soil types. Peat occupies 13.8 per cent of the total area.

Chemical criteria, crop production, and physical classification in two soil classes, J. S. BURD (*Soil Sci., 5 (1918), No. 5, pp. 405–419*).—Investigations conducted at the California Experiment Station by Burd, Hoagland, and Stewart, dealing with chemical analyses of water extracts of several cropped and uncropped soils as a measure of their relative productivity, have been previously noted (E. S. R., 38, pp. 812, 813). These studies also included analyses of the soils by the so-called complete, or fusion, method, and by the hydrochloric-acid and citric-acid extraction methods, the results of which are here reported for purposes of comparison. The conclusions reached may be summarized as follows:

Low figures for the important plant food elements (including potash, calcium oxid, magnesium oxid, phosphoric acid, and nitrogen), by water extraction and to a lesser extent by citric-acid extraction, were found to be in general accord with the crop-producing power of the soil. Except in the case of highly silicious soils, the complete analysis and hydrochloric-acid extraction methods are held to be worthless as criteria of the present productivity or probable endurance of the soil. Individual soils of a given series and class (Yolo silty clay loams) showed less variation in chemical composition than did representatives of different series of another physical class (fine sandy loams). The wide variation in crop yields and in the figures for water extractions within a given series and soil type are held to indicate that physical classification into types is inadequate as a means of predicting probable yields or determining fertilizer requirements.

The relative "rawness" of some humid subsoils, P. M. HARMER (*Soil Sci.*, *5* (*1918*), *No. 5*, *pp. 393–403*, *figs. 2*).—The author describes vegetative experiments made in the greenhouse at the Minnesota Experiment Station with both surface soils and subsoils taken from three prairie fields and four forested areas in the State in a study of the relative "rawness" of the subsoils of humid regions. The soils are said never to have been plowed. The prairie subsoils were found to be quite calcareous.

Experiments were made in 1915–16, employing only one soil sample from each region, the surface 12 in. of the prairie soil and 6 in. of the forested area being used, together with the corresponding subsoil from the third and fifth foot levels. The soils were placed in wooden boxes 12 in. square and 8 in. deep and cropped to both barley and alfalfa, the latter being well inoculated. The barley made a normal growth on the surface soil, producing well-filled heads, while that grown on the subsoil was stunted, yellowish-green in color, and produced very little seed. Three crops of alfalfa were obtained and indicated that the subsoils were as unproductive of alfalfa as of barley.

In the fall of 1916 more extensive experiments were begun with the seven different soils, the surface 6 in. and the corresponding subsoil from the third foot level being employed. These soils were placed in galvanized-iron pots and cropped with well-inoculated alfalfa plants transferred from a field sown five months before. Two subsoils, both low in carbonates and from forested areas, yielded as well as both the corresponding and other surface soils, while the remaining subsoils produced only from one-sixth to one-half as much as the corresponding surface soils. The nitrogen content of the productive subsoils did not exceed that of the unproductive subsoils.

It is concluded, therefore, that "in the humid State of Minnesota some of the glacial subsoils are as productive of alfalfa as surface soils when inoculation is assured, but others are quite unproductive, and the rawness is not associated with an especially low nitrogen content or with a lack of carbonates."

See also a previous note (E. S. R., 39, p. 620).

The influence of plant residues on nitrogen fixation and on losses of nitrate in the soil, H. B. HUTCHINSON (*Jour. Agr. Sci.* [*England*], *9* (*1918*), *No. 1*, *pp. 92–111*, *figs. 3*).—The author describes field, laboratory, and pot experiments made at Rothamsted during the period of 1906–1911, inclusive, in a study of the influence of sugar and plant residues upon nitrogen fixation in both sand and soil and upon the loss of nitrates in the soil. The results are summarized as follows:

"The foregoing experiments give definite evidence, corroborative of the work of Koch, Remy, and others, that the nitrogen content of sand or soil may be appreciably increased by the activity of Azotobacter when some suitable source of energy is supplied. For this purpose sugars, such as dextrose and saccharose, are suitable, but distinct gains have also been obtained by the use of plant residues. In laboratory experiments an increment of upward of 6 mg. of nitrogen per gram of plant residues occurred, but in pot experiments gains of 9 mg. per gram of substance were obtained. It is also shown that on the field scale, and in spite of the entrance of complicating factors, definite increases of crop (equal to 20 to 54 per cent) resulted from the application of carbonaceous compounds (sugar) when the soil conditions were favorable.

"Since the difference between the action of sugar and plant residues is largely one of degree and not of type, it is reasonable to suppose that such substances as stubble, leaves, and other complex organic materials may also serve to contribute indirectly to the reserves of soil nitrogen. The general soil conditions making for the successful operation of nitrogen fixation processes are, in addition to the supply of some source of energy, a suitable temperature, the presence of phosphates, and a supply of basic material, such as calcium carbonate. Even under the most favorable circumstances for nitrogen fixation there occurs a period during which adverse processes come into play, and it is not advisable that a crop be introduced before these have run to completion. Under unfavorable conditions, and particularly during periods of low temperature, these adverse changes may persist without any subsequent entrance of soil gains."

The production of carbon dioxid by molds inoculated into sterile soil, R. S. Potter and R. S. Snyder (*Soil Sci., 5 (1918), No. 5, pp. 359–377, figs. 5*).—This paper, a contribution from the Iowa Experiment Station, describes investigations planned to determine the physiological activity of certain molds when inoculated into sterile soil. A clay loam soil with a lime requirement of 1,540 lbs. of calcium carbonate per acre of 2,000,000 lbs. (Veitch) was employed. Sterilization was accomplished in the autoclave, and also in the Arnold sterilizer, in an effort to render the soil sterile without radically altering its composition. Inoculations were made from pure cultures of the different molds studied, including Mucor, Rhizopus, Aspergillus, Trichoderma, and Chaetomium, and from a soil emulsion, and the relative activity of the organisms was measured by the amount of carbon dioxid produced. The cultures were made both with and without 1 per cent of dextrose and with and without sufficient calcium carbonate to supply an excess of 1.6 tons of lime per acre over the lime requirement of the soil. The data are presented in tabular form and fully discussed.

Although the results of these experiments are not regarded as having definitely shown that molds are active in normal soils, the fact that in some cases more, and in all cases nearly as much, carbon dioxid was evolved from sterilized soils inoculated with molds as from similar soils inoculated with soil emulsions is held to indicate that they may be.

It has been definitely concluded that typical soil molds inoculated into sterilized soil grow with a vigor equal to or nearly equal to the growth induced by an inoculation with the entire soil flora, the evolution of carbon dioxid being the measure of the vigor of growth. Where dextrose was added to the soil the results were in general similar to those for the soil alone, except for the larger amounts of carbon dioxid given off. Calcium carbonate in this soil caused no marked increase or decrease in the growth of molds. Sterilization in the autoclave increased the nitrate, ammonia, and soluble nonprotein nitrogen, while sterilization in the Arnold sterilizer, increased the ammonia and soluble nonprotein nitrogen to a less extent and decreased the amount of nitrate. Molds in all cases caused a diminution in the amount of nitrates, while ammonia was not much changed in amount. In nearly every case there was a decrease in the amounts of soluble nonprotein nitrogen.

The inversion of cane sugar by soils and allied substances and the nature of soil acidity, F. E. Rice and S. Osugi (*Soil Sci., 5 (1918), No. 5, pp. 333–358*).—The authors describe a method for measuring acidity in soils through the inversion of sucrose in 50 cc. of a solution of cane sugar to which has been added from 5 to 10 gm. of the soil to be examined. They also present the results of considerable experimental work done at Cornell University upon the inversion of cane sugar by several different soils, the character of the soil extracts, the acidity due to the solid phase of the soil, inversion by other solid substances, the effect of hydrous oxids on cane sugar, and upon inversion and selective adsorption. Their conclusions may be summarized as follows:

Soils of many kinds and other insoluble materials can be made to invert sucrose. With soils this power is deemed to be a property of the mineral portion as well as of the organic matter. Furthermore, it is believed that this effect is due to acid and that this acid may occur in four different forms as follows: (1) A slight quantity in a few soils is soluble in the sugar solution. The principal portion, however, is bound to the soil particles in the nature of (2) acids which would otherwise be easily soluble, but are here strongly adsorbed on the soil particle surfaces, or (3) an insoluble acid such as silicic acid. Also (4) a neutral salt present in the soil solution in even small quantities may be broken down while in contact with the soil mass, the basic part being more strongly adsorbed than the acid, and the latter left free to exert its characteristic influence in inverting cane sugar.

That the inverting activity of soils is chiefly a property of the insoluble part is said to have been indicated in several ways. Many soils showed inverting action on sugar in a solution which remained neutral after contact with the soil or in some instances became alkaline. Also, when soil was allowed to adsorb some base, then digested with cane sugar solution, it showed inverting action and also yielded up sufficient base to make the extract distinctly alkaline. Very little, if any, inverting power was found in water extracts from soils. Inversion did not continue in sugar extracts after the soils were removed. Inversion increased with increasing amounts of soil in contact with the sugar solution, while there was no measurable change in the hydrogen-ion concentration in the extract. Greater inversion was produced by shaking soils with sugar solutions than by allowing the mixtures to stand quiet. Long continued and repeated extractions of soils with water and with cane sugar solution did not greatly reduce their inverting power.

Fuller's earth, cotton, charcoal, and other substances sometimes described as similar to acid soils were found not to invert cane sugar. Otherwise soluble acids so strongly adsorbed by solids as not to be removed by washing in any measurable quantity inverted sugar in such condition. Silicate minerals were given inverting power by treating suspensions with direct current, the base splitting off and passing into solution and to the cathode and insoluble silicic acid remaining with the mass. Soil acidity is said to be increased by a similar treatment of soils. Contrary to previous conclusions, hydrous oxids of lead, copper, bismuth, aluminum, iron, and zinc were not found to have any inverting power. Many suspended substances having no inverting power alone were found to produce inversion when a neutral salt was present, through selective adsorption of the base, thus setting a small amount of acid free.

"'Soil acidity' is the term customarily applied when infertility of soil can be corrected by the use of a free base, such as lime. There are many factors involved in causing this condition in soils, the presence of real acids being only one of them. Methods used for detecting or determining 'soil acidity' generally do not measure the acid there but may depend upon many properties of soil mass in no way related to acidity. The power of a soil to catalyze the reaction of cane sugar inversion is a measure of its acid, and is probably the only method which can measure the acid bound up with the soil solid phase."

A bibliography of 105 titles is appended.

The chemical effects of CaO and $CaCO_3$ on the soil.—I, II (*Soil Sci., 5* (*1918*), *No. 5, pp. 379–392*).—Investigations with water extracts (E. S. R., 38, pp. 812, 813), osmotic pressures (E. S. R., 38, p. 813), and soil reactions (E. S. R., 36, p. 117), made at the California Experiment Station, led to further observations concerning the effects of lime upon the soil as evidenced by these methods of study. The experimental work has been divided into two parts as follows:

I. *The effect on soil reaction*, by D. R. Hoagland and A. W. Christie (pp. 379–382).—Clay adobe, sandy loam, and silty clay loam soils were used in this investigation in addition to beach sand. Two 20-lb. lots of each soil were placed in earthenware pots and commercial quicklime added in the proportions of 0.07 and 0.28 per cent, respectively, calculated in terms of pure calcium oxid. The soils were maintained at approximately an optimum moisture content for six months. Samples were taken at intervals during this period and the H-ion concentration determined by the hydrogen electrode method.

The initial effect of both low and high percentages of calcium oxid was to increase greatly the OH-ion concentration in all the soils examined, the reaction of the clay adobe being least affected and that of the beach sand most affected. The influence decreased with time, but was more marked than in the case of the untreated soil or that treated with calcium carbonate even after 10 months.

Growing barley on soil in contact with calcium oxid for six months failed to produce any significant change in the OH-ion concentration, and no inhibition of plant growth was observed.

With the addition of an excess of calcium oxid to an acid fine sandy loam soil, nitrification was practically inhibited due to the high concentration of OH-ion, while similar soil treated with calcium carbonate gave 100 per cent nitrification.

II. *The effect on water-soluble nutrients in soils*, by A. W. Christie and J. C. Martin (pp. 383–392).—The direct chemical effects of calcium oxid and calcium carbonate on the water-soluble calcium, magnesium, potassium, phosphate, sulphate, and nitrate in seven different soils, including sandy loam, fine sandy loam, silty clay loam, and clay adobe, were studied. Previous soil treatments included either leaching, storing, cropping, or fallowing. Data on the osmotic pressure of the soil solutions as determined by the freezing-point method are also presented.

Six 500-gm. portions of each air-dry soil were used and duplicate applications made of 0.5 gm. of calcium carbonate and 0.28 gm. of calcium oxid. The soils were maintained at an optimum moisture content for one week and then analyzed. In order to demonstrate more fully the direct effect of lime, 0.4 per cent calcium oxid was added to a silty clay loam soil and allowed to stand only 24 hours before analysis. The results obtained indicated the immediate chemical effects of quicklime.

The effects of calcium oxid were more pronounced than those of calcium carbonate. Water-soluble potassium was increased in two soils and decreased in two, soluble magnesium increased in four cases and decreased in one, soluble sulphate increased in four soils, and soluble phosphates increased in two, while in only one case was a significant increase in nitrate observed.

The authors state that "it is evident from the data considered that all soils do not react chemically with lime in the same manner. Furthermore, even the same soil under different concentrations of soil solution, due to cropping or fallowing, may react differently. No attempt is made to explain the reasons for the changes observed. Evidently, the addition of lime compounds changes the equilibrium in the complex soil solution, and the resultant effects are varied and impossible to predict. Further study involving determinations of all the elements concerned would be necessary before even a plausible hypothesis could be advanced."

Neutralization of sour soils (*Bul. R. I. State Col., 13 (1918), No. 4, p. 39*).—In a comparison at the Rhode Island Experiment Station of the different forms of lime it is stated that "no positive crop differences developed where high magnesium limestone, high calcium limestone, or the burned and hydrated products produced from them were added in quantities sufficient to neutralize the same amount of acid in the laboratory. There appears to be no reason for avoiding the magnesian products." The lime in Thomas slag phosphate is said to be about one-third as efficient as that in the finest carbonate (E. S. R., 37, p. 815).

Largely through the continued use of sulphate of ammonia instead of nitrate of soda for top-dressing lawn grasses, the soil acidity was maintained to such an extent that weeds were eliminated. This being especially marked in the case of crab grass. See also a previous note (E. S. R., 37, p. 446).

Much of the benefit derived from liming is thought to be due to the precipitation of aluminum from the soil solution. Laboratory and solution experiments have shown that aluminum itself, aside from the acidity of its salts, was much more toxic to barley than to rye, affecting the two plants in the same manner as do so-called acid soils. See also a previous note (E. S. R., 39, p. 114).

An analysis of dry ground starfish showed it to contain approximately 5 per cent of nitrogen and 27 per cent of calcium oxid.

[Work in soil chemistry and bacteriology at the New Jersey Stations, 1917] (*New Jersey Stas. Bul. 317 (1917), pp. 28–34*).—This notes the progress of field and cylinder experiments on nitrogen availability and nitrogen accumulation and utilization, and describes new work undertaken to determine the fertilizer requirements of corn and potatoes.

The average yield of timothy on the nitrogen availability plats was 2,562 lbs. per acre for the unlimed plats and 2,472 lbs. for the limed plats. It is suggested that the reduced yield on the limed plats may have been due to a more rapid depletion of the nitrogen in the absence of legumes in the rotation. Rotation experiments in which clover supplied part of the nitrogen resulted in higher yields of timothy on the limed plats. Nitrate of soda, sulphate of ammonia, farm manure, and dried blood added to Penn loam soil in cylinders resulted in a recovery of 55.77, 41.75, 29.85, and 29.41 per cent of the applied nitrogen, respectively. In cylinders containing soils of varying mechanical composition, 61 per cent of the nitrogen applied as nitrate of soda was recovered as compared with 30 per cent from dried blood.

Wheat and rye grown continuously on the nitrogen accumulation and utilization plats are said to have given unusually low yields. Wheat grown on plats seeded to soy beans immediately after the wheat harvest yielded 5 bu. per acre more than wheat grown on wheat stubble. Liming the plats resulted in increased yields of soy beans, cowpeas and oats, Canada field peas, and alfalfa. Counts of the number of nodules on the roots of soy bean plants grown on both limed and unlimed plats showed an average of 85 nodules per plant for the former and 87 for the latter. The result obtained in cylinder experiments are held to indicate that in most cases larger yields were obtained where nitrogen was secured from leguminous green manure crops (grown between the main crops) than from either nitrate of soda or stable manure. This was specially noticeable in the case of corn.

The potato fertilizer experiments were conducted cooperatively at Mt. Holly and Elmer. The results of the first season's work indicate that an application of 1,200 lbs. of a standard 4:8:3 fertilizer was as efficient in increasing yields as the use of 1,600 lbs., and that a 3 per cent potash mixture gave better results than a 10 per cent mixture.

What is the bulk of manure produced by the consumption of hay? J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 78 (1917), pp. 244–248; abs. in Chem. Abs., 12 (1918), No. 20, p. 2105*).—Experiments are reported in which eight steers divided into four lots of two each were fed from December 29 to April 2, as follows: Lot 1, a standard ration of bean meal 190 lbs., maize 190 lbs., roots 3,971 lbs., chopped straw 757 lbs., and hay 752 lbs. Lots 2, 3, and 4 were fed the standard ration with the addition of 1,120 lbs. of hay for lot 2, 1,099 lbs. of palm-nut cake for lot 3, and 1,101 lbs. of malt culms for lot 4. All lots received the same amount of bedding, 1,907 lbs. The more important results obtained are given in the following table:

Manure produced by steers on different rations.

Lot.	Bulk of manure.	Weight of manure.	Mineral matter.	Nitrogen.
	Cu. yds.	*Lbs.*	*Per cent.*	*Per cent.*
1	5.53	8,330	4.22	0.467
2	6.72	9,723	4.23	.495
3	5.67	8,491	4.20	.750
4	7.00	10,759	3.79	.665

The conclusion drawn from these figures is that a ton of hay consumed in the yards will give 2.38 cu. yds. of extra bulk of manure, but that while cake fed in the same way produces little increase in bulk of manure, namely, about 0.25 cu. yd. for every ton consumed, "foods of bulky nature, like malt culms, dried grains, etc., produce an even greater bulk of manure than hay does (nearly 3 cu. yds. for each ton consumed). Feeding with malt culms or dried grains calls for more water to be given to bullocks than when hay is fed. The amount of water taken with cake and with hay is about the same in either case."

The triangle system for fertilizer experiments, O. Schreiner and J. J. Skinner (*Jour. Amer. Soc. Agron., 10 (1918), No. 6, pp. 225–246, pls. 3, figs. 14*).—In this paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, a triangle system for representing different fertilizer treatments, first employed by the authors in nutrient solution studies (E. S. R., 23, p. 624), is fully described and its application to experimental work both with nutrient solutions and in the field discussed and illustrated. With proper care in planning the work, the method is thought to present a comprehensive basis for the interpretation and the easy presentation and handling of the results.

Manurial values of dairy feeds, R. I. Grady (*Mo. Bul. Ohio Sta., 3 (1918), No. 10, pp. 317, 318*).—The author presents a table showing the amounts of nitrate of soda, 16 per cent acid phosphate, and muriate of potash which would be, respectively, equivalent in nitrogen, phosphoric acid, and potash to the amounts contained in 1 ton each of corn, oats, bran, oil meal, cottonseed meal, clover hay, and alfalfa hay, as indicated by data given in Henry and Morrison's Feeds and Feeding (E. S. R., 34, p. 261). At the present high prices of fertilizers, the manurial value of these feeds has been calculated as $13.90, $17.80, $33.23, $48.63, $56.95, $26.02, and $32.76 per ton, respectively.

[Fertilizers required for food production in Norway] (*Tidsskr. Norske Landbr., 24 (1917), No. 5, pp. 208–211; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 9, p. 1041*).—Summarizing data which are given in detail, it is estimated that per annum "the total fertilizer required in Norway to provide for food production is 70,862 tons of 15 per cent calcium nitrate, 91,531 tons of 16 per cent superphosphate, and 41,336 tons of 37 per cent potash salts."

Fertilizers in South Africa (*So. African Jour. Indus., 1 (1918), No. 5, pp. 465–467; Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, pp. 668–670*).—It is pointed out that the fertilizer requirements of South Africa are, in descending order of importance, phosphoric oxid, nitrogen, and potash. Statistics are given of the imports of manures and fertilizers into South Africa from 1913 to 1916, and the results of a survey, by the Scientific and Technical Committee, of the fertilizer situation are briefly reviewed.

The domestic sources of fertilizing materials include "South African guano supplies, the increased employment of green manuring, the use of ground limestone, the possible utilization of wool-washery and sawdust waste and of kelp for supplies of potash, cottonseed by-products, locally produced ammonium sulphate, the supply of phosphates from the Seychelles and elsewhere, and the possible utilization of Saldanha Bay and other local phosphate rocks." In addition there is a considerable amount of abattoir and fishery refuse which might be used for fertilizing purposes.

Efforts are being made to convert the large deposits of iron-alumina phosphates of South Africa into a form suitable for agricultural use. About 200 tons per month of ammonium sulphate is being produced from coal in Natal, practically all of which is exported to Mauritius for use in growing sugar cane.

Electric power for nitrogen fixation, E. K. Scott (*Proc. Amer. Inst. Elect. Engin., 37 (1918), No. 7, pp. 779–792, fig. 1; abs. in Sci. Abs., Sect. B—Elect. Engin., 21 (1918), No. 250, pp. 369, 370*).—The author compares the direct arc process for making nitric acid with the indirect cyanamid process.

It is shown that the arc process is much simpler, and the suggestion is made that a number of plants making nitrates by this process should be erected at existing power houses, working with off-peak power. A plant of 10,000 kw. is considered suitable. Transportation would thus be reduced. "A diagram is given showing the layout of a battery of by-product coke ovens with an electric power house worked by the surplus gas and a nitrate-from-air plant to use the electricity. Figures are given showing that the nitric acid made by such a plant is about the right amount to combine with the ammonia to form ammonium nitrate, a compound in great demand at the present time for explosives."

A new fertilizer, "superphosphate of ammonia," C. Brioux (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 21, pp. 632–638; abs. in Chem. Abs., 12 (1918), No. 20, p. 2104*).—A method of using superphosphate to absorb ammonia is described, and the fertilizing value of the neutral product thus obtained is discussed. The product obtained by this process in the experiments here reported contained 15.8 per cent of phosphoric acid, 14.1 per cent of which was soluble in 2 per cent citric acid, and 4.97 per cent of ammoniacal nitrogen.

The solubility and assimilability of calcium phosphates, Lindet and A. Bruno (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 24, pp. 692–694, 705–708; abs. in Chem. Abs., 12 (1918), No. 20, p. 2104*).—The question as to whether rock phosphate mixed with sulphur, as proposed by Lipman and others, would become citrate-soluble in a calcareous soil, is discussed, and various investigations indicating that sulphur in the soil aids ammonifying bacteria and is oxidized to sulphuric acid are reviewed.

Recovery of potash from iron blast furnaces and cement kilns by electrical precipitation, L. Bradley (*Jour Indus. and Engin. Chem., 10 (1918), No. 10, pp. 834–838*).—Among the conclusions drawn in this article are that "while the largest immediate tonnage [of potash] may be obtained from desert lakes, kelp, alunite, and a few other sources, nevertheless a study of the economic problems will show that the surest way of making our potash industry a permanent and enduring one, able to supply all of our requirements, even against German competition, is to develop and rely upon the by-product potash." The present development and possibilities of recovery of potash as a by-product from blast furnaces and cement works are discussed. In the author's opinion, the potentialities of recovery from blast furnaces apparently surpass those of the cement industry.

A classified bibliography of the subject is given.

Recovery of potash from kelp, C. A. Higgins (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 832, 833, fig. 1; abs. in Amer. Jour. Sci., 4. ser., 46 (1918), No. 276, pp. 764, 765*).—This article describes especially improvements in methods of harvesting kelp and recovery of by-products by a company operating near San Diego, Cal.

In the author's opinion, the domestic demands for potash can not be supplied from the Pacific Coast kelps. "Kelp, solely as a source of potash, will never compete with unrestricted supplies from Europe or even with the potash recovered in modern cement or blast-furnace practice. The utilization of kelp in such a way, however, as to realize on all the other possible values of kelp may help to render the users of high-grade potash for chemical purposes outside of the fertilizer trade independent of foreign supplies."

Potash from desert lakes and alunite, J. W. Hornsey (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 838, 839*).—This article briefly reviews Government and private investigation of sources of potash in the United States, including Searles Lake, Great Salt Lake, and other American lakes, the Pintados deposit in Chile, and alunite.

In the author's opinion these investigations have definitely resulted in the development of a permanent potash industry in this country, since some of the plants now in operation "will, undoubtedly, be able to continue after the war."

Potash from Searles Lake, A. de Ropp, jr. (*Jour. Indus. and Engin. Chem., 10 (1918), No. 10, pp. 839–844, figs. 14*).—A description is given of the Searles Lake deposits and of the works established there to recover potash and other products. It is stated that one plant in operation there is now producing about 1,800 tons of crude potash salts per month.

The Alsatian potash mines and works (*Chem. Trade Jour., 63 (1918), No. 1646, pp. 419, 420*).—Statements from both the German and the French points of view are given regarding the capacities and present and possible development of these mines and works.

Lime, and the liming of soils, J. A. Hanley (*Jour. Soc. Chem. Indus., 37 (1918), No. 12, pp. 185T–190T; abs. in Chem. Abs., 12 (1918), No. 20, p. 2106*).—Results of tests of the lime requirements of Yorkshire soils of different kinds by the Hutchinson and MacLennan method (E. S. R., 33, p. 622) are reported and discussed.

The author concludes that the "sourness" observed in these tests "is due to the neglect of liming soils either originally deficient in lime, e. g., coal measures or millstone grit, or from which the lime has been washed out by rain, e. g., limestone soils and many of the drift soils," and that "the inevitable loss of lime by leaching is augmented (1) by the continuous use of acid fertilizers, particularly sulphate of ammonia, and (2) by the presence of a smoky and acid atmosphere." Methods of correcting the conditions observed by liming and the relative value of different forms of lime for the purpose are discussed.

The recovery of ashes and their utilization in agriculture, A. PIÉDALLU (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 28, pp. 781–784; abs. in Chem. Abs., 12 (1918), No. 20, pp. 2104, 2105*).—The value of the ashes from French army and Paris bakeries is discussed. It is stated that the ashes from the army bakeries are used in the military gardens, but it is estimated that 3 metric tons of ashes containing 660 lbs. of potash salts from the bakeries of Paris are daily wasted. A table showing the ash, potash, phosphoric acid, and manganese content of different kinds of wood is given.

AGRICULTURAL BOTANY.

Ecology, F. E. CLEMENTS (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 303–306*).—Ecological studies during 1917 have centered mainly upon the problems of grazing research, indicator plants, climatic cycles, climatic cycles and succession in bad lands, and a system of permanent quadrates.

Experimental evolution in a desert habitat, W. L. TOWER (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 95–98*).—It is stated that since any desert environic complex represents probably the most diversified and variable set of conditions that organisms are called upon to meet, none of the introduced species could breed or survive without some aid in meeting such desert conditions. The cultures of introduced species now at Tucson, Ariz., have achieved a safe degree of adjustment to the problems they have met. Data are given regarding adjustment tests to which plants were subjected and the genetic behavior of plants under observation and experiment.

Vital statistics of desert plants, F. SHREVE (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 93–95*).—A record has been carried on for seven years in regard to the germinations and the fate of the seedlings of several species of desert perennials on an area near the Desert Laboratory. Growth curves established indicate that the largest individuals of *Carnegiea gigantea* are from 125 to 175 years old. Notes are given on germinations and survivals of the various species which were planted in the observational area in question.

It appears that the establishment of new individuals in the plant populations of the desert is an extremely slow process, even for plants which are abundant and characteristic. This fact leads to a striking conservatism as regards certain forms, this conservatism contrasting sharply with the rapid and abundant development of annual forms during periods favorable thereto.

Plant distribution on desert mountains, F. SHREVE (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 92, 93*).—An attempt is being made to study the causes of the presence or absence of different species of plants in various mountain regions.

Rate of growth in relation to altitudinal conditions, F. SHREVE (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 89, 90*).—From work prosecuted for several years, mainly on the Santa Catalina Mountains, it appears that the number of pine trees more than 10 cm. in diameter increases with an altitude of from 6,000 to 9,000 ft., marking approximately the limits of yellow pine. Climatic conditions and soil moisture are discussed in this connection.

The rôle of climatic conditions in determining the distribution of vegetation in the United States, B. E. LIVINGSTON and F. SHREVE (*Carnegie Inst. Washington Year Book, 16 (1917), p. 95*).—This investigation is said to have shown conclusively that the principal types of vegetation in the United States are controlled as to distribution by those moisture conditions which are related most directly to the maintenance of equilibrium between absorption and transpiration in individual plants.

Evaluation of the temperature of the soil as an environmental factor, W. A. CANNON (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 91, 92*).—A study of the influence of soil temperature on growth, employing as an indicator the development of *Covillea tridentata*, which is said to be very sensitive in this respect, is claimed to show that the soil temperature at a depth of 30 cm. (11.8 in.) at Tucson, Ariz., is about eight times as effective for root growth of Covillea as at the same depth at Carmel. This is a difference sufficient to account for the survival of a species in one locality and its failure in another.

Osmotic concentration of tissue fluids in relation to geographical distribution, J. A. HARRIS (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 88, 89*).—Studies previously reported (E. S. R., 37, pp. 47, 632; 38, p. 125; 39, p. 29) and in progress on sap concentration have at present for their ultimate object the completion of a reconnoissance of the sap properties of the vegetations of typical phytogeographical regions, a list of which is given.

Vegetable saps (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 131, 132*).—The director of the department of experimental evolution states that studies by Harris and Lawrence have shown that sap concentration in trees increases from lower to higher levels, and it is considered probable that this increase of concentration with elevation is a cause of sap ascent. A correspondence appears to exist also between sap concentration and environmental conditions and between concentration and the successive terms of the series trees, shrubs, half shrubs, perennial herbs, and winter annuals. Phanerogamic parasites (Loranthaceæ) have in general higher osmotic pressures in their saps than their hosts.

Some marine mangroves show, as regards sap concentration, osmotic pressures at least as high as 50 atmospheres. Certain mangroves growing in nearly fresh water show not over half that concentration. These facts, it is thought, may possibly be connected with the adaptation of mangroves to growth in salt water.

Studies on the development and nutritional physiology of some Chlorophyceæ, H. NAKANO (*Jour. Col. Sci., Imp. Univ. Tokyo, 40 (1917), Art. 2, pp. 214, pls. 3, figs. 9*).—A study has been made involving pure cultures of three new physiological races and two new morphological species of algæ. All of these are said to be able to give, when cultivated with Azotobacter, a larger amount of nitrogen than is given by Azotobacter alone. This fact is held to point to a symbiotic relation between Azotobacter and the algæ in question.

Yellowing in these algæ is said to result from the diminution of chlorophyll while the yellow coloring matters persist, the yellowed cells being richly supplied with fat or grains of amylodextrin. The factors involved are a plentiful supply of assimilable carbon, deficiency of nitrogen, intense illumination (red rays), optimal temperature, and alternate presence and absence of air. The conditions for restoration of normal green color are renewed supply of nitrogen compounds (several forms named), moderate light intensity (blue rays) or even darkness, optimum temperature, and sufficient oxygen supply.

In full light, the principal factor in etiolation is saprophytism, the secondary factors being the influence of light, air, and temperature. Bleaching is a result of the formation of formic acid, this phenomenon indicating death, while yellowing is characteristic of living plants.

Studies on the poisonous effects of organic and inorganic acids show that the injury is due to the presence of undissociated acid molecules.

Yellowing is regarded as of ecological significance. Increase of carbon sources checks chlorophyll formation, and as a result nitrogen may be utilized.

Controlled pollination in Nicotiana, T. H. Goodspeed and Pirie Davidson (*Univ. Cal. Pubs. Bot., 5 (1918), No. 13, pp. 429–434*).—The authors indicate the results of controlled pollination experiments carried out with *N. langsdorffii grandiflora* in a greenhouse, the temperature of which ranged around 30° C. (86° F.). While the data are regarded as too fragmentary to justify sweeping conclusions, it appears that fertilization of an extremely small percentage of the ovules is sufficient to prevent abscission of the flower, and it is emphasized that this fact apparently does not depend upon the normality of the embryo sacs and their capability for fertilization.

It was found that there is in Nicotiana a certain stage of development of the seed capsule beyond which automatic abscission does not occur and spontaneous abscission can not be induced. This is explained by the fact that mechanical tissue is rapidly developed in the pedicel of the flower after anthesis in sufficent amount to retain the flower upon the plant. It appears also that no normal pollen is produced by the F_1 *tabacum-sylvestris* hybrids. Apparently, also, there is no selective fertilization from the point of view of position on the placentæ, the particular embryo sacs reached by the pollen tubes being a matter of chance.

The inheritance of germinal peculiarities. Flowering plants (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 125–127*).—An account by the director of the department of experimental evolution is given of inheritance studies by Blakeslee (E. S. R., 32, p. 726; 36, p. 522; 37, p. 831), which are being continued.

In case of the yellow daisy (*Rudbeckia hirta*), added evidence has been accumulated in regard to the inheritance of self-fertility and self-sterility and the effects of inbreeding. The work on jimson weeds (*Datura stramonium*) has been extended, and a number of new mutants have been discovered. Results of similar work previously done suggest that the mutant character is transmitted through the female and not through the male parent. In Portulaca a dwarf mutant has been found which appears to act as a Mendelian recessive, but which occasionally produces branches reverting to the normal type, which are heterozygous for the dwarf character. Other vegetative segregations as well as doubling and color types of flowers in this species are being studied. Doubling in Portulaca seems to be a Mendelian dominant. Helianthus is under investigation as regards doubling and self-fertility. Verbena is being investigated regarding color characters and self-fertility. The adzuki bean (*Phaseolus angularis*) has been grown for a number of years. Its qualities, some of which are valuable, are discussed. Other studies of adzuki bean and other beans are mentioned.

Analysis of a potato hybrid, Solanum fendleri×S. tuberosum ("Salinas"), D. T. MacDougal (*Carnegie Inst. Washington Year Book, 16 (1917), p. 98*).—The wild potato of Arizona (*S. fendleri*), growing above an elevation of 5,000 ft., producing a small tuber, and enduring the climatic extremes of that habitat, has been carried through acclimatization cultures at Tucson and at the Coastal Laboratory. The cross was obtained in 1914 and the second generation, of about 1,000 plants, was brought to maturity in 1917.

The F_1 generation proves to be intermediate between the two parents, producing tubers two or three times as large as the wild parent. The F_2 includes a number of individuals apparently identical with the wild parent. Intermediate forms were also obtained, and it may appear that the domestic parent is also represented. The hybrid has been grown at various points, and this material is to be used in further genetic studies.

Mass mutations and twin hybrids of Œnothera grandiflora, H. DE VRIES (*Bot. Gaz., 65 (1918), No. 5, pp. 377–422, figs. 6*).—The author has given attention to the phenomenon reported with discussion by Bartlett (E. S. R., 35, p. 128) under the name mass mutation, which is said to give rise to offspring deviating in large numbers from type in a particular direction and appearing in the same sowings with normal mutations in other directions. Guided by the fact pointed out by Bartlett that the phenomenon bears some resemblance to Mendelian segregation, and proceeding on the assumption that the fundamental mutation possibly occurred in only one of the two gametes in a generation preceding the one in which the diversity becomes manifest, the author has studied the phenomenon of mass mutation in *Œ. grandiflora* in connection with its ability to produce twin hybrids in certain crosses. He claims to have found that the twin hybrids may be considered as a consequence of mass mutation, the mutated gametes producing one of the twins and the typical sexual cells the other. This conception is considered as applicable to *Œ. lamarckiana*, rendering superfluous certain hypotheses previously proposed.

It has been found that *Œ. grandiflora* from Castleberry, Ala., splits into two types in every generation, one of these consisting of strong, green plants of the parent type, the other of weak, yellow individuals, only a few of which flower and ripen seeds. The latter type is called *Œ. grandiflora ochracea*. Besides these, it produces other mutants in the ordinary proportions of 0.1 to 1 per cent, namely, *Œ. lorea*, with almost linear leaves, and *Œ. gigas*, with 28 chromosomes and the corresponding stoutness of all its organs. These two types are constant from seed, but *Œ. gigas* mutates into *Œ. lorea* and *Œ. ochracea*. Crosses among *Œ. grandiflora*, *Œ. ochracea*, and *Œ. lorea* show that these forms are isogamic, the pollen carrying the same hereditary qualities as the egg cells. Other observations are indicated with discussion.

The observed facts and the occurrence of about 25 per cent of barren grains among the seeds led to the conclusion that the yearly production of *Œ. ochracea* is a phenomenon of mass mutation analogous to the instances reported by Bartlett, and due to an initial mutation of the ordinary rare type followed by secondary mutation in the succeeding generations. This initial mutability of *Œ. grandiflora* is thought to have yielded, besides the ordinary mutants, hybrid mutants produced by the combination of a mutated sexual cell with a normal one. Assuming the offspring of this fecundation to split in a manner analogous to Mendel's formula for monohybrids, three types are supposed to result. One of these is the mutant *Œ. ochracea*, which is now a secondary mutant; the second is a mutant hybrid of the type of the species, which will repeat the splitting; and the third must be a constant form of the same type. This last does not appear, and a lethal factor is assumed to account for this gap. It must be linked to the otherwise pure *Œ. grandiflora* gametes. It is supposed to explain the absence of the constant type, together with the presence of a corresponding percentage of empty seeds. In this way, the mass mutation as well as the empty grains can be explained by the assumption of two initial mutations of the ordinary type. One is that into *Œ. ochracea*, the other is the origin of a lethal factor linked to the gametes which are not mutated into a weak, yellow form.

South African Perisporiales.—I, Perisporiaceæ, ETHEL M. DOIDGE (*Trans. Roy. Soc. So. Africa, 5 (1917), pt. 6, pp. 713–750, pls. 10*).—The author presents a list of Perisporiaceæ, representing collections from different parts of South Africa, indicating a number of what are claimed to be new species.

Uredinales of the Andes, based on collections by Dr. and Mrs. Rose, J. C. Arthur (*Bot. Gaz.*, *65* (*1918*), *No. 5*, *pp. 460–474*).—The present contribution to the fungi of the Andes comprises mainly material secured by Dr. and Mrs. J. N. Rose in 1914, including the new genus Cleptomyces; the new species *Uropyxis quitensis*, *Sphenosporea berberidis*, *Puccinia roseanæ*, *P. nicotianæ*, *P. acnisti*, *P. cuzcoensis*, *P. unicolor*, and *Æcidium enceliæ;* also the new combinations *C. lagerheimianus*, *P. bambusarum*, and *P. mogiphanis*.

The allies of Selaginella rupestris in the southeastern United States, G. P. Van Eseltine (*U. S. Nat. Mus.*, *Contrib. Nat. Herbarium*, *20* (*1918*), *pt. 5*, *pp. VII+159–172*, *pls. 8*, *figs. 8*).

FIELD CROPS.

Farm practices that increase crop yields in Kentucky and Tennessee, J. H. Arnold (*U. S. Dept. Agr.*, *Farmers' Bul. 981* (*1918*), *pp. 38*, *figs. 12*).—Measures are described for building up run-down land in the limestone and mountain districts south of the Ohio River, embracing Kentucky, Tennessee, southern West Virginia, and the western and more mountainous parts of Virginia and North Carolina. The establishment of suitable crop rotation systems, including legumes and grasses, and the judicious use of manure, crop refuse, lime, and commercial fertilizers, is recommended. Good farm practices employed on several rejuvenated farms are outlined, and some practical suggestions made on farming in this region.

Farm practices that increase crop yields in the Gulf Coast region, M. A. Crosby (*U. S. Dept. Agr.*, *Farmers' Bul. 986* (*1918*), *pp. 28*, *figs. 10*).—Changes in the cropping systems of the Gulf Coast region of Alabama, Mississippi, and West Florida are recommended, consisting chiefly in the introduction of one or more legumes. The relative value for soil improvement of velvet beans, cowpeas, soy beans, bur clover, vetch, peanuts, crimson clover, beggar weed, Lespedeza, oats, and rye is briefly discussed. Intercropping corn and cotton with a legume and the use of commercial fertilizers and winter cover crops as means of increasing soil fertility are described. Crop rotations for various systems of farming are outlined.

Crop systems for Arkansas, A. D. McNair (*U. S. Dept. Agr.*, *Farmers' Bul. 1000* (*1918*), *pp. 24*, *fig. 1*).—Crop systems said to make for increased food production and increased efficiency in both man and horse labor are described which are deemed applicable to all of Arkansas except the northwestern part, to northern Louisiana, northeastern Texas, southeastern Oklahoma, western Tennessee, and the northern half of Mississippi. The crop acreages for each cropping system suggested are calculated on the basis of two men and a team and for light, medium, and heavy soils. It is stated that two men with a team, who under a system of cotton and corn could farm but 33 acres of land, can handle 50 acres and raise 62 acres of crops under a system providing a four-year rotation of cotton with a winter cover crop, cowpeas, oats, or wheat followed by cowpeas, and corn.

[Tests with field crops and vegetables at the Rhode Island Station] (*Bul. R. I. State Col.*, *13* (*1918*), *No. 4*, *pp. 36, 37, 38, 39, 40*).—Alfalfa and sweet and mammoth clover survived the winter when sown as a winter cover crop after early potatoes, while winter vetch again died out. In a mixture of crimson clover, winter vetch, and sweet clover sown as a cover crop in corn, sweet clover alone survived the winter. Corn after a legume cover crop produced 51 bu. per acre, after rye as a cover crop 46 bu., and with no cover crop 40 bu.

Raw muck again proved inferior to stable manure as a source of organic matter in connection with chemical fertilizers. Muck composted with hydrated lime at the rate of 10 cords of muck to 1 ton of lime is said to have given quite satisfactory results with early table beets. Tests with celery, early tomatoes, and beans again demonstrated that "when the ground is used each year for market-garden crops, and no special provision made for the introduction of organic matter, success can not continue with the use of only fertilizer chemicals."

In rotations without farm manure and including corn and potatoes, the second year of grass after rye and rowen produced 3.6 tons of hay, the yield remaining practically unchanged with an application of 50 lbs. each of phosphoric acid and potash instead of 100 lbs. The third year of grass produced 1.6 tons of hay without nitrogen and 4.1 and 4.4 tons with 360 and 480 lbs. of nitrate of soda, respectively. It is thought that maximum yields of mixed timothy and redtop may be secured from an annual application of about 350 lbs. of nitrate of soda, 500 lbs. of acid phosphate, and 100 lbs. of high-grade potash salt.

Oats and summer vetch used as a nurse crop produced about the same amount of hay, 3.4 tons, with sulphate of ammonia as with nitrate of soda.

Pot experiments are said to have shown that the insoluble nitrogen in certain brands of fertilizers was practically useless, and that the nitrogen of garbage tankage was of low grade.

Although the after effect upon a crop of hay of different phosphates applied to corn in the preceding year was not sufficient to produce a maximum crop, there was no difference observed whether a given amount of money had been invested in raw rock phosphate or in acid phosphate, nor whether the same amount of phosphoric acid contained in the latter was supplied in bone, Thomas slag, or double superphosphate.

Mixed timothy and clovers sown in silage corn the preceding year yielded about 3.5 tons of hay, regardless of whether top-dressed with fertilizer or with 4 cords of cow manure containing either straw or planer shavings.

The addition of 240 lbs. of common salt per acre to soil from which potash was withheld to the extent of producing only half a crop of grass resulted in an increase in yield of about one-third. Potatoes grown on soil containing sufficient available potash were not benefited by the addition of salt. About as much winter wheat and rowen were obtained where no potash had been added for 7 years as where it had been applied in different combinations. So-called American rock potash (prepared by fusing ground feldspar with calcium chlorid) produced a slightly larger crop of potatoes than sulphate of potash. An application of 2 tons of wood ashes per acre resulted in a very scabby crop of potatoes.

In variety tests with silage corn, the leading kinds were Eureka with 28.7 tons and Leaming with 21.5 tons. The best soy bean varieties grown for silage were Wilson with 11.8, Virginia with 10.6, and Hollybrook with 10.2 tons. The best varieties of potatoes, each yielding over 300 bu. of marketable tubers per acre, included Cuban Multiplier, Pride of Vermont, Gold Coin, Norcross, and Lowell Green Mountain. Tests with early sweet corn are also noted.

The degree of benefit derived from liming different crops increased in the following order: Broad-leafed Batavian endive, beans, onions, and sugar beets, and in another comparison barley, carrots, alfalfa, and beets.

In a mixture of spring vetch and oats used as a nurse crop the vetch was much more depressed than the oats by soil acidity. In a comparison of barley and oats grown to maturity in nutrient solutions the oats matured more slowly than the barley and produced slightly more straw and grain with a limited amount of phosphorus.

Effect of crops on each other (*Bul. R. I. State Col., 13 (1918), No. 4, pp. 40, 41*).—In a continuation of work at the Rhode Island Experiment Station previously noted (E. S. R., 38, p. 337), a second crop of alsike clover following different crops was harvested in 1917 with results similar to those obtained in 1916. In both years the best yields followed rye, redtop, and squashes.

A heavy seeding of Medium Green soy beans planted with 30 lbs. of Eureka corn produced less green material, although probably more protein, than when the corn was planted alone. A mixture of 15 lbs. of corn and 22.5 lbs. of soy beans produced 19.6 tons per acre of satisfactory silage containing about one-fifth beans by weight. By planting 21 lbs. of corn on 0.7 acre and 13.5 lbs. of beans on 0.3 acre, 21 tons of material were obtained having the same relative proportion of corn and beans.

Plant propagation (*Bul. R. I. State Col., 13 (1918), No. 4, p. 41*).—In tests at the Rhode Island Experiment Station, 2 oz. uncut seed tubers of Irish Cobbler and Green Mountain potatoes were compared with 1.25 oz. seed pieces from different sized potatoes cut into two, three, and four parts. The number of eyes and stalks and the yields decreased in the order named. The uncut seed produced about 300 bu. of marketable tubers and the potatoes cut into three or four pieces about 250 bu. Sprouted uncut seed of Green Mountain produced 304 bu. of marketable tubers, as compared with 242 bu. from unsprouted seed.

White Cap corn has failed to show any marked difference whether the seed was selected from areas where the backward tassels were removed, from the progeny of ears shown to be large producers by the ear-to-row method, or from corn grown in the usual way and selected by its appearance.

Steam sterilization of seed beds for tobacco and other crops, E. G. BEINHART (*U. S. Dept. Agr., Farmers' Bul. 996 (1918), pp. 15, figs. 4*).—This publication contains a description of the apparatus and methods employed in steam sterilizing tobacco seed beds as outlined elsewhere by Scherffino et al. (E. S. R., 20, p. 834) and Gilbert (E. S. R., 22, p. 49). The application of the method to the production of truck crops in the greenhouse, cold frame, or field, as suggested by W. A. Ortón, is indicated.

The relative yields of oats and two-rowed barley in experiments in middle Sweden, H. TEDIN (*Sveriges Utsädesför. Tidskr., 27 (1917), No. 6, pp. 279–291*).—Comparative tests of 4 varieties of oats, Seger, Guldregn, Klock II, and Fyris, and 2 varieties of two-rowed barley, Primus and Gullkorn, were in progress from 1905 to 1917, inclusive. The average annual yield of grain of the 4 varieties of oats was 2,501 kg. per hectare (2,226 lbs. per acre) and of the 2 varieties of barley, 2,473 kg. With the production calculated on the basis of hulled grain the oats gave an average annual yield of 1,877 kg. and the barley of 2,226 kg. of grain per hectare. This yield represented 2,077 and 2,471 food units per hectare, respectively. In 10 of the 13 years the barley surpassed the oats in the production of hulled grain and food units. The varieties of oats in general produced the larger yields of straw.

Report on a comparative test with commercial fertilizers, barnyard manure, and sewage, 1910–1916, P. BOLIN (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 7–8, pp. 595–606*).—In a number of experiments annually conducted with oats, the applications consisted of 40,000 kg. of manure, of 20,000 kg. of manure with 200 kg. of superphosphate, and of 100 kg. of nitrate of soda, 300 kg. of superphosphate, and 200 kg. of potash salt per hectare, with the exception that in 1916 only 200 kg. of superphosphate and 150 kg. of potash salt were used. These tests were made on bog and sphagnum moss soils.

Experiments were conducted each year also on meadows, but these tests were not so numerous as those with oats. Sewage was used at the rate of 8,000 liters per hectare either alone or with 300 kg. of superphosphate. The commercial fertilizer application employed consisted of either 100 or 200 kg. of nitrate of soda with 300 kg. of superphosphate and 200 kg. of potash salt per hectare. These meadow tests comprised mossy and swampy soils and soils of mineral origin.

The results of both series of tests are given in tables. As compared with the check tests, the commercial fertilizer application showed an increase in the yield of oats as green forage valued at 106.95 krones ($28.66), and the use of manure and phosphate gave an increase valued at 57.15 krones per hectare. The use of the manure and phosphate showed practically the same results as double the quantity of manure applied alone. In the meadow experiments, the commercial fertilizer application showed a better result in each test than was obtained from the treatment with sewage. The use of 100 kg. of nitrate of soda in the application on swampy and mossy soils showed much larger increases in yields than the similar use of 200 kg. on the soils of mineral origin. Superphosphate applied with sewage was followed by an increase in the hay yield throughout the tests, but on the mineral soils the increase was in general inadequate to be profitable the first year. The increases secured on the swampy and mossy soils gave a satisfactory net profit.

Meadow culture tests in Jutland, 1905–1910, E. Lindhard (*Tidsskr. Planteavl, 24 (1917), No. 5, pp. 625–702*).—Cooperative meadow culture tests were conducted in several localities on light soils. The average number of seeds capable of germination per tôndeland (1.36 acres) of each species supplied by the mixtures used in four of the tests was as follows: Red clover 1,670,000, alsike clover 470,000, white clover 920,000, black medic 550,000, kidney vetch 165,000, bird-foot clover, 165,000, alfalfa 80,000, field brome grass 425,000, Italian rye grass 195,000, English rye grass 1,415,000, orchard grass 2,170,000, tall oat grass 375,000, timothy 1,500,000, meadow fescue 85,000, and hard fescue 80,000. The seeds of the leguminous plants numbered 4,020,000 and those of the grasses 6,245,000 per tôndeland. About 52 per cent of the seeds resulted in plants. As compared with results of a previous experiment on heavy soil, it is pointed out that on the light soils the number of seeds producing plants was the greater by 23 per cent but that, in general, winter injury was also greater on these soils.

A study was made of the behavior of the different species, and the results of the observations are noted. Black medic proved uncertain in yielding capacity, and throughout added comparatively little to the returns. Bird-foot clover was found also of mediocre value, and alfalfa did not make satisfactory growth under the conditions. Italian rye grass failed to thrive properly on light soil, but English rye grass was one of the best-yielding grasses in the test. Field brome grass also produced a large proportion of the total yield. Tall oat grass did not seem adapted to mixed culture with English rye grass and field brome grass. Timothy gave much better results than tall oat grass, and where liquid manure was applied gave specially good returns the second and third years. Meadow fescue increased the yield of hay but slightly, and hard fescue, which withstood drought and made a fair growth on poor soils, proved too low in quality to make a valuable constituent of the meadow plant mixture.

Alsike clover, white clover, bird-foot clover, English rye grass, orchard grass, and hard fescue on soils rich in lime produced a much larger number of plants per hundred seeds capable of germination than were grown on lime-poor soils. Meadow fescue produced the larger number of plants on the soils poor in lime.

The use of oats as a cover crop in sowing the seed mixture gave in general a better stand and a somewhat larger yield of hay than the use of rye for the same purpose.

Botanical analyses of the various meadows, the yields of hay, and the nitrogen production by the crops in the different localities for the several years are reported and tabulated, and the influence of weather conditions and methods of meadow management are discussed. It is concluded that in the maintenance of temporary meadows a good stand of white clover in the plant mixture is highly important.

Alfalfa, F. App (*N. J. Dept. Agr. Bul. 15 (1918), pp. 51, figs. 13*).—This describes cultural methods and field practices deemed best for growing the crop in New Jersey, together with notes on alfalfa insects and diseases. The organization of the New Jersey Alfalfa Association and its activities for 1917 are also outlined.

[Utilizing waste land in New Jersey for alfalfa] (*New Jersey Stas. Bul. 317 (1917), p. 27*).—Observations on the utilization of large areas of waste land in the State are said to indicate that some of these soils can be brought to the point of profitable alfalfa production by the use of lime, phosphorus, and legumes.

Primitive methods of maize seed preparation, H. H. Biggar (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 183–185*).—The author gives a brief account of the preparation of seed corn by the Indians, based on a study of their agricultural practices in maize production, covering 15 Indian reservations in Minnesota, North and South Dakota, Nebraska, Montana, and Manitoba.

Various methods of sprouting the seed are noted, with particular reference to the use of slender nettle, *Urtica gracilis*, in much the same way as the so-called rag-doll seed tester. It is stated that the principal corn grown by the Indians of the Middle West was *Zea amylacea*.

In a test to determine the relative amounts of water absorbed by different types of corn, Blue Flour corn was found to absorb 18 per cent of water, Reid Yellow Dent 13.5 per cent, and U. S. Selection No. 193, a flint corn, 6.6 per cent.

Cutthroat grass, Panicum combsii, C. V. Piper (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 162–164*).—The author notes the presence of *P. combsii*, hitherto regarded as a comparatively rare species, in great abundance on very fine, slippery, black muck in Polk County, central Florida, where it is known as "cutthroat grass" and the areas as "cutthroats." The grass is also said to be abundant in similar areas in Osceola, De Soto, and Lee counties. The cutthroats usually occur in seepage areas on the sides of slopes, especially sand ridges. Numerous species of the plant were found in bloom in November, 1917. The rôle of the grass in so-called "salt sickness" is briefly discussed.

Glandular pubescence in various Medicago species, R. McKee (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 159–162*).—The author records numerous observations, made chiefly at Chico, Cal., on the occurrence of glandular pubescence in various species of Medicago, particularly *M. lupulina* and *M. orbicularis*, in an effort to determine the effect of environmental conditions upon this character. The following species were observed to have glandular pubescence strongly developed on the pods at least: *M. soleirolii*, *M. rigidula*, *M. minima*, *M. disciformis*, *M. blancheana*, *M. tunetana*, *M. falcata viscosa*, and *M. gaetula*. Other species having the character less well developed or appearing only under certain conditions include *M. murex sorentinii*, *M. orbicularis*, *M. lupulina*, and *M. sativa*.

The number of hairs per square millimeter varied considerably in different species, occurring in numbers that could not be definitely counted in those species in which they are always well developed (*M. scutellata* and *M. rugosa*), while in those having only microscopic hairs the number varied from 40 to 120 per square millimeter.

The observations are held to indicate a very evident effect of environment upon glandular pubescence, the principal factors apparently being hot, dry weather and unfavorable soil moisture supply. It is concluded that the character can not be depended upon in determining subspecies.

Variety tests with oats in southern and middle Sweden, Å. Åkerman (*Sveriges Utsädesför. Tidskr.,* 27 (1917), No. 6, pp. 261–278; 28 (1918), No. 1, pp. 26–55).—The tests reported were conducted in various localities and on different soil types.

In the region of Lake Mälaren Great Mogul produced the highest yields on clay soil as well as on sandy soil. It is stated, however, that, although the results were favorable, the relatively late ripening period of this variety does not adapt it to soils of medium fertility in northern sections, especially where rust is likely to occur. Among the earlier varieties, Klock III gave the best results generally on all types of soil excepting the moss soils. As a rule Fyris gave lower yields than Klock III, but on certain clay soils in the Lake Mälaren region this variety on account of its earliness proved to be the best of the varieties of black oats under test. This variety was promising also by reason of its stooling capacity and its grain quality. Victory as compared with other varieties gave good results, especially on clay soils, but it was unable to compete successfully with Klock III, which ripens about the same time. The variety Gold Rain gave specially good returns on moss and bog soils and surpassed Ligowo in yield of both grain and straw.

Potato culture tests in 1917, G. Lind (*K. Landtbr. Akad. Handl. och Tidskr.,* 56 (1917), No. 7–8, pp. 607–609).—A possibility of growing potatoes from cuttings and potato peelings and the effect of the removal of the blossoms on the yield were studied. The plants grown from cuttings produced practically the same quantity of tubers as were secured from the plants grown from seed tubers in comparison. The plants propagated from peelings did not give so good results as were obtained from those derived from cuttings, but the outcome of the test indicated the value of this method of propagation when seed tubers are scarce. The removal of the blossoms was apparently without effect on tuber production.

Lining and loading cars of potatoes for protection from cold, H. S. Bird and A. M. Grimes (*U. S. Dept. Agr., Bur. Markets Doc. 17* (1918), pp. 26, figs. 22).—Methods of lining cars and of loading potatoes for the protection of shipments against cold in the principal types of cars with heaters and in refrigerator cars without heaters under favorable shipping conditions are recommended, based upon observations of commercial practices and the results of tests and inspections supplemented by conferences with shippers, loaders, and railroad officials at shipping points in Maine, New York, Michigan, Wisconsin, and Minnesota, and at the markets of Philadelphia, New York, Chicago, and elsewhere.

It is stated that approximately 75 per cent of all cars prepared to protect potato shipments from cold are either lined or loaded incorrectly. Protection from cold is said to depend "largely upon a constant current of warm air from the heater directly to the ceiling, spreading between the ceiling and the top potatoes, thence through openings at the opposite end of the load down to the space beneath the false floor and from there under the false floor to the heater again."

Farm practice in growing sugar beets for three districts in Colorado, 1914–15, L. A. Moorhouse, R. S. Washburn, T. H. Summers, and S. B. Nuckols (*U. S. Dept. Agr. Bul. 726* (1918), pp. 60, figs. 30).—This bulletin presents a detailed account of the farm practices and cost of growing sugar beets in the Greeley, Fort Morgan, and Rocky Ford districts of Colorado, embracing Weld and Larimer, Morgan, and Otero Counties, respectively. The data are based upon farm estimates obtained from representative sugar-beet growers on 371 farms, and are for the crop years of 1914 and 1915. Items, such as the hours of man and horse labor required to grow the crop, the quantity of seed and of manure and fertilizer employed, etc., which are said to show much less fluctuation from year to year than the actual money costs, are emphasized and form the chief basis for discussion.

The acre costs for all tillage operations performed by the grower with the exception of plowing, rolling the beets, irrigating, hoeing, and topping, were lower for the farms studied in the Greeley and Fort Morgan areas than for those in the Rocky Ford area, due mainly to the heavier soil types in the latter region which necessitated a greater amount of tillage. Man, horse, and contract labor was the most important charge, ranging from 54.3 to 59.1 per cent of the total cost of production. Charges for materials such as seed, manure, and water varied from 8.6 to 10.7 per cent of the total, while interest charges on the land for owners and rental for tenants, insurance, taxes, and machinery comprised from 32.3 to 35 per cent of the total cost of raising the crop. The total cost of production per acre was $72.53 for the Greeley area, $65 for the Fort Morgan area, and $64.87 for the Rocky Ford area, the total receipts per acre, including tops, amounting to $92.44, $81.66, and $67.36, respectively. The average yields for the respective regions were 15.57, 13.65, and 12.99 tons per acre.

Owners produced beets at a lower cost per acre and per ton than tenant farmers, except in the Rocky Ford area where their costs were higher. The lower cost of production to owners in the Greeley area is said to have been due largely to a lower interest charge on beet land than the corresponding rental charge on tenant farms.

Beet tops were fed directly to stock by 74 per cent of the farmers, while 12 per cent fed a part and sold the remainder, and 14 per cent sold all the tops.

Farm practice in growing sugar beets in the Billings region of Montana, S. B. Nuckols and E. L. Currier (*U. S. Dept. Agr. Bul. 735 (1918), pp. 37, figs. 7*).—This bulletin, prepared jointly by the Montana Experiment Station and the Bureau of Plant Industry of the U. S. Department of Agriculture, reports the results of a study of methods of management, labor requirements, and cost of growing sugar beets made in the summer of 1916 on 305 farms, representing a sugar beet crop of 8,849 acres and comprising about 36 per cent of the entire acreage grown for the factory at Billings, Mont., during 1915.

The total overhead charge for the entire area was $20.44 per acre, divided as follows: Land charges $11.85, manure $3.79, machinery $2.64, seed $1.72, cash to run farm 41 cts., and miscellaneous 3 cts. The total cost of sugar-beet production was found to be $56.79 per acre, including $17.71 for farm labor, $18.64 for hand labor, and the above-mentioned overhead charges. These data are said to be applicable to present conditions by adjustment to the present prices of labor, real estate, equipment, and the value of beets produced.

The results obtained are held to indicate that the growing of sugar beets is not profitable in this region unless a yield of more than 8 tons of beets per acre is obtained. A minimum of 20 acres per farm was found to be most economical. Of the total area in the crop, 77.2 per cent is said to have been grown at a profit. The average net profit per acre for the region was $11.70.

The beet-sugar industry in the United States, C. O. Townsend (*U. S. Dept. Agr. Bul. 721 (1918), pp. 56, pls. 9, figs. 2*).—This bulletin comprises a detailed discussion of the subject dealing with the distribution of the crop in the United

States; soil and climatic adaptations; field practices and cultural methods employed in growing sugar beets; irrigation, drainage, and seepage on sugar-beet lands; the maintenance of soil fertility in sugar-beet production; crop rotations for sugar beets and crops competing with sugar beets; farm equipment, including live stock and labor; sugar-beet by-products and live-stock production; labor problems; the successful grower; diseases and insects affecting the crop; roads; contracts between growers and sugar companies; competition between adjacent sugar-beet areas; and sugar-beet seed production.

The inheritance of glume length in Triticum polonicum, a case of zygotic inhibition, W. O. Backhouse (*Jour. Genetics, 7 (1918), No. 2, pp. 125–133, figs. 5*).—Investigations begun in 1912 are described in which a variety of *T. polonicum*, with an average glume length of 29 mm. (about 1.1 in.) and with glumes very faintly pubescent (classed as smooth in comparison with Rivet or Essex Rough Chaff), was crossed with a variety of *T. durum*, referred to as Kubanka, with an average glume length of 12 mm., quite smooth, and otherwise a typical example of the species. The studies were suggested by observations made by the author at Verrières in 1911 of a collection of varieties of *T. polonicum* grown there, which revealed the fact that none possessed perfectly smooth glumes and that the shorter the glume the greater the pubescence appeared to be.

The F_1 generation of the cross noted above possessed glumes of intermediate lengths, 18 or 19 mm., but was distinctly pubescent, while the F_2 generation showed a certain proportion of plants bearing fully pubescent ears. At harvest times a middle glume in the ear of each plant was measured, and a curve plotted in millimeters of a number of plants of each glume length. The plants were also classified by means of a hand lens into pubescent, intermediate, and smooth, the *T. polonicum* parent falling in the intermediate class. A large number of plants carried into the F_3 generation showed that, while only two errors were made at the short end of the curves, it was impossible to pick out any but the extreme longs with a certainty that they would breed true to their particular length. The numbers observed were 172 long and intermediate and 55 short. Regarding those individuals with a glume length varying between 10 and 14 mm. as pure short segregates and those between 15 and 31 mm. as both the longs and the heterozygotes, a count of the proportion of pubescent individuals showed for the short-glumed class 40 pubescent to 15 smooth individuals, while an examination of 56 theoretical homozygous longs revealed no individuals that could be classed as felted, although a short velvety pubescence was to be seen with a lens. Among individuals with glume lengths between 15 and 22 mm., the proportion was 85 felted to 31 smooth, although only 15 individuals were distinctly pubescent.

Absolutely glabrous long-glumed individuals were carefully selected and planted, and with two exceptions were found to be pure longs and also to breed true to smoothness. In crosses between these smooth lines and the original Kubanka to ascertain whether the presence of pubescence in any way affected the segregation of glume length, the F_2 generation contained some all-smooth individuals, the remainder behaving like the original cross and giving a 3:1 proportion of felted and smooth ears among the short-glumed class, the difference being only in the degree of pubescence, as exemplified in Prelude. This is held to indicate "that the long glume was able to inhibit the expression of a dominant character [pubescence], and, furthermore, that there was a direct relation between the length of the glume and the degree of felting."

The same variety of *T. polonicum* described above was also crossed with a felted, black-glumed variety of *T. turgidum*, similar to Rivet and with an average glume length of 11 mm. In this cross *T. polonicum* was considered smooth, and classification was made by the unaided eye. The F_2 generation was also plotted as a curve, and the pure shorts were said to be comprised of those individuals with a glume length between 9 and 13 mm. The ratio observed was 514 long and intermediate individuals to 178 short. An analysis of the population for pubescence again showed that glume length acted as an inhibitor. A study of the color revealed this inhibiting nature even more strikingly, all of the fully colored individuals, with the exception of one plant of 16-mm. glume length, being between 8 and 13 mm. Color appeared to be quite independent of pubescence.

Five long-glumed individuals were crossed with short-glumed Kubanka to ascertain whether some were homozygous for color, and the F_1 generation plants were grown in 1916. The author states that "there is no need to wait for the second generation for the results. Two individuals gave all tinged, one gave all white, and two gave a mixture of tinged and whites. There can be no doubt, therefore, that when the second generation is grown and true shorts appear there will also appear fully colored individuals."

The author further describes observations on plants grown from the seed of a cross of strains of Rivet and Polish wheats used by Biffen (E. S. R., 36, p. 738). The F_1 generation was grown at Pergamino, Argentina, in 1913 and was decidedly tinged. The F_2 generation was grown in 1914 at points in the northern, central, and southern parts of the wheat-producing area of the country. All of the individuals were colorless in the north, as in England. In the center, at about the latitude of Buenos Aires, some of the short-glumed individuals were tinged, while in the south, in the Pampa, the colored individuals were fairly well defined and were classified, giving all whites (72) among individuals of long and intermediate glume length and 7 colored and 23 white among the short glume length. Three doubtful shorts grown in 1915 bred true to short glume, but gave 7 white and 13 colored individuals. A reciprocal of the cross described above gave substantially the same results.

"The interest of the experiment, however, lies in the fact that, whereas in England the color disappears and does not return in any subsequent generation, the result of growing F_2's, obtained in identically the same way, in Argentina, is to prove that at any rate the color is there, and, given suitable climatic conditions, will show itself. Rivet wheat, grown for comparison, had the same peculiar mouse-gray color as in England and was no darker in this climate. The cause of the suppression of color in this particular cross must be sought for in the shape of an inhibitor, brought in, either by Polish wheat and meeting something in Rivet to release it, as it were, or vice versa; for this particular strain of *T. polonicum* crossed with colored varieties other than Rivet gives colored descendants, in climatic conditions under which, crossed with Rivet, they are colorless."

Origin of the Georgia and Alabama varieties of velvet bean, H. S. Coe (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 175–179, figs. 2*).—This briefly relates the history of early maturing mutants of *Stizolobium deeringianum* grown in Georgia and Alabama, which have made possible the extension of velvet-bean production to the northern limits of the cotton belt.

Variety tests of wheat, E. F. Cauthen (*Alabama Col. Sta. Bul. 205 (1918), pp. 135–142*).—This bulletin contains the results of tests with different varieties of wheat begun in 1899 and previously noted (E. S. R., 32, p. 137), together with similar data accumulated since. An Alabama strain of Bluestem with an average yield of 15.9 bu. per acre and Red Wonder with 16.9 bu. are considered to be among the leading varieties for those sorts grown four or more years, based on a comparison with Fulcaster grown each year of the test with an average yield of 13 bu. The average yield for all bearded varieties was 14.2 bu. and for all beardless kinds 14.7 bu.

Cultural methods deemed best suited for growing the crop in the State are briefly indicated.

Natural cross-pollination in wheat, H. K. Hayes (*Jour. Amer. Soc. Agron., 10 (1918), No. 3, pp. 120–122*).—This paper, a contribution from the Minnesota Experiment Station, reports observations on wheat grown on nursery plats on the university farm to ascertain the frequency of cross-pollination between various types.

Fifty plants of Haynes Bluestem selected in 1915 and grown in individual plats in 1916 resulted in 3 individuals which proved to be definite natural hybrids. One plant gave 45 brown and 19 white chaff individuals; a second gave 32 hairy brown chaff, 16 hairy white chaff, 13 smooth brown chaff, and 5 smooth white chaff plants; while a third gave 46 hairy and 19 smooth chaff plants. Two other selections gave both red and white kernels.

Of 47 plant selections of Marquis grown in 1916 from selections made in field variety tests, all were true for the Marquis type of head, but two gave both red and white kernels. In the winter-wheat nursery, one selection out of 54 proved to be a natural hybrid. Of numerous plant selections made in 1916 and grown in 1917, several gave definite indications of being F_1 crosses.

It is concluded that the results indicate that conditions in 1915 and 1916 were either very favorable for natural crossing in wheat or that cross-pollination is much more frequent than is generally supposed.

Natural crossing in wheat, H. K. Hayes (*Jour. Heredity, 9 (1918), No. 7, pp. 326–330, 334, figs. 2*).—Work similar to that noted above was continued during 1917 and 1918 and is said to have indicated that considerable natural crossing occurred. The observed crossing in lines of *Triticum vulgare* amounted to 1.3 per cent, and assuming that it occurred as often between plants of the same variety as between different sorts natural crossing in 1917 is believed to have ranged from 2 to 3 per cent. The appearance of F_1 plants in supposedly pure lines of wheat is thought to have led to the belief that hybrids frequently revert to type.

A considerable number of commercial samples of Preston, Haynes Bluestem, Minnesota 169, and Marquis wheat have been examined, and in nearly every case some unpigmented seeds found which, as a rule, bred true to the general characters of the variety. One such from a Marquis sample bred true for hairy chaff and closely approached Marquis in seed shape. While results of this nature might be explained as mutations, it is thought that "in the light of the data here given, it seems more logical to consider that they are the result of natural crosses."

A mechanical explanation of progressive changes in the proportions of hard and soft kernels in wheat, G. F. Freeman (*Jour. Amer. Soc. Agron., 10 (1918), No. 1, pp. 23–28*).—The author reports observations of commercial varieties of durum wheat and of local and introduced commercial types of bread wheat, grown on the Arizona Experiment Station farm at Yuma to ascertain why hard wheats of high-milling quality introduced into this region are often lost or soon deteriorate until they are no better than the ordinary local sorts.

Head selections of white and red durum, poulard, and red and white bread wheats, all local strains, and of a commercial type of Turkey wheat obtained in

Kansas, were grown in 100-ft. rows. The percentage of hard grains in each group, together with the correlation between yield and percentage of hard grains, is indicated in tabular form.

The correlation between yield and hardness in the case of the durum varieties was found to have a plus value, while that in the case of the other groups had a minus value, indicating that the harder races would be eliminated within a few years. It is concluded, therefore, that "the gradual softening of an impure race of wheat [that is, commercial strains] can thus be explained as a climatic selection without the necessity of assuming any direct or accumulative influence of the climate upon the hereditary substance itself. . . . An hereditary distinction between the durum and Turkey wheat is thus brought to light, in that the harder strains of Turkey wheat are much reduced in yield, whereas in the durum wheats the harder strains are the better yielders. These hereditary distinctions, though not striking in any one season, are sufficient to maintain the hardness of the durum wheat and slowly change the other toward the condition of softness and low nitrogen content usually found among bread wheats which have been grown for a number of years in a warm climate. . . .

"We must discard mixed commercial varieties and grow only pure races of wheat coming originally from a single plant. . . . It is highly important that the seed wheat of the community be maintained in its standard of purity through repeated pedigree selection. This work should be done either by the State or by reputable, trained seed breeders, and from these the farmer should renew his seed at least every four or five years."

Producing bread-making wheats for warm climates, G. F. Freeman (*Jour. Heredity, 9 (1918), No. 5, pp. 211–226, figs. 5*).—In connection with the studies noted above the author, in an effort to obtain a high-grade milling wheat for warm climates, describes reciprocal crosses made in 1913 between a white macaroni wheat coming originally from Algeria; a soft red bread wheat also from Algeria; and Sonora, a soft white wheat grown locally. The inheritance of grain texture is discussed, and tabulated data are presented showing the inheritance of this character through four generations. Microscopical studies of the texture of the wheat grain were made by means of thin cross sections reduced to the necessary transparency by polishing. Observations on the inheritance of "yellow berry" in pure lines of hard wheat are also noted.

The hardness of a wheat is said to be determined by the solidity of the grain, and this in turn by the nature and relative proportions of gluten and starch in the endosperm. With a sufficiently high ratio of gluten to starch, the cell contents are cemented together solidly as the grain dries out in ripening, while in the absence of sufficient gluten the shrinkage does not fully compensate for the loss of water, and air spaces appear within the cells which render the grains soft and also serve as refracting surfaces, making the grains opaque. Two types of soft grains were recognized among the wheats employed in these experiments. "True softness" was represented by a type in which the air spaces in the endosperm were diffuse and finely scattered, the type being only slightly affected by environmental conditions. The second type, commonly known as yellow berry, was characterized by air spaces within the endosperm occurring in flakelike groups with quite definite margins, giving rise to opaqueness which might be confined to a small spot only or might include the entire endosperm. This type was very sensitive to environic conditions.

The results obtained in the hybridization work may be summarized as follows: The genetic behavior of true softness may be explained by two independent factors which govern the relative proportion of gluten and starch. These factors showed incomplete dominance over their absence, the intensity of their action depending upon the number of times the factors appeared in the endosperm. Thus (assuming double fertilization) the presence of none to six factors in the endosperm cells would give rise to a series of types grading from hard (translucent) through alomst insensible degrees to completely soft (opaque) grains. The genetic factors governing the appearance of yellow berry have not been fully analyzed, but they are evidently distinct from those which give rise to true softness and are said to be very sensitive to environic influences,

"In spite of the strong regression from extreme selections, the almost perfect uniformity of results from a number of carefully controlled experiments indicates that genetic factors, for a greater or less sensitivity, are inherited as definitely as are other factors governing quantitative characters. The number of factors involved has not been determined."

Nematode galls as a factor in the marketing and milling of wheat, D. A. Coleman and S. A. Reggan (*U. S. Dept. Agr. Bul. 734* (*1918*), *pp. 16, figs. 7*).—Preliminary observations are reported upon the present distribution, the influence upon market grade and milling quality, and the methods of control of galls produced by the nematode *Tylenchus tritici* in wheat.

"The galls . . . in comparison with sound wheat are irregular in shape, shriveled, and wrinkled. Usually they are shorter and broader than sound wheat kernels, but sometimes are equal in size, or again may be very narrow and needlelike. Very small galls, the size of wild buckwheat, are also found frequently. It is not uncommon to find several of them tightly cemented together."

The disease is said to be established in certain sections of Virginia and has not only reduced yields per acre, but has also seriously affected market grades and the milling qualities of marketed wheat. The market grade is reduced by a reduction in weight and by an increase in the amount of dockage, and especially in the amount of foreign material other than dockage in any given lot of infected grain. Flour yields from infected wheat are reduced, and the percentage of low-grade flour and shorts is increased. Ordinary wheat-cleaning machinery is said to be unsuited for removing these galls, although machinery for washing and drying wheat is expected to be successful.

The best methods of control are said to include crop rotation and clean seed. The nematode larvæ contained in the galls can be killed by the hot-water treatment employed in the control of smut. The galls can also be floated away from the sound wheat by means of water.

Chemical analyses of nematode galls and sound wheat, by the Bureau of Chemistry, and comparative milling and baking tests, by L. M. Thomas, at the grain standardization, milling, and baking laboratory, at Fargo, N. Dak., are included.

Have the farmers been given a square deal in the Federal standards for hard red spring wheat? C. J. Brand (*U. S. Dept. Agr., Bur. Markets Serv. and Regulatory Announcement, No. 34* (*1918*), *pp. 10*).—This comprises a letter written in reply to a communication from the Commissioner of Agriculture of North Dakota, relative to the revised Federal standards for wheat, which became effective July 15, 1918. See also a previous article by Sanderson (E. S. R., 39, p. 871).

Federal grain supervision and the standards for wheat applied to 1917 crop of hard red spring wheat, including comparison of present and revised official standards (*U. S. Dept. Agr., Bur. Markets Serv. and Regulatory Announcement, No. 36* (*1918*), *pp. 16, figs. 11*).—This number includes primarily a more detailed account of the information noted above, together with a comparison of the previous and revised official standards.

A comparison of the Federal v. Minnesota grading system, T. SANDERSON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 6, pp. 107–160, figs. 5*).—A comparison of the two systems for grading wheat is presented, based upon an analysis of the information contained in the two publications noted above and upon the results of numerous milling and baking tests made at the North Dakota College (E. S. R., 38, p. 663).

Variations in seed tests resulting from errors in sampling, O. A. STEVENS (*Jour. Amer. Soc. Agron., 10 (1918), No. 1, pp. 1–19, figs. 3*).—Germination and purity tests, made during 1914 and 1915 by the department of botany of the North Dakota Agricultural College, are described in connection with studies of the fundamental factors which occasion variations in seed tests. These variations are said to be largely of two sources, mathematical and personal or economic. The direct causes of variations in purity tests are attributed to imperfect mixing, random sampling, errors in weighing, personal selection and errors of identification, while in germination tests variations are attributed to imperfect mixing, random sampling, errors in counting, personal selection, improper conditions for germination, and special conditions of the seed. These causes are briefly discussed.

In the experimental work described, 50 germination and purity tests were made from each lot of seed by one individual. Conclusions and recommendations based on the results obtained may be summarized as follows:

The probable error of a single germination test of 100 to 400 seeds varied according to the percentage of germination as follows:

Approximate probable error for germination tests.

Number of seeds used.	Percentage of germination.				
	99.	97.	95.	90.	80 to 50.
100	0.75	1.00	1.50	2.25	2.80
200	.50	.70	1.00	1.50	2.00
300	.40	.55	.90	1.20	1.75
400	.35	.50	.70	1.05	1.50

The above figures were increased about one-fifth in the lower percentages of germination for legumes containing the so-called "hard" seeds, the sources of variation being reduced as far as it is possible to do. No attempt was made to determine the range of variation where factors other than that of mathematical probability entered to any extent. These values may also be used for other experiments involving similar conditions, e. g., counting 500 seeds to determine the percentage of mixture of two kinds. Samples not containing mixtures of materials which tend to separate readily (such as sand, fine trash, or coarse material), require only a small amount of mixing, while samples which contain such mixtures should receive, when practical, a supplementary test of larger quantity to show the approximate amount of such materials.

In purity tests the quantities used should receive careful investigation in order to determine whether those in current use could be changed to advantage. The use of the second decimal place is of no value in most work, but if such accuracy is desired, the test should be based upon a sample of sufficient size. In an instance of such change in some work carried on at this laboratory the following schedule was adopted and the second decimal used: For cereals a measured quantity (about 8 oz. for wheat) was used unless the seed was obviously impure, and then the regular quantity (30 gm.) was taken, while for flax and smaller seeds three times the regular quantity was taken unless decidedly impure. This is not suggested as a new basis, but is mentioned as a case of a sliding scale used to advantage. The number of seeds of certain noxious weeds, such as wild oats, mustard, etc., was calculated from the larger sample, which is deemed quite an important point that should be carried out for any sorts that are considered of special importance.

It is maintained that results of seed tests should be accompanied by an indication of their accuracy expressed by writing the probable error after the result, as 95±1.5 per cent, although for ordinary reports it is deemed desirable to have some form by which the results can be stated more completely. While the probable error represents a very definite quantity, it is pointed out that its practical application is somewhat difficult, and that it represents only an even chance that the true result lies within the limits indicated. The chances are as great that it lies beyond this, while if the probable error is doubled there are about four chances in five that it lies within these limits, or that the results will still be beyond this in 20 per cent of the trials. This is regarded as the smallest reasonable allowance that can be made, and for the smallest practical scale of allowance for variation the figures in the table should be doubled. The observations indicate that the second decimal place is not necessary for the calculation of probable error in such tests.

The amount of seed used for tests (and therefore the degree of accuracy obtained) must be regulated by two factors, viz, the degree of accuracy necessary for dependable results and the amount of work which it is possible to handle. From the data presented it would seem that for germination tests 200 seeds in a single test would be advisable for ordinary work, the number being increased when desired. It is very important that the probable error be known so that such adjustments may be made.

Duplicate tests appeared to be of little value, as, so long as only the factor of probability in selection was present, variation between duplicates was not significant, while if other factors are present the chances are probably as great that duplicates which vary but little are unreliable. The necessity of duplication must be governed chiefly by judgment, whether duplicates vary or not, and a test of 200 seeds will often require less time and space than two of 100 each.

The observations of Rodewald (E. S. R., 16, p. 881) relative to "accidental" and "systematic" errors in germination and purity tests are briefly reviewed, and his results and conclusions are compared with those of the author.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 2 (1918), No. 5, pp. 8, figs. 6*).—The principal feature of this number is a statistical report on the acreage for 1918, the usual yield of seed, and the general date of harvesting vegetable seeds, by States and crops, as determined by the seed survey of July 1. The data are supplemented by outline maps of the United States showing the counties in which the different crops were grown commercially for seed in 1918.

Market notes are presented for Kansas City, Chicago, and the Eastern States, and information is given relative to transportation of seed and to exportation of vegetable seed. The production of sugar-beet seed in the United States and onion-set conditions in the Chicago district are briefly discussed.

The usual data relative to the imports of forage-plant seed permitted entry into the United States are included.

The revised agricultural seed law, C. P. SMITH (*Maryland Sta. Bul. 219 (1918), pp. 9*).—This bulletin contains the text of the revised seed law, previously noted (E. S. R., 39, p. 399), together with the rules and regulations for its enforcement.

HORTICULTURE.

A nutrition basis for horticultural practice, E. J. Kraus (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 10, pp. 559–562*).—A discussion of the practices of soil fertilization and pruning with special reference to their influence in maintaining a proper balance between nitrogenous compounds and carbohydrates in the plants with the view of promoting fruitfulness, and based upon the investigation with the tomato conducted by the author and H. R. Kraybill previously reported (E. S. R., 40, p. 40).

Effect of electricity on plants (*Missouri Bot. Gard. Bul., 6 (1918), No. 8, pp. 97–100, pls. 2*).—During the three seasons 1916–1918 experiments were conducted at the Missouri Botanical Garden with tomatoes, string beans, sweet corn, and *Salvia splendens* to determine the value of electricity in stimulating plant growth. The de Graffigny "Electrifier," an apparatus secured from France, which was used in this work is illustrated and described, and the results of the experiments as conducted for the three seasons are briefly reported.

The results indicate that all crops presumably were influenced by the electric current conveyed by the apparatus. As compared with the check plats the electrified plats showed considerable increase in vegetative, as well as reproductive, growth, and the date of maturity was hastened.

It is pointed out, however, that before any definite practical application can be made of the use of electricity in growing plants it is necessary to realize "(1) the need for quantitative measurements of the electric discharge, (2) that a stimulus may act differently on the plant at different stages of its life, (3) that the effect of the stimulus depends upon its intensity, (4) that the effect of the stimulus depends on the time at which it is applied, and (5) that the effect of the stimulus may appear a considerable time after it is applied."

Effect of low temperatures on greenhouse plants, M. Free (*Brooklyn Bot. Gard. Rec., 8 (1919), No. 1, pp. 14–17*).—A discussion of the behavior of various classes of plants in the greenhouses of the Brooklyn Botanic Garden during the winter of 1917–18, when the shortage of coal necessitated unusually low temperatures.

[Third annual report of nursery and market garden experimental and research station in Hertfordshire in 1917] (*Expt. and Research Sta., Waltham Cross, Ann. Rpt., 3 (1917), pp. 34, figs. 5*).—This comprises a report on manurial and cultural experiments with tomatoes and cucumbers grown under glass. Data on a study of physiological conditions in cucumber houses, together with a report on soil sterilization experiments conducted at two trade nurseries, are also given.

Adaptation of vegetables, W. W. Tracy, sr. (*Amer. Florist, 52 (1919), No. 1598, pp. 36, 37*).—A report of the author's address on Varietal Adaptation of Culinary Vegetables to Local Conditions, delivered before the Massachusetts Horticultural Society, January 11, 1919.

As a result of over 50 years' experience in seed breeding and seed growing, the author concludes that many new strains of vegetables and flowers develop from the same original seed stock without crossing or even careful selection, but simply as the result of differing soil and climatic conditions, and that these strains, each adapted to certain cultural conditions or consumers' requirements are often as worthy of distinct varietal names as those already catalogued. The importance of developing strains suited to local conditions is discussed, and suggestions are given on saving different kinds of seed.

Genetic studies of some characters in Pisum, S. Nohara (*Bot. Mag. [Tokyo], 32 (1918), No. 377, pp. 91–102, figs. 2*).—As the result of a cross between a

Japanese and French variety of edible podded peas the F_1 progeny yielded hard inedible pods. There was a splitting up into hard and soft pods in the F_2 progeny in the ratio of about 9:7. Soft F_2 pods bred true to type in F_3. The hard F_2 pods yielded a few homozygous hards in F_3, but for the most part split in one way or the other into heterozygous individuals. From the results thus far secured, the author concludes that the development of hard pod from two edible pod parents is due to two complementary factors.

Regulating the bearing habit of fruit trees, J. C. WHITTEN (*Minn. Hort., 47 (1919), No. 1, pp. 23–25*).—In this paper the author briefly discusses cultural practices which are known to have some influence in regulating the bearing habit of fruit trees.

Influence of low temperature on fruit growing in New York State, W. H. CHANDLER (*Proc. N. Y. State Fruit Growers' Assoc., 17 (1918), pp. 186–194*).—A popular review of the knowledge relative to the killing of buds, wood, flowers, and young fruit by low temperature, with special reference to New York State conditions.

Report on tests of self-sterility in plums, cherries, and apples at the John Innes Horticultural Institution, IDA SUTTON (*Jour. Genetics, 7 (1918), No. 4, pp. 281–300, pls. 2*).—In continuation of previous reports by Backhouse (E. S. R., 28, p. 237), this report summarizes the results of self-sterile studies in plums, cherries, and apples conducted by various investigators at the John Innes Horticultural Institution since 1911. Tabular data are given showing the results of fertilizing individual varieties with various other varieties, together with a summarized list of plums, cherries, and apples shown to be self-sterile, partly self-fertile, or self-fertile. A short bibliography of related literature is included.

The work as a whole shows that many important commercial varieties set little or no fruit unless cross-pollinated. Pollinizers must be planted with these self-sterile kinds, and provided that a variety produces plenty of pollen and flowers simultaneously with the variety which it is intended to pollinate, any variety, at least with plums and apples, appears to be suitable for this purpose. An exception to this was noted in the case of Coe Golden Drop and related varieties of plums, which did not set fruit well even when cross-pollinated with a number of other varieties, thus indicating cross-incompatibility.

No definite conclusions are derived from the work with cherries, which was not carried on to such a large extent as with apples and plums. Some records of failures with certain pollen, however, suggested that incompatibility may exist among certain varieties of cherries also.

Minnesota State Fruit-Breeding Farm in 1918, C. HARALSON (*Minn. Hort., 47 (1919), No. 1, pp. 1–4, pl. 1, figs. 2*).—A brief report on progress made in breeding and testing hardy fruits, including plums, apples, strawberries, raspberries, blackberries, gooseberries, and grapes.

Influence of orchard soil management on fruit bud development and formation as found in the apple, R. S. KIRBY (*Proc. Iowa Acad. Sci., 24 (1917), pp. 447, 448*).—A brief progress report on a study being conducted at the Iowa Experiment Station to determine what influence the different methods of soil management would have on fruit bud formation and development.

No definite conclusions are derived from the work at this time. Observations thus far made, however, indicate that the time of flower bud differentiation is somewhat earlier on heavy sod land than under cover crop or clean tillage conditions. Flower and leaf buds started to differentiate as early as July 1 and continued to differentiate to September 15, but by far the largest percentage started to form between July 20 and August 10. The fruit bud formation on individual trees is closely correlated with the growth of the trees.

Twenty years of fertilizers in an apple orchard, R. D. ANTHONY (*Proc. N. Y. State Fruit Growers' Assoc., 17 (1918), pp. 210–218*).—This paper comprises a short report of the present status of the long-continued orchard fertilizer experiment being conducted at the New York State Experiment Station (E. S. R., 25, p. 643).

As a result of 19 years of fertilization, it is concluded that the application of a complete fertilizer has increased the yields somewhat, but that nearly as good results have been secured when the nitrogen was omitted and only phosphoric acid and potash used. The increases have amounted even in the most favorable cases only to about a bushel per tree per year since the orchard had its first commercial crop. It is pointed out that these gains are not sufficient to pay the charges, especially with present prices for labor and fertilizers.

The effect of cross-pollination on size, color, shape, and quality of the apple, W. H. WICKS (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 10, pp. 568–573*).—A summary of the author's investigation previously noted in full (E. S. R., 39, p. 645).

Status of commercial apple growing in Virginia, R. E. MARSHALL (*Va. Polytech. Inst. Ext. Bul. 40 (1918), pp. 15, figs. 6*).—This comprises the results of a census of the commercial apple industry of Virginia, taken in 1918 under the direction of the extension division of the Virginia College. Tabular data are given showing the number of trees by counties and by important varieties. There are approximately 2,185,000 commercial apple trees of different ages in the State.

Peach growing, H. P. GOULD (*New York: The Macmillan Co., 1918, pp. XXI+426, pls. 32, figs. 19*).—A treatise on the principles and practice of peach production, the introductory chapters of which deal with the introduction of the peach into America and the economic status and extent of the peach industry. The succeeding chapters discuss location and site of the orchard; propagation of peach trees; details of planting an orchard; orchard management; the tillage of peach orchards; interplanted crops; fertilizers for peach orchards; pruning peach trees; insect and disease control; thinning the fruit; irrigating peaches; a consideration of adverse temperatures; annual cost factors in growing peaches; peach varieties, botany, and classification; picking and packing the fruit; and transportation, storage, and marketing.

Storage of grapes, P. THAYER (*Mo. Bul. Ohio Sta., 3 (1918), No. 10, pp. 315–317*).—For several seasons a test has been conducted at the station to see what varieties of grapes are best adapted for storage. Notes are given on the behavior under storage of some 22 varieties which were selected for the test by reason of lateness of ripening, firmness of flesh, or toughness of skin. Of these Wilder appeared to be the best for storage and Lindley was very good. Other varieties adapted for storage were Agawam, Diana, Gaertner, Hernito, Iona, Salem, Vergennes, and Xenia.

The experiment indicated that a uniform temperature of about 40° F. would be the optimum, since cold storage seems to increase the amount of shattering and in some cases to injure the flavor. The fruit should be mature and free from disease, picked when dry, and handled carefully to avoid cracking. It should be stored on shelves or in trays in shallow layers in an atmosphere with a reasonable amount of humidity.

Smyrna fig culture, G. P. RIXFORD (*U. S. Dept. Agr. Bul. 732 (1918), pp. 43, figs. 12*).—A treatise on Smyrna fig culture, dealing with the extent and origin of the industry, introduction of Smyrna figs into the United States, classification of cultivated figs, various crops of the fig tree, fig pollination and caprification, application of caprifigs to Smyrna trees, caprifig plantations, the seedling fig orchards at Loomis, Cal., harvesting and curing, packing, shipping fresh figs, Smyrna fig culture in the Southern States, starting, care, and management of the Smyrna fig orchard, the splitting of figs, and fig breeding. Descriptions are given of Smyrna and Capri fig varieties that are promising, or that have already assumed importance in the fig industry. The opportunities in the industry are briefly discussed, and a bibliography of literature on the fig is appended.

Culture of the Logan blackberry and related varieties, G. M. Darrow (*U. S. Dept. Agr., Farmers' Bul. 998 (1918), pp. 24, figs. 11*).—This publication deals with the culture of the Logan blackberry, also popularly known as the loganberry, in the milder parts of California, Oregon, and Washington. Information is given relative to the status of the industry, origin of the variety, extent of culture, location, and site of the plantation, planting, training, and pruning the plants, harvesting and utilizing the fruit, yields, duration of plantations, propagation, and related forms and hybrids.

Cranberry investigations, T. J. Headlee (*Proc. Amer. Cranberry Growers' Assoc., 49 (1918), pp. 11–19*).—The cooperative cranberry experiments that are being conducted under the direction of the New Jersey Experiment Stations (E. S. R., 37, p. 745) were replanned during the year and limited for the present to problems of plant food, soil acidity, soil water, and insects. The present report reviews the results of previous fertilizer experiments, briefly notes some initial soil acidity experiments, and outlines future fertilizer and soil acidity experiments.

Temperatures of small fruits when picked, N. E. Stevens and R. B. Wilcox (*Plant World, 21 (1918), No. 7, pp. 176–183*).—Observations on a variety of small fruits here reported show that on clear days they usually have a temperature considerably above that of the air. No constant difference in temperatures of fruits of the same variety, but of different colors, was observed. The rise in temperature appears to be mostly due to the absorption of radient energy from the sun; it was not noticeable at night nor on cloudy days, and berries in the shade are uniformly cooler than those in the sun. A list of cited literature is appended.

Home storage houses for fruit, F. N. Fagan (*Penn. State Col. Ext. Circ. 74 (1918), pp. 18, figs. 25*).—This circular gives suggestions for constructing home storage houses, including illustrations of various methods of construction.

Home vegetable and fruit storage (*Mass. Agr. Col. Ext. Serv. Bul. 26 (1918), pp. 7, figs. 2*).—Suggestions are given for storing various classes of fruits and vegetables, including directions for constructing a cool storeroom in the cellar.

Report of nut tree investigations in Maryland, E. S. Johnston (*Maryland Sta. Bul. 218 (1918), pp. 239–265, figs. 2*).—With the view of determining the range of country wherein different varieties of Persian walnuts and pecans can be grown, the station distributed a number of these trees in various sections of the State during the three years, 1907–1909. This bulletin contains a report of the present status of these trees and of trees growing at the station, together with notes on the records of other nut trees in different counties of Maryland and a list of varieties of walnuts and pecans recommended for planting. Information is also given relative to the economic importance of nuts. A brief bibliography of nut publications is included.

In all, 1,500 walnut and pecan trees were distributed. It is found that a greater percentage of trees have survived in the counties on the Eastern Shore and in the counties of Anne Arundel, Calvert, Washington, and Montgomery. Of the varieties planted on the station grounds the following have grown best: Wiltz, Franquette, Mayette, and Chaberte walnuts, and Pabst, Moneymaker, Stuart, Busseron, Major, and Mantura pecans.

A new variety of avocado, the "Chinin," G. Itié (*Agron. Colon., 3 (1918), No. 20, pp. 42–44, figs. 3*).—The author describes a group of avocados (*Persea gratissima*) obtained from the State of Tabasco, Mexico, the fruit of which differs so much from the ordinary avocados that the group has been given the name "Chinin." Four types of this group are described. The "Chinin" is distinguished from the avocado by its wrinkled skin, by the constitution of the endocarp, which is always thick and resistant, and by the texture and flavor of the pulp. The most common type is very elongated, pear-shaped in form, and often resembles a calabash in appearance.

Lemon orchard from buds of single selected tree, A. D. Shamel (*Jour. Heredity, 9 (1918), No. 7, pp. 318–320, figs. 2*).—The author recently examined a 40-acre Lisbon lemon orchard near Porterville, Cal., set out in 1907, with trees all grown from buds of a very productive and valuable parent tree. Not one off-strain tree was found in this orchard, whereas in neighboring Lisbon lemon orchards, where no bud selection based on performance records and intimate tree knowledge had been practiced in propagation, it was found that from 10 to 70 per cent of the trees were of variable or off-type strains.

Orange-like fruit from a lemon tree, T. W. Brown (*Jour. Heredity, 9 (1918), No. 7, pp. 308–310, figs. 3*).—The author describes a lemon tree growing in the gardens of the Ministry of Agriculture, Cairo, Egypt, that bears orange-shaped fruit. The fruits are lemon in color, but many of them are characterized by a raised longitudinal orange-colored line on one side.

One of the branches developed a large fruit which resembled an orange both in appearance and taste. The tree was supposed to be a typical Italian lemon. It is suggested that the bud from which it was propagated may have been taken from a lemon-orange hybrid tree.

A fruiting orange thorn, A. D. Shamel and C. S. Pomeroy (*Jour. Heredity, 9 (1918), No. 7, pp. 315–317, figs. 2*).—The fruiting orange thorn here illustrated and discussed was observed on a Washington navel orange tree. The authors state that through the selection of buds for propagation from thornless limbs, or those having small thorns, considerable progress has been made in isolating thornless strains.

Pyrethrum and its culture, H. Faes (*Le Pyrèthre et Sa Culture. Lausanne: Sta. Vit. Lausanne, 1918, pp. 7, figs. 2*).—This article contains a brief account of the species of chrysanthemum (*Chrysanthemum cinerariæfolium*) furnishing the Dalmatian insect powder, together with the results of experimental cultures in different localities in Switzerland and general directions for growing pyrethrum.

FORESTRY.

Value of scientific research in forestry, C. F. Korstian (*Trans. Utah Acad. Sci., 1 (1908–1917), pp. 186–194*).—A paper on this subject read before the Utah Academy of Sciences, April 6, 1917.

Some present-day problems in forestry, E. R. Hodson (*Trans. Utah Acad. Sci., 1 (1908–1917), pp. 45–54*).—A popular discussion of various problems relating to forestry, and dealing especially with forest areas in Utah, Nevada, and southern Idaho.

Forestry work, W. H. Whellens (*London: T. Fischer Unwin, Ltd., 1918, pp. 236, figs. 17*).—An elementary treatise on the principles and practices of silviculture, with special reference to British conditions.

Effect of the war on forests of France, H. S. Graves (*Amer. Forestry, 24 (1918), No. 300, pp. 709–717, figs. 10*).—A popular discussion of forest conditions in France, the effect of the war on the forests, and economic consequences.

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended December 31, 1917, A. F. Fischer (*Ann. Rpt. Dir. Forestry P. I., 1917, pp. 91*).—This comprises a report for the year on the divisions of forest management, forest lands and maps, investigation, sawmills and utilization, administration, and of the forest school, including recommendations relative to needed legislation. Appended to the report are grading rules governing the inspection and measurement of Philippine lumber, revised groups of Philippine timber trees, data on public lands applications received from the Bureau of Lands, together with data on major and minor forest products, revenues, and expenditures for the year.

Annual report of the director of forests, N. W. Jolly (*Ann. Rpt. Dir. Forests [Queensland], 1917, pp. 5, pls. 4*).—A statistical report relative to the administration and management of the State forests in New Zealand, including data on areas, yields in major and minor products, revenues, expenditures, etc.

The trees of White County, Indiana, with some reference to those of the State, L. F. Heimlich (*Proc. Ind. Acad. Sci., 1917, pp. 387–471, figs. 59*).—This comprises a survey of the native species of trees in White County, Ind., including information relative to their distribution and economic uses. A bibliography of related literature is appended.

The vegetation of northern Cape Breton Island, Nova Scotia, G. E. Nichols (*Trans. Conn. Acad. Arts and Sci., 22 (1918), pp. 249–467, figs. 70*).—This comprises a study of the ecological relations of the deciduous forest climatic formation and the northeastern evergreen coniferous forest climatic formation, both of which formations are well represented on the island of Cape Breton.

A bibliography of related literature is appended.

Some factors in the replacement of the ancient East African forest by wooded pasture land, C. F. M. Swynnerton (*So. African Jour. Sci., 14 (1918), No. 11, pp. 493–518*).—The author describes the forest types occurring in portions of Southern Rhodesia and Portuguese East Africa, discusses evidence of forest destruction and probable former continuity, factors in forest distribution, and reconquest by forest as furthered by fire protective measures taken by the author during the past 15 years.

Limiting factors in relation to specific ranges of tolerance of forest trees, A. H. Hutchinson (*Bot. Gaz., 66 (1918), No. 6, pp. 465–493, pls. 2, figs. 5*).—In this paper the author discusses the factors of temperature, water, soil, humus, light, time, and competition with reference to their influence in limiting the range of tolerance of forest trees. Notes are given on the specific ranges of tolerance of some of the dominant forest species of Ontario, together with their relation to limiting factors.

Logging in the Douglas fir region, W. H. Gibbons (*U. S. Dept. Agr. Bul. 711 (1918), pp. 256, pl. 1, figs. 84*).—The purpose of the present bulletin is to bring together in systematic and usable form the bulk of the information dealing with Douglas fir logging costs thus far acquired. In preparing the manuscript the author has consulted freely many of the lumber trade journals and other available sources of information.

Introductory consideration deals with a description of the Douglas fir region and a general account of the logging industry. Various steps involved in logging are then considered in detail, with reference to methods employed and costs of these methods. The important phases discussed include felling and bucking, primary log transportation, loading, railroad transportation, railroad inclines, unloading, water transportation, general expenses, and total cost of logging at one operation.

The ancient oaks of America, W. TRELEASE (*Brooklyn Bot. Gard. Mem., 1 (1918), pp. 492–501, pls. 10*).—The purpose of the present paper is to bring together the scattered facts relative to the fossil oaks of America. Leaves of various fossil forms are illustrated, and a key is given to the principal leaf types of the Cretaceous and Tertiary fossil oaks, together with a list of references.

The ray system of Quercus alba, L. M. LANGDON (*Bot. Gaz., 65 (1918), No. 4, pp. 313–323, figs. 22*).—A study of the ray system of *Q. alba*, as affected by such conditions as the age of the trees, location of shoots in the trees, and vigorous or suppressed conditions of growth, indicated that neither the age of the trees nor the location of wood in a tree is an appreciable factor in the modification of the ray system. The conditions of vigorous and suppressed growth, however, do tend to modify the ray system. A bibliography of literature is appended.

The relationship between the leaves and latex of Hevea brasiliensis, W. BOBILIOFF (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 10, pp. 735–768, figs. 10*).—The investigation here reported showed that the current of latex from natural leaves into the stem and back is interrupted at the base of the petiole by a layer of crystals of oxalate of lime, hence it is concluded that no analogy exists between the lactiferous tubes and those conducting organic stuffs (sieve tubes). The latex which exudes from the trunk of the tree as the result of tapping or other injury does not originate from the leaves, and therefore the leaves are of no vital interest in forming latex. The apparent reduction of latex in the dropping leaf must be attributed to a decrease of the percentage of water. No relationship can be traced between the anatomical structure of the leaf and its petiole and the yield of a given Hevea tree. There also exists no correlation between the size of the leaves and the latex production.

Rubber seed selection, A. H. MALET (*Agr. Bul. Fed. Malay States, 5 (1917), No. 7, pp. 271–274*).—Data presented by the author indicate a wide range of variability in the yield of latex among seedling Hevea rubber trees, thus indicating the need of scientific seed selection.

The girth-increment of sal in regular crops in the United Provinces, E. MARSDEN (*Indian Forester, 44 (1918), No. 10, pp. 469–475, pls. 2*).—Tabular data are given showing the girth-increment in even-aged crops of sal (*Shorea robusta*), as determined by measurements in 1913 and in 1918 of 61 sample plats laid out in the United Provinces.

Determination of increment by stem analysis (*Forestry Com. N. S. Wales Bul. 13 (1918), pp. 14, figs. 8*).—For the purpose of obtaining authentic information relative to the growth of species of eucalyptus on the southern tableland of New South Wales, stem analyses of a number of species were made by W. A. W. de Beuzeville. In the present bulletin the figures and conclusions reached for the mountain ash are presented in full, as this species is reported to be the fastest growing species in New South Wales.

The application of the graphic calculation.—I, On the determination of woodland surveys and the calculation of tree volumes, A. PARASCANDOLO (*Ann. R. Ist. Sup. Forestale Naz. Firenze, 3 (1917–18), pp. 93–136, pl. 1, figs. 40*).—This article describes an instrument for facilitating measurement by graphs, and further deals with the application of graphic calculation in measuring woodland areas and tree volumes.

Meeting the wood fuel situation, E. SECREST (*Mo. Bul. Ohio Sta., 3 (1918), No. 10, pp. 291–299, figs. 5*).—A popular paper discussing methods of cutting, burning, buying, and selling fuel wood.

Suggestions for marketing small timber in Wisconsin, B. MacKaye (*Wis. Conserv. Com. Bul. 4 (1918), pp. 32, pl. 1, figs. 5*).—This bulletin was prepared under the direction of the Wisconsin Conservation Commission in cooperation with the Forest Service of the U. S. Department of Agriculture. It contains a tabular list of commodities made from crude products of different woods, and a list of wood-using firms in the State, together with suggestions for selecting the most profitable market for different crude products. Cooperative marketing is also briefly discussed.

A list of forest products statistics issued by the Statistical Clearing House, Central Bureau of Planning and Statistics (*Washington, D. C.: War Indus. Bd. [U. S.], 1918, pp. 53*).—This bulletin was prepared under the direction of the War Industries Board. It shows the principal sources of statistics on forest products, including both original and secondary sources and the various Government offices in Washington from which the tabulations may be secured by properly accredited persons.

DISEASES OF PLANTS.

Weather conditions and crop diseases in Texas, F. H. Blodgett (*Mem. Torrey Bot. Club, 17 (1918), pp. 74–78*).—Following the storm of August 16, 1915, the damage to cotton by anthracnose (*Glomerella gossypii*) was directly related to the distribution of rainfall during the storm period. In 1916, local factors were more generally permitted to express themselves as distinct elements of their environment. Anthracnose or bacterial spot affected 8 per cent of the cotton bolls near Hillsboro. Humidity appeared to be a factor, this applying to areal distribution as well as to periodic recurrence of precipitation. Seasonal distribution of rainfall is said to be specially important in connection with cotton anthracnose under Texas conditions.

Dwarfing or stunting as a factor inducing disease was indicated in a series of counts near Dallas. The occurrence of conditions specially favoring the epidemic development of an infrequent disease was illustrated in the case of *Æcidium gossypii* appearing in Hidalgo County. The alternate host was not discovered. Cotton fields which were nearly ready to show first blooms suffered severely. Date of irrigation and weather conditions may bear some relation to the severe outbreak. This view is supported by the activity of the secondary parasite Tuberculina.

[Plant diseases in Ontario] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 43 (1917), pp. 20–31*).—Portions of this report, which deals also with other subjects, give accounts of dusting for apple scab, which is not considered superior to liquid spraying; control of brown rot on sweet cherries by means of a combination of dusting and liquid sprays; the fifth year's test of such pear blight control measures, as prompt removal of blighted branches or blossoms and disinfection of tools or wounds made therewith; a new nozzle dispensing with a tower for tall trees; and a successful search for a raspberry variety immune to yellows.

Prolonged wet weather in early summer favored the development and spread of certain fungus diseases. Currant leaf spot was very severe in the Niagara district. Apple scab was prevalent and severe in all orchards which had not been thoroughly sprayed. Tomato blossom end rot was prevalent in parts of the Province. The disease is considered as physiological.

Potato late blight (*Phytophthora infestans*) appeared early in July, but was checked by dry weather. A minor outbreak occurred in September. An inspection revealed the presence of such physiological diseases as leaf roll, mosaic, and curly dwarf in certain areas.

Celery late blight was satisfactorily controlled by Bordeaux mixture, but not by sulfocide. Bordeaux mixture was shown by experiments continued during five years to be entirely safe when made up in accordance with the 4:4:40 formula, starting when the plants are in the seed bed and spraying at intervals of ten days or two weeks throughout the growing season. Studies on the carrying over of the blight in the seed gave negative results.

Oat smut experiments carried on for two years indicate that the sprinkling method of employing formalin can be successfully practiced. Directions and precautions for such use of formalin are outlined.

Experiments on the cause and control of a disease of winter tomatoes have been carried on for three years, the results giving promise that the disease may be held in check by the application of such fertilizers as acid phosphate and bone flour. Control of snapdragon rust involves destruction of all diseased plants, watering the plants only from below in the greenhouse, dusting the plants thoroughly every ten days with finely powdered sulphur or spraying with lime-sulphur 1:35, growing plants from seed, and exclusion of all imported potted plants or cuttings. Inspection of white pines for blister rust showed forty infections on six pines, but no rust on either wild or cultivated Ribes.

Diseases of economic plants, W. Nowell (*West Indian Bul., 16 (1918), No. 4, pp. 309, 310, 322–327, 330, 331*).—These portions of a report (which also includes insect pests and data on soil, climatic, and other conditions) deal with sugar cane root disease (*Marasmius sacchari*) and rind fungus (*Melanconium sacchari*); cotton leaf mildew, bacterial boll disease, angular leaf spot, black arm, internal boll disease, and boll soft rot (*Phytophthora* sp.); cacao root disease (*Rosellinia pepo*), canker and black rot of pods (*P. faberi*), brown rot of pods and dieback and stem disease (*Lasiodiplodia theobromæ*), and pink disease (*Corticium salmonicolor*); citrus black root disease (*R. pepo* and *R. bunodes*), red root disease (*Sphærostilbe* sp.), pink disease, crown rot, collar gumming, and dieback; coconut bud rot and root disease; maize rust, smut, and root and seedling diseases; peanut leaf rust (*Uredo arachidis*); onion bacterial rot; a rubber disease due to *Rosellinia* sp.; and phanerogamic parasites (dodder and mistletoe) attacking various plants.

Parasitic fungi collected in the Government of Podolia, Russia, L. Garbowski (*Bul. Trimest. Soc. Mycol. France, 33 (1918), No. 3–4, pp. 73–91; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 3, p. 394*).—A list of parasites, with their respective hosts, collected in the Government of Podolia, Russia, during 1915 comprises 121 fungi. Of these several are named and described as new species, among them *Fusariella populi* on *Populus tremula* and *Macrosporium somniferi* on *Papaver somniferum*.

Mycological notices, T. Lindfors (*Svensk Bot. Tidskr., 12 (1918), No. 2, pp. 221–227, figs. 4*).—The author supports the claim that *Cæoma interstitiale* and *Puccinia peckiana* are developmental forms of the same fungus. He also describes as new species *Protomyces sonchi* on *Sonchus oleraceus*, *P. kemneri* on *Orobus tuberosus*, and *Helminthosporium acrothecioides* on *Hordeum vulgare*.

Carduaceous species of Puccinia.—I, Species occurring on the tribe Vernoniæ, H. S. Jackson (*Bot. Gaz., 65 (1918), No. 4, pp. 289–312*).—This is the first of a proposed series of papers dealing with the species of Puccinia found on the members of the tribe Vernoniæ. Of these three are noted in this connection, Piptocarpha and Elephantopus harboring 2 species each, and Vernonia 25 species, some of which are new or newly named.

Æcial stage of Puccinia oxalidis, W. H. Long and R. M. Harsch (*Bot. Gaz., 65 (1918), No. 5, pp. 475–478*).—The authors report studies made during 1915 and 1916 on an Æcidium first found on leaves of *Berberis repens*. This is said to be the alternate stage of *P. oxalidis*, a description of which is given in connection with *Oxalis violacea*.

An experiment in the treatment of covered smut of barley, E. S. Salmon and H. Wormald (*Jour. Bd. Agr.* [*London*], *24* (*1918*), *No. 12*, *pp. 1388–1394*, *pl. 1*, *fig. 1*).—Experiments involving seed treatment with formalin were completely sucessful in preventing covered smut (*Ustilago hordei*) of barley. Sprinkling the seed with 2.5 per cent copper sulphate solution was less effective. Bordeaux mixture was of little value in this connection. Sweating the seed in a malt kiln at a temperature not exceeding 100° F. afforded no protection.

Smut in oats and barley (*Jour. Bd. Agr.* [*London*], *24* (*1918*), *No. 12*, *pp. 1417–1419*).—Covered and loose smut of barley are described, with a discussion of the economy, efficiency, and safety of protective methods of treatment.

Studies on the rice blast fungus, I, Y. Nishikado (*Ber. Ōhara Inst. Landw. Forsch.*, *1* (*1917*), *No. 2*, *pp. 171–218*, *pls. 2*, *figs. 2*).—This investigation of rice blast, said to be the most serious disease of rice in Japan, was begun in the summer of 1915, and is expected to continue for some years. The present contribution deals with the host relation of the fungus, in the cross-inoculations, morphological and cultural comparisons of Piricularia from various hosts, and the ecology of the fungus and the source of early infection. Definite accounts are claimed to exist of the occurrence of this disease in Japan at least two centuries ago.

Studies of the rice-blast fungus and of related species were made on cultures obtained from rice, crabgrass, Italian millet, green foxtail, *Zingiber mioga*, and *Z. officinale* grown in various parts of Japan. The causal organisms were studied in connection with species to which they are supposed to be closely related, and are technically described as new species, the one attacking Italian millet and green foxtail as *P. setariæ*, and that attacking *Z. mioga* and *Z. officinale* as *P. zingiberi*.

Fungus parasites of Bromus erectus, D. Cruchet (*Bul. Soc. Vaud. Sci. Nat.*, *51* (*1917*), *No. 193*, *pp. 583–586*).—An incomplete list is given of fungi parasitic on *B. erectus*. *Epichloe typhina* and *Urocystis agropyri* are discussed as being more serious than the other forms, none of which are considered very destructive.

Disease resistance in cabbage, L. R. Jones (*Proc. Nat. Acad. Sci.*, *4* (*1918*), *No. 2*, *pp. 42–46*, *figs. 2*).—The author summarizes results of work done or participated in by himself in selecting cabbage strains for resistance to yellows (*Fusarium conglutinans*), as previously noted (E. S. R., 34, p. 542; 36, p. 248), also results of work done by Tisdale on the factors internal to the plant which are favorable to the activity of the organism or related organisms (E. S. R., 36, pp. 748, 845), and that done by Gilman on the influence of soil temperatures in this connection (E. S. R., 36, p. 248). He states that the resistance observed is due to the relations of the interior cells of the host to those of the parasite. Resistant tissues apparently restrain the development of the parasite until a protective cork formation has been established. Resistance appears to be a transmitted character, but hybrids show intermediate degrees, and resistance appears, therefore, to be dependent upon a number of heritable factors. Environmental factors have a marked influence on resistance. It is thought that a resistant strain may be obtained from any vigorous, established variety, since in case of some Fusariums (as well as other fungi) it is comparatively easy to secure disease-resistant strains of host plants.

The leaf spot disease of red clover caused by Macrosporium sarcinæforme, L. J. Krakover (*Ann. Rpt. Mich. Acad. Sci.*, *19* (*1917*), *pp. 273–328*, *pls. 5*, *figs. 2*).—Leaf spot of red clover, due to *M. sarcinæforme* and said to be different from the like-named fungus attacking alfalfa, is described in connection with a somewhat detailed account of the disease and the causal organism.

The diseased spots do not transpire, the injury being due to the unbalanced metabolism which leads to a depletion of the cell reserves. The fungus grows equally well in light and in darkness, but the shaded lower leaves of the plants are more readily attacked than those higher up. The organism may be spread by the splashing of rain, or it may overwinter in crop refuse. Seed may carry the disease to the next crop, and spores may be carried 48 ft. by a wind velocity of 3.93 miles per hour, or possibly farther in the open air. The breeding of resistant varieties is depended upon as a means of control.

[Fungus diseases of mushrooms], W. B. McDougall (*Bul. Ill. State Lab. Nat. Hist., 11 (1917), Art. 7, pp. 427, 428, fig. 1*).—A disease of *Lentinus tigrinus* is said to be caused by a Sporotrichum, and a disease of cultivated mushrooms to be caused by a bacterium.

A wilt of Capsicum annuum, L. Pavarino and M. Turconi (*Atti Ist. Bot. Univ. Pavia, 2. ser., 15 (1918), pp. 207–211*).—This is a descriptive discussion of a pepper wilt studied at Pavia. The supposedly causal organism is considered a new species, and has been named *Bacillus capsici*.

[Liability of potatoes to disease] (*Carnegie Inst. Washington Year Book, 16 (1917), p. 132*).—It is stated that Harris has analyzed biometrically certain data on the liability of potatoes to disease, the most important conclusion from which is that varieties of potato which show more than the average amount of injury by one disease will usually show more than average injury by another disease; that is, to a considerable extent, susceptibility to disease is general rather than specific.

Black wart caused by Chrysophlyctis endobiotica, L. O. Kunkel (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Bul., 2 (1918), No. 11, pp. 197–199*).—A report is given of the discovery in Luzerne County, Pa., of the black wart of potatoes due to *C. endobiotica*. It is believed that this disease was introduced into this locality in a shipment of imported potatoes received in 1912. As it is probable that only a small part of the shipment was distributed in this region, attention is called to the disease so that plant pathologists may be on the lookout for it in their localities.

Diseases of sugar cane in tropical and subtropical America, especially the West Indies, J. R. Johnston et al. (*West Indian Bul., 16 (1918), No. 4, pp. 275–308, pls. 7*).—The greater part of this information is said to have been compiled by Johnston during his investigations on the subject, which continued for several years. The organisms listed as causing diseases of sugar cane include *Bacterium vascularum*, *Trichosphæria sacchari*, *Gnomonia iliau*, *Sphærella sacchari*, *Eriosphæria sacchari*, *Leptosphæria sacchari*, *Thyridaria tarda*, *Nectria laurentiana*, *Ustilago sacchari*, *Hypochnus sacchari*, *Odontia saccharicola*, *O. sacchari*, *Marasmius sacchari*, *M. stenophyllus*, *Schizophyllum alneum*, *Laternea columnata*, *Cytospora sacchari*, *Coniothyrium melasporum*, *Darluca melaspora*, *Diplodia cacaoicola*, *Colletotrichum falcatum*, *Melanconium sacchari*, *M. saccharinum*, *Cephalosporium sacchari*, *Thielaviopsis paradoxa*, *Cercospora longipes*, *C. vaginæ*, *C. kopkei*, *Helminthosporium sacchari*, *Sclerotium rolfsii*, and *Himantia stellifera*. Diseases classed as nonparasitic or of undetermined causation include yellow stripe disease, top rot, sereh, mottling disease, withertip, and chlorosis. A brief discussion is given of the diseases and means employed or attempted for their control, and a bibliography is appended.

Nematode injury [to sugar cane] caused by Heterodera radicicola, N. A. Cobb (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Bul., 2 (1918), No. 13, pp. 237, 238*).—The author reports a heavy infestation of stalks of sugar cane received from Florida. One-half of the main roots of the stalks were dead, while of those alive, 45 per cent were infested. While sugar cane has been known to be a host for this nematode, such serious infestation does not seem to have been previously reported.

Some important diseases of sweet potato, C. D. SHERBAKOFF (*Quart. Bul. Plant Bd. Fla., 2 (1918), No. 4, pp. 179–189, figs. 6*).—The author discusses mainly the material presented in the bulletin by Harter (E. S. R., 35, p. 49) according to the grouping of diseases made therein.

Peach yellows and peach rosette, J. B. S. NORTON (*Mo. Bul. Cal. Com. Hort., 6 (1917), No. 7, pp. 282–286, figs. 3*).—This is a brief account of the causation and progress of peach yellows and peach rosette and of control measures therefor.

A few insects and diseases common to small fruits, F. H. DUDLEY (*Bul. [Maine] Dept. Agr., 17 (1918), No. 3, pp. 22–27*).—Besides mention of raspberry cane borer, cane maggot, and sawfly, and the giant root borer of the blackberry, notes are gven on raspberry crown gall (*Bacterium tumefaciens*), cane blight, and anthracnose; strawberry leaf spot (*Mycosphærella fragariæ*); and blackberry crown gall, cane knot, red rust (*Puccinia interstitialis*), and anthracnose.

Comparisons between effects of basic and of acid copper sprays, J. CAPUS (*Rev. Vit., 47 (1917), No. 1218, pp. 280–282*).—Acid and alkaline sprays applied 2½ days before a rain were found to be equally prompt and efficacious as regards their fungicidal effects, which were entirely satisfactory. Atmospheric conditions constitute a very important factor. The effects of the alkaline sprays are much more lasting than those of the acid preparations.

Diseases and enemies of cacao in Ecuador and modern methods of cacao cultivation, J. B. RORER, trans. by A. PACHANO (*Enfermedades y Plagas del Cacao en el Ecuador y Metodos Modernos Appropriados al Cultivo del Cacao. Ambato, Ecuador: Assoc. Agr. Ecuador, [1918], pp. 80, figs. 22*).—The three main parts of this report, which is based mainly upon observations made by the author in the months of November and December, 1917, deal respectively with the various cacao diseases and pests in Ecuador, modern methods of cacao culture, and economic considerations in this connection.

Melanose of citrus, H. S. FAWCETT (*Mo. Bul. Cal. Com. Hort., 6 (1917), No. 7, pp. 280, 281, fig. 1*).—This is a brief descriptive and historical account of citrus melanose (*Phomopsis citri*).

Florida citrus diseases, H. E. STEVENS (*Florida Sta. Bul. 150 (1918), pp. 13–110, figs. 49*).—This bulletin has been prepared as an attempt to bring together information regarding all the common citrus diseases that occur in Florida. While primarily intended for the consideration of fungus and bacterial diseases, the publication also includes a few other diseases and injuries due to various causes. The information given is for the most part the result of the author's personal investigation and observation, although he has drawn upon other sources for data regarding different diseases. Under control methods, the author describes the best and latest treatment for combating the diseases.

Preventing wood rot in pecan trees, S. M. MCMURRAN (*U. S. Dept. Agr., Farmers' Bul. 995 (1918), pp. 8, figs. 10*).—The author popularly describes the wood rot of pecan trees which follows improper pruning, etc., and gives suggestions for the control of the rot, the principal means recommended being proper pruning and protection of wounds.

Some bacterial diseases of orchids, G. L. PAVARINO (*Atti Ist. Bot., Univ. Pavia, 2. ser., 15 (1918), pp. 81–88, pl. 1*).—From diseased portions of orchids, the author claims to have isolated organisms which are described as new species under the names *Bacterium cattleyæ*, *B. kramerlani*, *B. briosianum*, *Bacillus pollacii*, and *B. farnetianus*.

More about rose diseases, L. M. MASSEY (In *The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1918, pp. 63–71, fig. 1*).—This is the second report made by the author on this investigation (E. S. R., 37, p. 353).

Crown canker, an important rose disease first observed by the author in 1916, is now known to exist in Missouri, Pennsylvania, Indiana, Michigan, Massachusetts, and New York, seedlings and grafts of different ages and numerous varieties being affected. It has not been observed on outdoor plants. *Cylindrocladium scoparium* is said to be the cause of the disease, which may prove to be the most important disease of roses under glass. Moisture appears to be an important factor. Control experimentation is in progress.

In case of black spot (*Diplocarpon rosæ*), commercial concentrated lime-sulphur made up to a strength of 1:50 proved more efficacious than ammoniacal copper carbonate and probably as much so as Bordeaux mixture and sulphur-arsenate dust, but it is said to discolor the foliage almost as much as Bordeaux mixture. In the nursery, sulphur-arsenate permitted the lowest rate of infection, 7.66 per cent, Bordeaux mixture 8.51, lime-sulphur 24.43, Hammond's copper solution 1:100, 37.77, and untreated 80 per cent. Experiments were conducted at Ithaca, N. Y., for the same disease. Results of all these tests, taken with others noted as applying to powdery mildew, are thought to warrant the opinion that the sulphur-arsenate dust mixture, when properly applied, affords the most efficient means of control of the two diseases said to be most injurious to roses.

A study of heart rot in western hemlock, J. R. WEIR and E. E. HUBERT (*U. S. Dept. Agr. Bul. 722 (1918), pp. 37, figs. 13*).—The western hemlock is said to be subject to a large percentage of decay, due almost entirely to the fungus *Echinodontium tinctorium*, which causes a stringy brown rot of the heartwood extending to all parts of the trees. The fungus is said to enter mainly through branch stubs, and the decay extends up and down the heartwood until all the susceptible heartwood is attacked. The extent of the injury was found to increase with age.

As means of control, the authors suggest cutting the infected trees and destroying by fire all infectious cull material, and all infected trees left standing.

Tumors of the maritime pine, J. DUFRÉNOY (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 8, pp. 355, 356*).—In the forest of Arcachon, the maritime pine shows a large number of tumors on trunk or root. These are here described as to external and internal characters and relations, some of them recalling those of crown gall as noted by Smith and others (E. S. R., 25, p. 243). The reactionary cells and neighboring ones contain abundant microorganisms which are Gram-negative but colorable by gentian violet or methylene blue. Both the diseased tissues and the exuding resin may also show the presence of a very fine mycelium.

Root and stem tumors appear to be due to different bacteria which require further study. These bacterial trunk tumors of the maritime pine are said to be different from those of the Aleppo pine, inasmuch as the parasites in the former case are intracellular and the injury develops away from the base of the tree.

The white pine blister rust and the chestnut bark disease, E. P. MEINECKE (*Mo. Bul. Cal. Com. Hort., 6 (1917), No. 7, pp. 268–279, figs. 9*).—This is a brief discussion of the history, characteristics, effects, and control of white-pine blister rust (*Peridermium strobi*, *Cronartium ribicola*) and chestnut-bark disease (*Endothia parasitica*).

Black canker of chestnut, G. Briosi and R. Farneti (*Atti Ist. Bot. Univ. Pavia, 2. ser., 15 (1918), pp. 43–51, figs. 2*).—Referring to a previous note by the authors (E. S. R., 22, p. 749) and to comments thereon by Griffon and Maublanc (E. S. R., 24, p. 652), the authors give an account of comparisons tending to show that *Coryneum perniciosum, Fusicoccum, perniciosum,* and *Melanconis perniciosa* should be considered as distinct from *M. modonia*.

Mycological and pathological notes, II, M. Turconi and L. Maffei (*Atti Ist. Bot. Univ. Pavia, 2. ser., 15 (1918), pp. 143–149, pl. 1*).—This series adds to the first (E. S. R., 35, p. 45) the new genus Chætoceratostoma, represented by *C. hispidum* found on dead leaves of *Castanea vesca* in Liguria, also by the new species *Macrosporium sophoræ* in living leaves of *Sophora japonica* and *Gibberella briosiana* on branches of *S. japonica* in the botanical garden at Pavia.

Fomes applanatus in South Africa, and its effect on the wood of black ironwood trees (Olea laurifolia), P. A. van der Bijl (*So. African Jour. Sci., 14 (1918), No. 11, pp. 485–492, pls. 4, figs. 2*).—*F. applanatus* is dealt with as regards its synonymy and nutritive relations, especially with *O. laurifolia*, although the fungus is known to occur on a large number of other hosts.

On black ironwood the fungus is regarded as a facultative parasite, gaining entrance through wounds at about the soil level and growing into the healthy wood. The organism continues to form sporophores after it has killed the host. Its action on the wood is described as one of delignification followed by digestion. A description of fungus is given, and attention is also drawn to forms of the same fungus which occur in South Africa.

Control measures are limited to prevention by forest sanitation, as the destruction of sporophores and of diseased wood.

Fomes officinalis, a timber-destroying fungus, J. H. Faull (*Trans. Roy. Canad. Inst., 11 (1917), No. 2, pp. 185–209, pls. 8, fig. 1*).—The author gives the results of a study, in its various aspects, of *F. officinalis*, the cause of red heart rot of conifers, both living and dead.

The fungus is said to gain access to the living host as a wound parasite. It occurs in Europe and Asia on *Larix europæa* and *L. sibirica*, and in British Columbia, Ontario, Quebec, Arizona, California, Oregon, Washington, Montana, Nevada, Idaho, Wisconsin, Michigan, and Wyoming on *Abies concolor, A. magnifica, A. grandis, L. occidentalis, L. laricina, Picea engelmanni, P. sitchensis, Pinus lambertiana, P. murrayana, P. ponderosa, P. jeffreyi, P. strobus, P. monticola, Pseudotsuga taxifolia, Tsuga heterophylla,* and *T. mertensiana*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A sketch of the natural history of the District of Columbia, together with an indexed edition of the U. S. Geological Survey's 1917 map of Washington and vicinity, W. L. McAtee (*Bul. Biol. Soc. Wash., No. 1 (1918), pp. 142, pls. 2*).—The occurrence and distribution of plants and animals in the District of Columbia is discussed in connection with a classified bibliography and an indexed map.

The genera of fishes from Linnæus to Cuvier, 1758–1833, seventy-five years, with the accepted type of each, D. S. Jordan and B. W. Evermann (*Leland Stanford, jr., Univ. Pubs., Univ. Ser., 1917, [No. 27], pp. 161*).—A contribution to the stability of scientific nomenclature.

About the biology of Mus concolor, L. Otten (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 6 (1917), pp. 82–119, pls. 5*).—A report of studies of the small house rat.

The rôle of the field rat in the epidemiology of plague, L. OTTEN (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 6 (1917), pp. 1–81; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 5, p. 415*).—Examinations of 2,111 field rats (*Mus rattus diardii*) resulted in the collection of 1,083 adult fleas, of which 576 were *Loemopsylla cheopis* and 507 were *Pulex ahalæ*. The author's investigations indicate that the field rat gets *L. cheopis* from the house rat, but that this flea dies off out-doors when inclement weather arrives. *P. ahalæ* infests the field rat throughout the year. While the field rat is susceptible to plague, the author does not ascribe any importance to it in the spread of plague from village to village.

On the duration of infectiousness of the Indian rat flea (Loemopsylla cheopis), L. OTTEN (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 6 (1917), pp. 120–126; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 5, p. 415*).—In connection with the investigations above noted the author found that this rat flea may transmit plague for a period as long as 43 days.

Aristonetta, a good genus, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 31 (1918), p. 98*).

Hierofalco rusticolus candicans in North Dakota, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 31 (1918), p. 97*).

Olor columbianus on the Potomac River, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 31 (1918), p. 97*).

Spizella monticola, the correct name for the North American tree sparrow, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 31 (1918), p. 98*).

Squatarola squatarola cynosuræ near Washington, D. C., H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 31 (1918), p. 97*).

Ninth annual report of the State entomologist, C. P. GILLETTE and G. M. LIST (*Off. State Ent. Colo. Circ. 26 (1918), pp. 52, fig. 1*).—Included in this report are brief notes on the insect pests that have caused the most damage to orchards in Colorado and have received the most attention, namely, the San José scale, Putnam scale, Howard scale, codling moth, fruit-tree leaf roller (*Archips argyrospila*), and pear-leaf blister mite; and on shade-tree pests, including the European elm scale, black locust borer (*Prionoxystus robiniæ*), and cottony maple scale.

The first infestation of the alfalfa weevil in Colorado was discovered early in July, 1917, near Paonia, in the upper part of the North Fork Valley, Delta County. Infestations were found as far east as Bowie, 5 miles east of Paonia, but no weevils could be found west of the town.

Tests of insecticides are reported upon by G. M. List (pp. 36–45). Blackleaf 40 used against the apple aphis, the most serious insect of young apple orchards in Colorado, was found to destroy all the aphids at a strength of 1:700 and but a few survived at strengths up to 1:1,500. The addition of soap was found to be of considerable benefit in aiding the liquid to penetrate the curled leaves and wet lice that were not in exposed places. The mealy plum louse (*Hyalopterus arundinis*), which often does considerable damage to plum and prune trees in the State, was not destroyed by blackleaf 40 to which fish-oil soap had been added when used at a strength of 1:800.

Injury to foliage by nicotin sulphate sprays led to experiments which demonstrated that a small amount of injury on the tips of leaves of all plants will result from the application of spray at strengths of 1:50, both with and without soap. The injury was not severe, being more marked on the plum and rose, and only on the rose did it cause any spotting of the leaves. The dilution of 1 part to 100 parts of water, both with and without soap, gave a very slight amount of burning on all plants except the apple. The dilution of 1:150, without soap, gave a very slight amount of burning on the rose, but when used with soap no burning was noticeable.

Lime-sulphur used against the tomato psyllid (*Paratrioza cockerelli*), which often becomes of economic importance in tomato fields and gardens of the State, destroyed 80 per cent of the psyllids when used at the rate of 1:33. The strengths of 1:40 and 1:45 seemed to have been almost if not quite as effective as 1:33 without so much apparent injury to the plants, although the growth was checked for a short time. The lime-sulphur then seemed to act as a stimulant, as the plants grew rapidly, even more rapidly than checks which had few psyllids on them. Nicotin sulphate used against the tomato psyllid at the rate of 1:200 gave negative results.

In tests of a number of miscible or soluble oils for the destruction of the fruit-tree leaf roller there was a great variation in the results obtained, some giving excellent results with all strengths, while others gave very poor results even with the higher strengths. Hydrocyanic acid gas had very little, if any, effect upon hatching of the leaf-roller eggs, while carbon bisulphid gave better but unsatisfactory results. Hot water used at the rate of 140° F. or higher was very effective in the destruction of the fruit-tree leaf-roller eggs.

Entomology (*New Jersey Stas. Bul. 317 (1917), pp. 35–40*).—This is a brief statement of the work of the year.

In the course of control work with orchard insects it was found that 95 per cent of the apple plant lice were destroyed during the dormant season by coating the eggs with winter-strength lime-sulphur, and that about 98 per cent were killed when they were wetted with a 2 per cent aqueous solution of crude carbolic acid to which enough soap had been added to break the surface tension. The efficiency of lime-sulphur appears to be increased by the addition of 40 per cent nicotin at the rate of 1:500. The miscible oils gave less satisfactory results, Scalecide, which contains no phenol, killing about 45 per cent, while Mechling's scale oil, which contains considerable phenol, killed about 85 per cent.

Control work with the pear psylla indicates that winter treatments may be omitted, but that 40 per cent nicotin should be added to the winter-strength lime-sulphur (1:500), which is applied just before the blossoms open, and that the treatment must be very thorough. Studies of the control of the peach borer show that poisoning the adults will not effect a control, since as many as 500 eggs may be laid before food is taken, and that control by destruction of the eggs involves a treatment every 9 or 10 days, beginning July 15.

Thirty-second report of the State entomologist, 1916, E. P. Felt (*N. Y. State Mus. Bul. 198 (1917), pp. 276, pls. 8, figs. 54*).—Following a brief preliminary account the experimental work with the codling moth, carried on in continuation of that previously noted (E. S. R., 36, p. 855), at Kendall, Albion, Hilton, and Newfane is reported upon. The codling-moth work in western New York emphasizes the necessity for thorough application, particularly of the first or calyx spray, which is applied just after the blossoms fall, and is the spray which gives by far the larger returns in preventing wormy apples. The second application may be effective in reducing "side injury" to some extent (E. S. R., 37, p. 259). Both the second and third sprayings, even if they have comparatively little influence in reducing the numbers of this pest, are considered abundantly justified in localities during seasons when scab is more or less prevalent. "A comparison of results obtained in the Kendall orchard in 1915 and upon the same trees in 1916 shows a reduction of one-third to two-thirds in the amount of wormy fruit and is striking evidence of the efficiency of thorough spraying and the results which may be expected the following season."

Work with the apple maggot failed to demonstrate any marked benefits from the use of a sweetened poison in their destruction. The collection and destruction of infested fruit before the maggot has an opportunity to escape appears to be the best means of control.

In control work with the pear thrips the application of lime-sulphur composed of 150 lbs. of lump lime in 20 gal. of standard lime-sulphur wash to 200 gal. of spray proved to be one of the most promising methods of controlling the pest by one application. "An important advantage of this treatment is that it also controls San José scale, though it is a little early for pear psylla. It can be supplemented, however, in case thrips are extremely abundant, by the application of the tobacco-soap preparation at the time the blossom clusters have separated."

Under the heading of "Notes for the Year" brief accounts are given of the occurrence during the year of the more important fruit, shade, and forest tree insects and garden, greenhouse, grass, clover, and miscellaneous insects.

Part 5 of A Study of Gall Midges (E. S. R., 36, p. 856), which deals with the tribe Lasiopteriariæ, is appended (pp. 101–252).

[Control of insect pests in Washington] (*Proc. Wash. State Hort. Assoc., 14 (1918), pp. 27–32, 52–56, 97–101, 127–134*).—The papers here presented include the following: Control of Aphis on Apple and Truck Crops, by A. H. Harrison (pp. 27–32); Costs and Efficiency in Arsenate of Lead Spraying, by S. W. Foster (pp. 52–56); Some Conclusions Regarding the San José Scale, by A. L. Melander (pp. 97–101); the Sulphur-Lime Spray, by C. J. DeVise (pp. 127–134).

[A report on economic insects in British Guiana in 1916], G. E. Bodkin (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1916, pp. 61–74*).—This is the annual report of the occurrence of and work with the more important insects of the year. A list of the commoner birds of the Botanic Gardens, prepared by L. D. Cleare, jr., is incorporated. A list is also given of 12 species of thrips which occur in the colony.

Injurious insects in Sweden during 1912–1916, A. Tullgren (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 152 (1917), pp. 104; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 4, pp. 145–151*).—This is a report of the entomological department of the Agricultural Experiment Station of Sweden, prepared in cooperation with about 550 correspondents throughout the country who send in regular reports concerning noxious insects.

Insect pests of plants cultivated in European Russia in 1914, N. [M.] Kulagin (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 7, pp. 1047–1054*).—A summary of information on the insect pests of cultivated plants in different parts of Russia, compiled from the Russian literature.

Reports on injurious insects of the mulberry tree in Formosa, M. Maki (*[Formosan Govt. Agr. Expt. Sta. Spec. Bul. 90 (1916), pp. 265, pls. 14, figs. 24]; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 4, pp. 174, 175*).—Eighty-seven insects and six other animals known to injure the mulberry tree in Formosa are reported upon.

Investigations on the insects injurious to spruce and pine cones, I. Trägårdh (*Skogsvårdsför. Tidskr., No. 7–8 (1918), pp. 413–476, figs. 44; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 3, pp. 90–92*).—The present paper, in which only the most common of the injurious insects which are found on spruce cones collected during the winter and their parasites are dealt with, is based upon investigations of about 14,000 cones collected from different parts of Sweden and kept in breeding cages.

On a new method of ascertaining the parasites of the respective host insects in a mixed infestation, I. TRÄGÅRDH (*Bul. Ent. Research, 9 (1918), No. 1, pp. 75–79, figs. 5*).—A method which enabled the author to ascertain the relation of the cone insects to one another in the investigations above noted is described.

Arsenate of lime, G. E. SANDERS (*Canada Dept. Agr., Ent. Branch Crop Protec. Leaflet 10 [1918], pp. 4*).—The use of this arsenical as a spray for apple, potato, and pear is discussed. It is pointed out that when the cost is taken into consideration arsenate of soda is the only arsenical insecticide that approaches arsenate of lime as a potato poison.

The present status of investigations of Coccobacillus acridiorum, B. BARBARÁ (*Rev. Inst. Bact. [Argentina], 1 (1917), No. 1, pp. 107–113; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 5, pp. 177, 178*).—This paper reviews the experimental work conducted with a view to determining the value of *C. acridiorum* in the destruction of locusts. The author's conclusions are as follows:

The coccobacillus considered by d'Hérelle as the cause of the epizootic in Yucatan in 1909 is innocuous to the locust after passing a certain length of time in culture media. The organism can, however, be rendered more virulent by its passage through locusts, until it is capable of killing these by injection in 4 or 6 hours. This virulence is rapidly lost when the organism is exposed to an exterior medium. This virulence, according to the Argentine Commission, is not sufficient to destroy locusts even when the culture is ingested by them in enormous quantities; even at its best the coccobacillus destroyed only 40 per cent in these circumstances.

A systematic study of the organisms distributed under the name of Coccobacillus acridiorum, R. W. GLASER (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 19–42*).—The author reports upon a study made of four cultures, one supposed to represent *C. acridiorum* from Honduras where striking results are claimed to have been obtained with it in field experiments, two supposed to be *C. acridiorum* labeled "Souche Cham" and "Souche Sidi" from d'Hérelle at the Pasteur Institute, Paris (the first said to be identical with that received from Honduras, and the second representing a strain of *C. acridiorum* passed through a series of grasshoppers in Tunis in 1915), and one supposed to be *C. acridiorum* from Canada, where it had been used in experimental work. The four cultures were found to differ from one another more or less, and a table is given which shows the most striking differences and similarities.

The bacterium from Honduras was found to represent a new form and is described under the name *Bacillus poncei*. The author concludes from experimental work with *B. poncei* that it is pathogenic to *Melanoplus femur-rubrum* and *Encoptolophus sordidus*, but in most cases he failed to recover the organism from the blood, alimentary tract, and feces. Experiments led him to believe that insects can develop immunity principles which can more or less successfully cope with certain foreign organisms. He concludes that passage infections performed by using the alimentary tract are hopeless on account of the extensive flora. Blood passages with *B. poncei* were likewise useless, in most cases, for the reason that the gut ruptured after a short time.

In experiments the culture "Souche Cham" was pathogenic to *M. atlanis*, *M. bivittatus*, and *M. femur-rubrum*, being most so for the first mentioned. Passage infections with it were possible, but no increase in virulence was observed. "The gut of *M. atlanis* does not rupture, and for this reason the blood and muscle tissue can be used for passage infections. Extracts from the stomach or intestines can not be used for passage infections. In food infections the time between inoculation and death is somewhat extended. 'Souche Cham' and 'Souche Sidi' are quite virulent even in old cultures. . 'Souche Sidi' is not as pathogenic to *M. atlanis* and *M. bivittatus* as 'Souche Cham.' No passage infections with 'Souche Sidi' were attempted." No experiments were made with the culture used by DuPorte and Vanderleck in Canada (E. S. R., 38, p. 358) as a systematic study showed it to be identical with d'Hérelle's "Souche Sidi" strain.

A bibliography of 15 titles is appended.

Notes on certain plant bugs connected with cotton in St. Vincent, J. C. Hutson (*West Indian Bul., 17 (1918), No. 1, pp. 27–39*).—These notes relate to observations of the West Indian cotton stainer (*Dysdercus delauneyi*), the green soldier bug (*Nezara viridula*), the leaf-footed tomato bug (*Leptoglossus balteatus*), the red tomato bug (*Phthia picta*), the pea chink (*Edessa meditabunda*), etc., made in St. Vincent during a period of five weeks in November and December, 1917.

Some effects of cotton stainer control in St. Vincent, W. N. Sands (*West Indian Bul., 17 (1918), No. 1, pp. 40–46*).—The results of control work with *Dysdercus delauneyi* are reported upon, a summary of the results being presented in tabular form.

Notes on trapping the cotton stainer in St. Vincent, W. N. Sands (*West Indian Bul., 17 (1918), No. 1, pp. 47–49*).—These notes supplement the account on the use of the gasoline torch in destroying *Dysdercus delauneyi*, previously noted (E. S. R., 38, p. 461).

Insect enemies of the chinch bug, W. P. Flint (*Jour. Econ. Ent., 11 (1918), No. 5, pp. 415–419*).—The author first reviews briefly records of the enemies of the chinch bug and then reports observations of predacious enemies made during the outbreak of the pest in Illinois from 1909 to 1915.

Observations on the life history and habits of Pilophorus walshii, B. B. Fulton (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 93–96*).—This relates to a species of black bug found in large numbers in a neglected apple orchard near Geneva, N. Y. Aphids are said to constitute one of its chief sources of food.

The dimorphs of species of Chaitophorus, A. C. Baker (*Proc. Biol. Soc. Wash., 31 (1918), pp. 85–88*).—The author gives a key to and descriptions of 5 species. A species from Japanese maple at West Chester, Pa., is described as new under the name *C. japonicus*.

The apple woolly aphis (Eriosoma lanigera), G. G. Becker (*Arkansas Sta. Bul. 154 (1918), pp. 3–22, figs. 6*).—This is a progress report of investigations of the woolly apple aphis, a paper relating to which, and carrying the same conclusions, has been previously noted (E. S. R., 39, p. 258).

Ceroplastes grandis new to Argentine fauna, C. Lizer (*Physis, 2 (1916), No. 12, p. 438; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 6, p. 225*).—The scale *C. grandis* is recorded from Argentina on *Ilex paraguariensis*.

On the occurrence of Chrysomphalus paulistus in the Parana Delta, C. Lizer (*Physis, 2 (1916), No. 12, pp. 432, 433; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 6, p. 225*).—This scale is recorded from Sao Paulo, Brazil, on the sweet bay (*Laurus nobilis*) and olive (*Olea europæa*).

Impregnation of the underwear as a means of controlling the clothes louse, W. Moore (*Jour. Amer. Med. Assoc., 71 (1918), No. 7, pp. 530, 531*).—In the author's investigations here reported creosote and heliotropin, often known under the name piperonal, gave the best results.

"A strip of underwear containing a 10 per cent solution of creosote in lubricating oil, used at the rate of 1 cc. to 8 sq. in. of underwear, worn next to the skin, was effective for 24 hours, after which it was found to have lost its toxicity. Surprising results were obtained with heliotropin, which was effective for only 48 hours when worn. . . .

"If heliotropin is used without oil it crystallizes out and is soon rubbed off. It is therefore necessary to use some other compound of an oily nature that is too viscous to be absorbed rapidly by the underwear. Experiments with heavy lubricating oils, beeswax, petrolatum, spermaceti, and oil of theobroma (cocoa butter) were conducted. Results showed that a 5 per cent solution of heliotropin in ether, to which 0.5 gm. of fat or wax was added, would remain effective for 72 hours. When increasing the amount of heliotropin it was found to be most soluble in oil of theobroma. When 1 gm. of heliotropin to 8 gm. of oil of theobroma dissolved in ether, carbon bisulphid, or benzene was used, spread over 48 sq. in. of underwear, the underwear could be worn for 168 hours before it lost its toxicity to lice.

"Considering the results of all the experiments, it appears that 168 hours is the maximum time that an effective compound will remain in the underwear in sufficient quantities to kill the lice quickly. Using a less volatile compound, which would remain in the clothing a longer period of time, would result in a diminished toxicity; that is, an increase in the time required to kill the lice."

The peach tree borer (Sanninoidea exitiosa), G. G. Becker (*Arkansas Sta. Bul. 150 (1918), pp. 3–32, pls. 2, fig. 1*).—This bulletin is based upon investigations begun in 1910, the bioligical studies being made at Fayetteville and the experiments on control at Abbott, Chester, El Dorado, Fayetteville, Rogers, and Van Buren. A paper relating to the biology of the species has been previously noted (E. S. R., 37, p. 158). The results are summarized by the author as follows:

"The eggs of the peach . . . borer appear to be 97 per cent fertile. The period of incubation of the egg ranges from 5 days to 2 weeks, though it is doubtless longer than this for eggs deposited late in the season. Nearly 85 per cent of the larvæ pupate within a radius of 1 in. from the trunk of the tree. After spinning up, the insect may remain in the larval stage within the cocoon for a period of from 5 to 9 days. About 2 weeks are spent within the cocoon as a pupa. The time which elapses from the time that the larva spins its cocoon to the time that the moth emerges ranges from 18 to 30 days.

"There are four stages in the emergence of the adult from the pupa stage. In the Ozarks, adults may emerge any time from the middle of May until the last of October, but the majority of moths, perhaps 75 to 90 per cent of them, will emerge some time between the middle of August to the middle of September. Emergence in the extreme southern part of the State is apparently about one week earlier than it is in northwest Arkansas.

"Eggs may be deposited on the trunk, leaves, or twigs of the peach tree or on clumps of dirt or weeds, etc. About 85 per cent of them are deposited at the base of the tree or on the trunk a little higher up. Eight females which were kept in cages without water or food averaged 522 deposited eggs per female. Three females which were fed with sweetened water averaged 722 deposited eggs. Females may deposit as many as 1,000 eggs. The average life of a moth appears to be about 6 days.

"Wrapping papers, tree veneers, white lead paint, asphaltum used on the trunk, lime-sulphur, tanglefoot, Scott's tree protector, tree collars, asphaltum combinations used to seal the crack between the trunk of the tree and the soil, nicotin preparations at different dilutions, carbolineum, carbon disulphid, and heat, all proved to be ineffective or impracticable in controlling the borer. Mounding the trees is attended with danger when the mounds are leveled so late that the bark does not have a chance to harden properly before cold weather sets in. Removing the soil from the base of the tree and leaving the roots exposed, with a view to freezing the borers, not only fails to kill the borers but is likely to cause the death of the trees by the freezing of the exposed parts."

The peach tree borer (Sanninoidea exitiosa), H. A. GOSSARD and J. L. KING (*Ohio Sta. Bul. 329 (1918), pp. 57–87, figs. 15*).—The authors find the peach borer to be on the wing in northern Ohio from July 1 to early September, being most abundant about mid-August. The life of the individual moth is 4 or 5 days.

The female lays an average of about 400 eggs (from 300 to 650), chiefly on the tree trunks and larger branches, but occasionally on the leaves high in the tops (as inferred from caging tests on large trees) or on the ground several inches away from the trunk.

"The eggs hatch in 8 or 10 days and the more fortunate larvæ enter the growing wood through cracks and crevices in the bark below the soil level, but most of them die before finding a suitable point of entrance. In the fall they extend their burrows, which sometimes girdle and kill the trees. Feeding is resumed in spring and the larvæ become mature, measuring from 1 to 1.25 in. long by midsummer. The cocoons of the pupæ are commonly at the bases of the trees under dead bark or just beneath the surface of the soil, at or even several inches distant from the trunk. Pupating occurs in July and early August, the pupal period lasting about 19 days; then the adult moths emerge.

"Prevention and amelioration of injury is best accomplished by 'worming,' or cutting out the borers, once in the fall during October or November, and again in early summer during the first 10 days of June. Mounding with earth, following the summer 'worming,' and the use of certain sprays on the trunks and larger limbs will lessen the task of worming."

The pink bollworm in Brazil, BRUNO LOBO (*Lavoura: Bol. Soc. Nac. Agr. [Brazil], 22 (1918), No. 3–4, pp. 110–131, figs. 18*).—A report upon control measures, particularly those employed in Egypt.

The two- and three-brooded rice borers, T. KONDO (*Abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 6, pp. 234–236*).—The author gives an account of the morphology, life history and habits, and methods of control of the two moths *Chilo simplex*, commonly known as the two-brooded rice borer, and *Schoenobius incertellus*, the three-brooded rice borer. These two insects are said to be the most important rice pests in Japan.

The greasy surface caterpillar: Its life history and seasonal history, H. L. DUTT (*Agr. Jour. Bihar and Orissa [India], 5 (1917), No. 1, pp. 1–14*).—The author here deals with the biology of the black cutworm (*Agrotis ypsilon*). This is an insect pest of major importance in Bihar and Orissa, being responsible for a loss of several lakhs of rupees ($32,330.10 each) to the fall-sown crops. It is active chiefly during the winter on the chaur lands, and in the spring occurs sporadically on tobacco, potato, garden vegetables, etc., where it cuts the succulent stems of young plants.

A new codling moth attacking the persimmon [in Japan], T. TANAKA (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, pp. 462, 463*).—The kaki fruit moth (*Kakivoria flavofasciata*), first described by Nagano in April, 1916, is said to cause serious injury to persimmon fruit in Japan.

The action of insecticides on the eggs of the Polychrosis (Eudemis) botrana, J. FEYTAUD (*Bul. Soc. Étude et Vulg. Zool. Agr., 16 (1917), Nos. 9–10, pp. 97–105; 11–12, pp. 117–120*).—A report upon the results of experiments with 10 different insecticides.

Eudemis naevana, the holly tortrix moth, L. H. HUIE (*Proc. Roy. Phys. Soc., Edinburgh, 20 (1917), No. 3, pp. 164–178, pl. 1; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 3, pp. 117, 118*).—This moth is said to commonly infest holly trees in England, and apple and hawthorn are also recorded as host plants.

Contributions to a knowledge of the Crambinæ of North America, I, G. G. Ainslie (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 51–62, figs. 11*).—This is the first of a series of papers in which available systematic and biologic information concerning each species of the pyralid subfamily Crambinæ, including personal observations by the author, will be brought together. Complete bibliographies will be given. In the present paper *Crambus hemiochrellus*, which has been reared to maturity on blue grass, is dealt with.

Breeding of Anopheles quadrimaculatus in deep water and at a distance from shore, H. R. Carter (*Pub. Health Rpts. [U. S.], 33 (1918), No. 16, pp. 571, 572*).—In investigating an infestation by *A. quadrimaculatus* at Quantico, Va., in September, 1917, the author found extremely heavy breeding of *A. quadrimaculatus* over large areas of floatage over the wild celery (*Vallisneria spiralis*) growing in Quantico and Chappawampsic Creeks at depths from 2.5 to over 6 ft. and extending in places to nearly 0.5 mile from the shore. The breeding of *A. quadrimaculatus* in deep water is said to have previously been noted on Broad River, S. C., and other places, but not to the extent of that in the vicinity of Quantico. In all of these cases the matting of the floatage prevented the breaking of the waves, which passed through it in long swells and furnished good food supply and perfect protection against fish.

Effect of Anopheles punctipennis on the natural conveyance of malarial fever, H. R. Carter (*Pub. Health Rpts. [U. S.], 33 (1918), No. 16, pp. 572–575*).—In discussing the extent to which this mosquito is a vector of malaria in nature, the author states that he has never found malaria prevalent where *A. punctipennis* alone was breeding, although an outbreak of malaria where this was the only species has been reported from Virginia by Brumfield.

Loss during hibernation of the power of malarial anophelines to transmit infection, E. Roubaud (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 6, pp. 264–266; abs. in Rev. Appl. Ent., Ser. B, 6 (1918), No. 5, pp. 101, 102*).—In experiments with *Anopheles maculipennis* infected with malignant tertian malaria (*Plasmodium falciparum*), the author finds that the sporozoits are discharged from the salivary glands by a relatively small number of punctures. If they are not so discharged they gradually degenerate in the glandular tissue or in the salivary medium. Thus the prolonged infectivity of Anopheles does not appear to be possible, and the salivary medium in mosquitoes can not be regarded as a hibernating medium for malarial sporozoits.

The use of palliatives for mosquito bites, H. E. Ewing (*Jour. Econ. Ent., 11 (1918), No. 5, pp. 401–404*).—"Hydrogen peroxid, glycerin, and indigo apparently are worthless as palliatives, and not only fail to have any alleviating effect on the injury from the mosquito bites, but apparently augment the injury. However, this apparent augmentation probably comes from the rubbing which has the effect of increasing the itching pain at first and of diffusing the wheal, although usually neither the pain or swelling lasts as long.

"Soap, bay rum, dilute alcohol, and dilute ammonia have but slight value. Dilute ammonia is to be preferred of the four. If soap is rubbed into the skin some relief is obtained, which probably comes chiefly from the rubbing.

"Strong alcohol and strong ammonia have the greatest value as palliatives, both giving a marked reduction in pain. There is a tendency for the former to leave a hardened lump in the place of the wheal, and the latter is rather harsh on the skin."

A new species of Sciara bred from red clover crowns, F. W. Pettey (*Jour. Econ. Ent., 11 (1918), No. 5, p. 420, pl. 1*).—*Sciara trifolii* reared from red clover crowns in Idaho, by A. C. Burrill, is described as new.

Life history of the leaf-eating crane fly, Cylindrotoma splendens, A. E. CAMERON (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 67–89, figs. 19*).—The larvæ of the species here considered feed on the leaves of the false bugbane (*Trautvetteria grandis*) on Vancouver Island, B. C.

Oils tested to trap Trypetidæ and Ortalidæ, H. H. P. SEVERIN (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 6, pp. 419–423, figs. 2*).—Following a brief review of the literature on work with various oils in the trapping of fruit flies, the author reports upon studies made at the Maine Experiment Station, particularly with the apple maggot, currant fruit fly, sunflower fly (*Straussia longipennis*), and an ortalid (*Seoptera colon*). His experiments show that oils derived from crude petroleum, such as kerosene and paraffin, do not attract the adults of the apple maggot. The tests of the effect of various oils on the currant fruit fly have been previously noted from another source (E. S. R., 38, p. 466). Experiments with the hydrocarbons and oil of citronella were performed with sexually mature sunflower flies, but none showed a positive reaction to various quantities of these oils. The same was true with *S. colon*.

Fruit flies of economic importance in California, H. H. P. SEVERIN (*Mo. Bul. Cal. Com. Hort., 7 (1918), Nos. 6, pp. 430–432, fig. 1; 7, p. 464, fig. 1*).—Notes are presented on the apple maggot and sunflower fly (*Straussia longipennis*), which oviposits in the stalk of the sunflower and in the stalk of the Jerusalem artichoke (*Helianthus tuberosum*).

Seasonal and climatic variation in Cerodonta, J. M. ALDRICH (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 63–66*).—In this paper the author considers *Cerodonta dorsalis*, an agromyzid widespread in the United States and Canada, the larva of which mines in the leaves and leaf sheaths of wheat, timothy, etc.

Observations on the life history and biology of Agromyza laterella, P. W. CLAASSEN (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 9–18, figs. 21*).—This is a report of studies of a species which forms galls on the common wild blue flag (*Iris versicolor*) in the vicinity of Ithaca, N. Y.

Clytus devastator, a new pest of the Florida orange, E. A. BACK (*Jour. Econ. Ent., 11 (1918), No. 5, pp. 411–414, pl. 1*).—"*C. devastator*, a cerambycid borer, was first described as a serious pest of Citrus in Cuba in 1836, and has since been recorded by collectors, besides in Cuba, at Key West, Chase, Paradise Key, and Palm Beach on the east coast of Florida, and at Perico Island, close to Anna Maria Key, at the mouth of Tampa Bay on the west coast of Florida. It has been reared from 'Cuban mahogany,' pomegranate (*Punica granatum*), and Citrus (orange), and, according to E. A. Schwarze, has as its preferred host the common mangrove (*Rhizophora mangle*). Aside from the original statement that it was a serious pest of Citrus in Cuba, it had not been reared from Citrus until it was found damaging orange trees on Perico Island, Fla., in the spring of 1910. It has demonstrated its capacity to become a serious pest in Florida, and with the extension of the citrus industry still farther south into more tropical portions of the State, or with a rearrangement of its host relationships following further development of the country, it may assume an important rôle as a pest of Citrus."

New Zealand timbers and the borer.—A note on the susceptibility of New Zealand timbers to the attacks of the borer, Anobium domesticum, R. SPEIGHT (*New Zeal. Jour. Sci. and Technol., 1 (1918), No. 3, pp. 142–144*).—The author reports upon an examination of 150 New Zealand timbers, and lists the botanical and local names, number immune, and number attacked by *A. domesticum*. Soaking the timbers in petrol in which carbolic acid and camphor are dissolved is said to be a thoroughly satisfactory method of treatment on a small scale.

A pest of plantations, C. Moreira (*Chacaras e Quintaes, 17 (1918), No. 2, p. 123; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 6, p. 256*).—The author records great injury to gardens and potato fields by the blister beetle *Epicauta atomaria*.

A second food plant for the cherry leaf beetle, E. C. Van Dyke (*Jour. Econ. Ent., 11 (1918), No. 5, p. 431*).—The author has found *Galerucella cavicollis* to feed in numbers on the leaves of *Rhododendron calendulaceum* in the Black Mountains, North Carolina.

Lasioderma serricorne, a coleopteran injurious to tobacco and other plant products at Deli, Sumatra, L. P. de Bussy (*Meded. Deli Proefstat. Medan, 10 (1917), No. 6, pp. 129–157, pl. 1; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 8 (1917), No. 12, pp. 1303, 1304*).—The cigarette beetle is said to occur in Sumatra wherever tobacco is prepared for the market and also among numerous other plant products.

The black-eye pea weevil, F. W. Urich (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 1, pp. 14–16*).—A summary of information on *Bruchus* (*Pachymerus*) *quadrimaculatus*, which, though of tropical origin, is now cosmopolitan.

Curculionid enemies of the vine, J. Feytaud (*Rev. Vit., 48 (1918), No. 1227, pp. 5–10, pl. 1*).—A brief summary of information on the curculionid enemies of the grapevine, together with a colored plate with illustrations of *Otiorhynchus ligustici* and *O. sulcatus*.

Beekeeping for West Virginia, C. A. Reese (*W. Va. Dept. Agr. Bul. 33 (1917), pp. 52, figs. 30*).—A practical guide for the beekeeper.

The segmentation of the abdomen of the honeybee (Apis mellifica), J. A. Nelson (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 1–8, figs. 7*).

Additional notes on the life history of Bombus auricomus, T. H. Frison (*Ann. Ent. Soc. Amer., 11 (1918), No. 1, pp. 43–49, figs. 2*).—The author's studies of this species, of which earlier studies have been noted (E. S. R., 38, p. 564), are summarized as follows:

"The nests are usually established [in the vicinity of Champaign, Ill.] some time between the middle of May and the middle of June. The bumblebees of this species are of a docile disposition as compared with such a species as *B. pennsylvanicus*. The colonies are of rather small size. The workers sometimes lay eggs which are capable of hatching. The eggs are laid in separate cells, several of which may be adjoining but the cell individuality is never lost. The larvæ continue to remain isolated from other individuals in the same stage of development. The life cycle varies in individual cases, but may be said to last for all sexes about 3.5 weeks."

The wheat jointworm and its control, W. J. Phillips (*U. S. Dept. Agr., Farmers' Bul. 1006 (1918), pp. 14, figs. 18*).—This is a more extended account than that by Webster, previously noted (E. S. R., 17, p. 785). An account by Houser has also been previously noted (E. S. R., 25, p. 561).

FOODS—HUMAN NUTRITION.

The significance of fats in the diet, E. H. Starling (*Brit. Med. Jour., No. 3005 (1918), pp. 105–107*).—The requirements of the body for fats and the significance of these substances in ordinary metabolism are discussed.

It is pointed out that while, strictly speaking, there is no evidence of an absolute physiological minimum of fat in the diet provided that the caloric value of the whole diet is sufficient to meet the total energy needs of the body and to provide a surplus for fat formation, practically a certain amount of fat is necessary. The reasons given are that a meal in which a deficiency in fat is made up by carbohydrates is lacking in staying power, is too bulky, and is more subject to fermentative changes in the intestines.

Statistical data are given of the proportion of fat to total energy in the diets of individuals of different energy requirements, from which the assumption is made that in a normal diet the fat should account for from 20 to 25 per cent of the energy of the whole diet. The figure of 75 gm. of fat per day, adopted by the Inter-allied Scientific Food Commission as the minimum desirable ration for the average man working eight hours a day and utilizing 3,000 calories, is midway between 20 and 25 per cent. Requirements of fat in grams, corresponding to the energy requirement of different ages and classes as proposed by Lusk and adopted by the commission, are given in tabular form. The author states that it must be borne in mind "(1) that the fat figures represent what I have called the minimum desirable ration; (2) that, given an otherwise adequate diet, these figures can be diminished without serious detriment to the health of the individual, though probably not without inconvenience and diminution of efficiency; and (3) that they can be considerably augmented without interfering with efficiency or with health."

The physiological behavior of raffinose.—II, S. KURIYAMA (*Jour. Biol. Chem., 34 (1918), No. 2, pp. 321–333*).—In continuation of the investigations previously noted (E. S. R., 37, p. 571), studies are reported of the raffinose-splitting power of extracts of feces, the presence of raffinase in certain seeds, the fate of raffinase taken by mouth, and certain properties of raffinase. The results are summarized as follows:

"The activity of yeast raffinase is not materially decreased by filtration through a clay filter or by dialysis. The sterile extract of feces usually contains a small amount of raffinase. The extract of feces markedly decreases the activity of yeast raffinase. Mung bean, its sprouts, cotton seed, and soy bean contain a small amount of raffinase. Yeast raffinase taken by mouth is, for the most part, destroyed by the gastric juice. Under suitable conditions, however, part of it can reach the intestine in active condition. The raffinose-splitting power of the sterile extract of feces can be increased by yeast feeding."

Studies of chemical composition of "tarabagani" (Paralithodes camtschatica), H. MATSUI (*Jour. Col. Agr. Tokyo Imp. Univ., 5 (1916), No. 4, pp 395–400*).—This crab has a white fibrous flesh with an agreeable flavor and is chiefly canned for export. Analyses are given which show the differences in chemical composition between the raw and cooked flesh and also those due to sex.

Hydrolysis of fish muscle, Y. OKUDA and K. OYAMA (*Jour. Col. Agr. Tokyo Imp. Univ., 5 (1916), No. 4, pp. 365–372*).—A comparison of the composition of the muscle substance of *Pagrus major*, one of the most common fishes in Japan, and halibut.

Hydrolysis of fish gelatin, Y. OKUDA (*Jour. Col. Agr. Tokyo Imp. Univ., 5 (1916), No. 4, pp. 355–363*).—This investigation was made to determine whether fish gelatin, which differs somewhat in physical properties from commercial gelatin, also differed from it in chemical composition.

It was found that as regards the distribution of nitrogen there was no great divergence. Larger yields of glycocol, alanin, leucin, phenylalanin, glutaminic, and aspartic acids were found in the fish gelatin, but the contents of diamino acids were approximately equal in the two gelatins.

The physical chemistry of bread making, E. J. COHN and L. J. HENDERSON (*Science, n. ser., 48 (1918), No. 1247, pp. 501–505*).—A review of the physical and chemical processes involved in the fermentation of dough and the baking of bread.

It is stated that the acidity of the dough at the time of baking seems to be the most important variable factor in bread making. Suggestions are given to facilitate the use of from 20 to 25 per cent of wheat substitutes, such as the use of 2 to 3 per cent of dry, powdered serum as a gluten substitute. The causes of ropy bread and its prevention through the use of acid are also discussed.

"Over the top" in baking, MABEL CORBOULD (*Mo. Bul. Ohio Sta., 3 (1918), No. 10, pp. 303–307, fig. 1*).—Gluten is described and its function in bread making explained. Recipes for bread, in which substitutes are used, are included.

Mon-dah-min, and the Red Man's world-old uses of Indian corn as food, HEN-TOH (*Jour. Home Econ., 10 (1918), No. 10, pp. 444–451*).—This includes an Indian legend for the origin of corn, as well as recipes which have been in use in many Indian families for generations.

The antiscorbutic property of desiccated and cooked vegetables, M. H. GIVENS and B. COHEN (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 127–145, fig. 1; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 20, p. 1693*).—To determine whether drying at various temperatures or first cooking and then drying vegetables destroys their antiscorbutic properties, feeding experiments were conducted on guinea pigs, using cabbage and potatoes dried under different conditions. The animals were fed a diet known to produce scurvy and at the onset of scorbutic symptoms were given small amounts of the dried vegetables.

A small addition of raw cabbage to a scurvy-producing diet was found to prevent scurvy. Cabbage dried in a blast of air at from 40 to 52° C. retained some of its antiscorbutic value. It is thought that a daily supplement of 1 gm. of this "low dried" cabbage will prevent scurvy in the guinea pig and initiate recovery from scorbutic symptoms. Cabbage was found to lose its antiscorbutic power if heated in an oven for two hours at 75 to 80° and then dried at 65 to 70° for several days, or if cooked for 30 minutes and then dried for two days at 65 to 70°. Potatoes cooked and then dried for two days at 65 to 70° were found to possess no antiscorbutic value.

It is claimed that the experiments also indicate that roughage is not the determining factor in the course of scurvy in guinea pigs, and that they confirm the conclusion of Cohen and Mendel (E. S. R., 39, p. 770) that the antiscorbutic property is not identical with the so-called fat- and water-soluble dietary essentials at present recognized.

The dietary properties of the potato, E. V. MCCOLLUM, NINA SIMMONDS, and H. T. PARSONS (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 197–210, figs. 7; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 20, p. 1694; Chem. Abs., 12 (1918), No. 23, pp. 2605, 2606*).—A biological study is reported of the properties of the potato as a food for the young rat during the growing period.

The results indicate that, in respect to growth, the dietary properties of the potato closely resemble those of the cereal grains, the first limiting factor being the relative shortage of calcium, sodium, and chlorin. The content of the fat-soluble A is too low for optimum nutrition, and the biological value of the nitrogen seems to be no greater than that of the cereal grains. This is in marked contrast with the conclusions of Rose and Cooper (E. S. R., 38, p. 567) as to the value of the potato nitrogen for maintenance in the adult.

In accounting for the discrepancy between the apparent values of the nitrogen of the potato for maintenance as contrasted with growth, the authors suggest the possibility of the improvement of proteins of low biological value "through the reutilization of the unused quota of amino acids which remain after the draft by certain glandular tissues upon the list of these circulating in the body fluids. It is possible that the protein of the potato may fulfill these conditions and, therefore, actually be of decidedly greater value for maintenance as contrasted with growth. When growth takes place, this peculiar supplementary relationship between the unused quota of amino acids just mentioned could be of but slight importance, since the magnitude of the endogenous metabolism is small."

Household use of Ohio apples, W. J. GREEN (*Mo. Bul. Ohio Sta., 3 (1918), No. 10, pp. 309–312, figs. 2*).—The varieties of apples most commonly found on the market and the uses to which they are best adapted are listed.

The housekeeper's apple book, L. GERTRUDE MACKAY (*Boston: Little, Brown, & Co., 1917, pp. 122*).—The author emphasizes the importance of apples as food and gives many recipes for their use.

The utilization of some nuts as food, F. A. CAJORI (*Jour. Home Econ., 10 (1918), No. 7, pp. 304–311*).—The results are recorded of metabolism experiments designed to study the utilization of nitrogen in the case of protein-rich nuts and of the carbohydrate and nitrogen of the chestnut, lichi nut, and coconut. The results indicate that nuts are valuable foods if eaten properly and used in the diet as are eggs, meats, and other foods which are rich in protein. According to the author, the evidence points to a physiological value on a par with that of more common staple articles of the diet.

Analysis of local foodstuffs (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1916–17, pp. 26–28*).—Analyses are reported of foodstuffs grown in Dominica, including tania meal, dasheen meal, farine, banana meal, plantain meal, and waw-waw meal. All of these materials show a predominating amount of carbohydrates and a low fat and protein content. Experiments show that farine meal can be used to replace part of the wheat flour in bread making.

Commercial stocks of grain, flour, and miscellaneous food products (in the United States on October 1, 1918) (*U. S. Dept. Agr., Food Surveys, 2 (1918), No. 13, pp. 12*).—Data are reported for these classes of food products.

Conservation and the food budget, JEAN KRUEGER (*Jour. Home Econ., 10 (1918), No. 8, pp. 363–368*).—A food budget taken from the account book of the University of Wisconsin home economics practice cottage.

The world's food supply and woman's obligation, JANE ADDAMS (*Jour. Home Econ., 10 (1918), No. 9, pp. 389–400*).—The author discusses the shortage in the European food supply in its relation to food conservation by women in this country through elimination of waste, actual reduction of consumption, and substitution of foods which can not be readily shipped.

Changing a peace-time ration for war time, CAROLINE L. HUNT (*Jour. Home Econ., 10 (1918), No. 8, pp. 371–374*).—The concluding paragraph summarizes the article as follows: "For a war-time ration use vegetables and fruits abundantly. Choose ways of preparing and serving which require the addition of little or nothing that has any fuel value and that reduces their bulk by driving off their water."

Everyday foods in war time, MARY S. ROSE (*New York: The Macmillan Co., 1918, pp. IX+117*).—The author emphasizes in a simple and direct way the part which some of the common foods play in the diet. The book is designed to make it "easier to save" wheat, meat, sugars, and fats, and to make out an acceptable bill of fare without excessive cost. War-time recipes are included.

Cost of living and the war, W. J. LAUCK (*Cleveland: The Doyle & Waltz Printing Co., 1918, pp. IV+196, figs. 16*).—This volume summarizes and discusses official and other data bearing upon the cost of living, with special reference to the families of wage earners.

High cost of living in State institutions, G. W. BEACH (*St. Paul: State Bd. Control, 1917, pp. 16*).—An analysis of the present high cost of institutional living.

A note on the "man value" of working class diets, GREENWOOD and CECILY M. THOMPSON (*Brit. Med. Jour., No. 3006 (1918), p. 133*).—The following new coefficients have been adopted by the Inter-allied Food Commission for use in estimating the man value of a family diet: From 0 to 5 years 0.5 man value, from 6 to 10 years 0.7, 11 years and over—males 1, females 0.83, and all children of combined ages 0.68.

A preliminary report on the preparation of antipolyneuritic substances from carrots and yeast, K. SUGIURA (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 191–196; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 20, p. 1694*).—Water and alcoholic extracts of carrots were prepared by grinding 700 gm. of fresh carrots finely in a meat chopper and treating with either 1 liter of distilled water for two days at room temperature or with 1 liter of 95 per cent alcohol for five days. In either case the mixture was filtered through a hardened paper in a Büchner funnel, washed with fresh solvent, and the clear golden-yellow filtrate concentrated in vacuo at a low temperature until it became a sirupy mass.

The chemical nature and yield of the substances varied somewhat with the time and temperature at which extractions were made and with the concentration and variety of carrots. The yields were about 7 per cent of the original fresh carrots. Analyses of the two extracts gave the following results:

Analyses of water and alcoholic extracts of carrots.

Kind of extraction.	Total nitrogen.	Total ash.	P_2O_5.	Amino nitrogen.	Uric acid.	Phenol.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Water	1.51	7.10	0.91	1.09	0.17	0.55
Alcohol	.44	3.17	.21	.31	.02	.56

A colorless crystalline substance was prepared from yeast as follows: Brewers' yeast was filtered, pressed, and dried to a powder. Ten gm. of this powder, the nitrogen content of which was 9.59 per cent, was treated with 100 cc. of distilled water, shaken, placed in a 300 cc. collodion bag, and suspended for air dialysis at room temperature until perfectly dry. By this means about 5 mg. of a colorless crystalline substance formed on the outer wall of the bag. A similar substance was also obtained by treating 10 gm. of powdered yeast with 100 cc. of 5 per cent sodium chlorid solution and subjecting the mixture to air dialysis as before.

The experimental results of the use of these substances indicate that the extracts of fresh carrots and crystalline substances from yeast preparations may cure polyneuritis in pigeons in those cases in which the disease has developed quickly; that is, in about 20 days. If the symptoms had appeared more slowly, the substances did not effect a cure.

Monthly metabolism of nitrogen, phosphorus, and calcium in healthy women, H. C. SHERMAN, L. H. GILLETT, and H. M. POPE (*Jour. Biol. Chem., 34 (1918), No. 2, pp. 373–381; abs. in Physiol. Abs., 3 (1918), No. 4–5, pp. 257, 258*).—The calcium and phosphorus requirement in normal nutrition was determined by metabolism experiments on two healthy women during 10 successive three-day periods in which the subjects lived upon prearranged diets absolutely uniform from day to day. The diets were so arranged as to satisfy the requirements for energy and protein, while sufficiently low in phosphorus and calcium to test the ability of the body to establish equilibrium of these elements. A quantitative determination of the intake and output of nitrogen, phosphorus, and calcium was made at the end of each period.

The experimental data obtained from the two subjects, calculated to a basis of 70 kg. of body weight, would indicate a requirement "per man per day" of 0.9 and 0.74 gm. of phosphorus and 0.49 and 0.38 gm. of calcium, respectively. The data also indicate that "there does not appear to be any distinct monthly cycle in the metabolism of either nitrogen, phosphorus, or calcium (except for the previously known tendency to retain nitrogen for a day or so at the beginning of the menstrual period), nor was the output of any one of these three elements in the menstrual flow large enough to affect materially the estimate of the daily requirement for normal metabolism as averaged for the entire month. From this standpoint the menstrual flow is essentially a blood loss, and as such is important to the balance of intake and output of iron, but of minor consequence in the nitrogen, phosphorus, or calcium metabolism."

Studies in uric acid metabolism (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 1–26; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 20, p. 1693; Chem. Abs., 12 (1918), No. 23, pp. 2607, 2608*).—Two papers are presented:

I. *The inflence of high protein diets on the endogenous uric acid elimination*, by H. B. Lewis and E. A. Doisy (pp. 1–7).—This paper presents the results of metabolism experiments to compare the effects on uric acid excretion in man of high protein diets rich and poor in their content of arginin and histidin. No differences in the excretion of uric acid following the ingestion of the two types of high protein diet were evident. "This would indicate that, under the experimental conditions of the present study, arginin and histidin function no more than the other constituents of the protein molecule in the stimulation of the output of endogenous uric acid following ingestion of a high protein diet."

II. *Proteins and amino acids as factors in the stimulation of endogenous uric acid metabolism*, by H. B. Lewis, M. S. Dunn, and E. A. Doisy (pp. 9–26).—The purpose of the experiments described in this paper was to study the influence of proteins and protein derivatives on the endogenous uric acid excretion in man with the use of the newer, more accurate colorimetric methods for uric acid determination and with as complete a control as possible of the variable factors. The results are summarized as follows:

"Ingestion of purin-free protein food resulted in an increased uric acid output in the fasting subject, which reached its maximum the third and fourth hours after ingestion of the food. No quantitative differences in the action of three types of protein food, cottage cheese, egg white, and glidine (a wheat protein preparation), were observed. Amino acids (glycocoll, alanin, aspartic, and glutaminic acids) also increased uric acid excretion, the maximum effect being produced within two hours after ingestion, more rapidly than in the case of the protein. The stimulation of uric acid metabolism caused by the dicarboxylic amino acids was more marked than with glycocoll or alanin. Asparagin, the acid amid of aspartic acid, resembled aspartic acid in its action. The effect of the amino acids is considered to be the result of a stimulation of uric acid production rather than of a more rapid excretion of the uric acid already present in the system, since successive doses of glycocoll on the same experimental day resulted in an increased elimination of uric acid in each case. Sarcosin, methyl glycocoll, an amino acid which does not pass through the same path of catabolism as do the other amino acids, did not influence uric acid excretion. Ammonium chlorid and urea, products of deaminization of the amino acids, were also without effect on endogenous uric acid excretion.

"Since the secretory activity of the digestive tract is not stimulated by amino acids, it is believed that the experiments as a whole speak against the hypothesis of Mareš that the secretory activity of the alimentary glands is mainly responsible for the increased uric acid excretion observed after protein ingestion. It is suggested that the effect is to be considered rather as one due to a general stimulation of all cellular metabolism by amino acids, the products of the digestion of protein."

The distribution of phosphoric acid in normal human blood, W. R. Bloor (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 49–57; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 20, p. 1693; Chem. Abs., 12 (1918), No. 23, pp. 2615, 2616*).—The distribution of phosphoric acid in the blood of normal men and women has been determined by the methods previously noted (E. S. R., 40, p. 16). Conclusions drawn from the results reported are summarized as follows:

"Phosphoric acid compounds found in human blood may be divided into two classes, the acid-soluble (soluble in dilute acids and precipitated with the proteins by alcohol ether) and the lipoid-phosphoric acid compounds (soluble in alcohol ether and precipitated with the proteins by dilute acids). The two groups are apparently sharply defined, and, since in general their sum is equal to the total phosphates, the presence of other forms of phosphoric acid combination in blood in significant amounts is doubtful.

"In the second of these groups are contained substances of the type of lecithin; in the first group inorganic phosphates and an unknown compound (or compounds), which is decomposed by heating with acids yielding phosphoric acid. The amount of the unknown form of phosphoric acid combination in plasma is relatively small—up to 10 per cent of the total phosphates—while in the corpuscles it composes 60 to 80 per cent of the total phosphate. The corpuscles are relatively richer in all types of compound than the plasma, and there is also considerably less variation in their composition in different individuals than is the case with the plasma."

A theory advanced by the author in explanation of the chemical nature of the unknown form of phosphoric acid combination is that it is possibly inosinic acid or some similar residue of the nucleoprotein of the nucleus which is no longer present in the mammalian erythrocytes. The large amount of organic phosphorus in the corpuscles is also considered of significance in view of the fact that the corpuscles have been found to be one of the places of formation of lecithin during fat absorption.

Botulism, E. C. Dickson (*Monographs Rockefeller Inst. Med. Research, No. 8 (1918), pp. 117, pls. 10, figs. 2*).—This is a detailed study of investigations, a preliminary report of which has been previously noted (E. S. R., 33, p. 866). The report includes an historical review of the subject from American and European literature; reports of new cases; symptomatology, course, diagnosis, treatment, and mortality of American cases; experimental work with various strains of *Bacillus botulinus* and their toxins; and a critical review of the results of the investigations. The author summarizes his conclusions as follows:

"(1) Botulism is endemic in the United States and is of comparatively frequent occurrence on the Pacific Coast; (2) the toxin of *B. botulinus* may form in a medium which is of purely vegetable composition; (3) there is apparently a close relation between the botulism of human beings and [limber neck], a hitherto unexplained illness of domestic fowl; and (4) the *botulinus* toxin produces characteristic lesions in the body in the form of thrombosis in the blood vessels of many of the organs."

ANIMAL PRODUCTION.

Western live stock management, edited by E. L. Potter (*New York: The Macmillan Co., 1917, pp. XIV+462, pls. 16, figs. 40*).—This volume, prepared originally as a college text, aims to give a survey of actual live-stock conditions in the West. "Methods now in vogue are doubtless far from perfect, but we believe that all real improvement must be based on an accurate knowledge of present practices. We are therefore presenting here the information which experienced stockmen already possess, but which the young man or the beginner often finds slow and expensive to acquire."

The editor gives a general introduction on western conditions and their influence on live-stock production and treats of beef cattle. O. M. Nelson deals with sheep, C. N. Kennedy with horses, and G. R. Samson with swine. An effort has evidently been made toward concise but comprehensive treatment. The volume closes with a classified glossary of 10 pages and a full index.

Live stock on the farm, W. DIETRICH (*Philadelphia and London: W. B. Saunders Co., 1917, pp. 261, figs. 68*).—An elementary exposition in which, after some introductory matter on live-stock farming, feeds, and breeding, there are separate treatments of each class of stock, including a chapter on poultry by C. E. Brown and ending with a discussion of swine feeding.

Biggle poultry book, J. BIGGLE (*Philadelphia: Wilmer Atkinson Co., 1917, pp. 176, figs. 108*).—A small, compact manual covering the general field of poultry management on the farm, including reference to turkeys, guinea fowls, ducks, geese, and pigeons.

Inheritance studies with poultry [at the Rhode Island Experiment Station] (*Bul. R. I. State Col., 13 (1918), No. 4, pp. 41, 42*).—It is stated that further evidence is at hand to show that ability to lay large, heavy eggs is a heritable character. Hereditary factors for black pigmentation have been found in the White Dorking breed similar to those already reported for the White Leghorn.

Pigmentation in guinea pig hair, H. R. HUNT and S. WRIGHT (*Jour. Heredity, 9 (1918), No. 4, pp. 178–181, figs. 4*).—Black and red guinea pigs differ genetically by a single factor, but microscopic examination of the hair discloses several structural differences. Pigment in black individuals is black, rod-like in shape, and distributed extensively in the cortex as well as in the medulla (center) of the hair. In reds it is yellowish, generally in the form of spherical granules, and almost entirely restricted to the medulla. Diffuse (nongranular) yellow pigment is sometimes present. Similarly sepia, the dilute form of black, has pigment granules in the cortex, but yellows and creams, the dilute forms of red, do not. It is held that in blacks and yellows there is a specific enzym not found in reds and yellows, which increases the oxidizing power of the fundamental pigmentation enzym and enables the latter to overcome a certain resistance on the part of the cortex to the production of pigment.

Practically no microscopic differences could be found between black and sepia, but yellow showed distinctly fewer granules than the reds, some of them being blackish in color, while in creams the minute, scattered granules are apparently all black. The authors do not suggest a cause for the difference in the effect of the dilution factor.

Oyster propagation (*New Jersey Stas. Bul. 317 (1917), p. 41*).—Observations by P. C. Cameron indicate that oysters will spawn later in the season and at much lower temperatures than previously assumed. Studies of oyster propagation should not, therefore, be limited to summer months.

DAIRY FARMING—DAIRYING.

The open shed compared with the closed barn for dairy cows, T. E. WOODWARD, W. F. TURNER, W. R. HALE, and J. B. MCNULTY (*U. S. Dept. Agr. Bul. 736 (1918), pp. 13*).—Earlier work along this line is briefly reviewed, and similar experimental work in progress for three years at the Dairy Division Experiment Farm at Beltsville, Md., is described. The milk and butter-fat records, the quantities of digestible nutrients in the feed consumed, and the feed cost of milk and butter fat, are given in tables, and the labor requirements, the health and comfort of the cows, and the preservation and handling of the manure under the two systems are compared in the discussion of the results.

The open shed used the first year, providing approximately 75 sq. ft. of floor space per cow, had the north end and the east and west sides closed up to within 18 in. of the plate, while the south end had only a fence to keep the cows inside. The last two years a new shed was used, of which the south side was entirely open, and the north side and both ends had large doors swung from the top which were raised in summer and lowered in winter. The closed barn was a modern, well-ventilated structure.

A herd of 1 pure-bred Guernsey, 2 pure-bred Holsteins, 10 grade Jerseys, and 8 cows of miscellaneous breeding was divided into two groups, of which one during the first year was kept in the open shed and the other in the closed barn. The second year the groups were reversed, and the third year they were again reversed. Only the records for the five months, November to March, were studied, and owing to the irregularity in calving these records did not in any case cover the entire period of five months, though all records fell within that period, and all the cows did not have three years' records that were comparable. In order that there should be no difference in the records of individual cows due to time of freshening, production records covering the same length of time in the two barns and taken the same time after calving were compared.

It was found that the cows consumed somewhat more feed and produced slightly more milk in the open shed than when kept in the closed barn, but the increase in production did not quite offset the extra feed cost. In the open shed some of the more aggressive cows deprived weaker and more timid ones of their share of the feed and of the normal advantages of the shed, which resulted in lower milk yields from the cows thus mistreated.

Excluding milking and feeding, slightly more labor was required to care for the cows in the open shed. The manure under the open-shed system was apparently well preserved until it was hauled, and was handled more economically than in the closed barn. Cornstalks in the manure were sufficiently decomposed to be handled successfully with the manure spreader. As compared with the closed barn, 68 per cent more bedding was required in the open shed, but the cows were cleaner and more comfortable. There was little difference in the time required to bed the cows under the two systems, and in the open shed it was possible to use cornstalks or other coarse material for the purpose. There was apparently little, if any, difference in the frequency of injuries to cows under the two systems.

The relation of milk yield to age at first calf, R. C. Towles (*Maryland Sta. Bul. 217 (1918), pp. 227–240*).—A study through the first four lactation periods was made of 15 Ayrshire cows to determine the influence of the age at which the first calf was produced upon milk production. Data with reference to production during the first four lactation periods of cows in milk two or more years, showing the sires and dams, comparative production by lactations, and comparative lengths of lactations, are presented in tables. A special effort was made to have all other factors as nearly comparable as possible, with the age of first calving as the only variant.

The average production per lactation of 4 cows first calving under 30 months of age was 3,993 lbs. of milk, of 5 cows first calving between 30 and 36 months 5,353 lbs., and of 6 cows first calving above 36 months of age 5,295 lbs. The average fat production per lactation for the three groups was 155, 199, and 195 lbs., respectively. The average age at first parturition for the three groups was 27, 34.4, and 37.5 months, respectively.

"It may be concluded from the foregoing that the most profitable age for first calving among breeds maturing at or about the age of the Ayrshire lies beyond the 30-month limit, and that there is little to be gained by permitting the thirty-sixth month to pass by before first parturition."

The Guernsey breed, C. L. Hill (*Waterloo, Iowa: Fred L. Kimball Co., 1917, pp. 417, figs. 194*).—This volume is a condensed treatment of the history of the Guernsey breed by a breeder who has long been identified with the American Guernsey Cattle Club. The origin and development of the breed on the island of Guernsey and its history in England are subjects of several chapters, but most of the book deals with the breed in America, including notes on the earlier importations, the first private and official tests, records made in public tests, and performance in the show ring. The last and longest chapter in the book deals with the families of Guernsey cows, of which about 25 are recognized.

Milk supply and public health, Ella Groenewold (*Quart. Jour. Univ. N. Dak., 8 (1918), No. 3, pp. 239–254, figs. 3*).—This is a summary of information on bacteria in milk, infant mortality and impure milk, certified milk, pasteurization and transportation of milk, and inspection of milk supply.

Why liberal use of milk in the diet insures good health and long life, J. F. Lyman (*Agr. Student, 25 (1918), No. 2, pp. 77–81, figs. 2*).—This is a brief discussion of the value of milk and of the necessity of its liberal use in the diet of both children and adults.

VETERINARY MEDICINE.

The study of problems of immunity by the tissue culture method.—I, II (*Jour. Immunol., 3 (1918), No. 3, pp. 219–246, figs. 4*).—Two papers are presented.

I. *A study of the cells and blood plasma of animals which are naturally resistant and others which are susceptible to diphtheria and tetanus toxins,* by Y. Suzuki (pp. 233–246).—In this paper a method is described for determining the presence and studying the properties of the protective substances in animals that are naturally immune and in those that are susceptible to bacterial and other toxins. The method consists in studying the growth of tissue cells in their own and in foreign plasma with and without the addition of suitable toxins The tissues were prepared from the heart muscle and ovary of chickens and rats, these being chosen since chickens have a natural immunity for tetanus and rats for diphtheria. The experiments reported tend to prove that this natural immunity is due to two factors—a special resistance of at least certain of the cells of these animals and the existence of neutralizing substances in their plasma. The plasma protects not only the cells of these animals against lethal doses of toxin but also the cells of susceptible animals.

II. *The tissue culture as a means for quantitatively estimating toxin and antitoxin and determining the distribution of antitoxin in passively immunized animals,* by M. T. Burrows and Y. Suzuki (pp. 219–232).—In this paper are described further experiments outlined for the purpose of studying more carefully the general distribution and action of antitoxic substances. The tissue cells of young chickens and chick embryos were studied.

The sensitiveness of the cells of chick embryos to diphtheria toxin was found to vary inversely with the age of the embryos. As a considerable concentration of diphtheria antitoxin did not affect the growth of the cells, it was found possible to test the effect of various dilutions of diphtheria toxin on the growth of cells in a medium containing a constant and known quantity of diphtheria antitoxin. The blood of passively immunized chickens was found to contain a substance capable of neutralizing diphtheria toxin. The tissue cells of chick embryos were able to resist otherwise lethal doses of diphtheria toxin after they had remained a short time in the plasma of a passively immunized chicken.

The author concludes that the tissue culture has a very definite value for the study of toxic and antitoxic substances.

A new culture bouillon particularly favorable to the development of Streptococcus pyogenes, L. Boyer (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 5, pp. 229–231*).—The medium is prepared by macerating for from 12 to 24 hours a mixture of 500 gm. crushed beef ribs, 100 gm. N hydrochloric acid, and 900 gm. water, and then heating the mixture in an autoclave at from 125 to 130° C. for one-half hour. It is then cooled, filtered through cloth, added to 15 gm. peptone in 1,000 parts of water, and neutralized with dilute sodium hydroxid to an amphoteric reaction. After a second heating in the autoclave it is filtered hot, tubed, and sterilized at 120°.

The medium is considered to be excellent for the growth not only of streptococci but also of other aerobic organisms of war wounds and has given good satisfaction in the qualitative bacteriological examination of such wounds.

Liberation of antibodies on injection of foreign proteins, S. F. Herrmann (*Jour. Infect. Diseases, 23* (*1918*), *No. 5, pp. 457–469, figs. 5; abs. in Jour. Amer. Med. Assoc., 71* (*1918*), *No. 21, p. 1774*).—To determine the factor responsible for the apparent benefits of foreign protein therapy, experiments were conducted on rabbits sensitized in various ways. The following results were obtained:

"In rabbits sensitized with streptococci a definite liberation of specific opsonins and agglutinins follows the injection of foreign protein. A similar rise in specific opsonins also occurs in rabbits sensitized with meningococci. Foreign protein injections have no effect on antibodies in typhoid-immune rabbits. In suitable rabbits, which do not readily produce lysins against sheep corpuscles, the injection of foreign protein within 10 days after the injection of antigen is followed by a marked liberation of specific lysins. A variety of foreign proteins can be used. Human serum, typhoid vaccine, human ascitic fluid, and guinea-pig serum proved equally efficacious."

The author concludes that "the intravenous injection of foreign protein serves as a stimulus for the liberation of specific antibodies in animals in which the previously injected antigen is unable to cause such a liberation. This insufficiency may lie either in the antigen or in the rabbit."

Sporotrichosis following mouse bite with certain immunologic data, J. J. Moore and D. J. Davis (*Jour. Infect. Diseases, 23* (*1918*), *No. 3, pp. 252–266, pl. 1, figs. 3*).—"An instance of an infection with *Sporotrichum schenckii* following the bite of a field mouse in North Dakota is described. It is not known whether the organisms came from the mouse or from the soil or the skin. The infection has now persisted for about 18 months, improving with administration of iodid and relapsing when the iodid is discontinued."

Bacteria of infectious diseases of man and animals, G. H. Jones (*Ontario Dept. Agr. Bul. 265* (*1918*), *pp. 38–68, figs. 14*).—This is a collection of information on the organisms, diagnosis, treatment, and control of infectious diseases of man and animals.

The germicidal action of freezing temperatures upon bacteria, C. M. Hilliard and Mildred A. Davis (*Jour. Bact., 3* (*1918*), *No. 4, pp. 423–431*).—From the data presented the authors have drawn the following conclusions:

"Intermittent freezing of bacteria exerts a more effective germicidal action than continuous freezing. The reduction is much less in milk and cream than in pure tap water when freezing temperatures are applied, due, no doubt, to physical protection offered to the bacteria by the colloidal and solid matter in suspension. The degree of cold below freezing is not a very important factor in the destruction of bacteria. There is no critical temperature below freezing where the germicidal effect is greatly accelerated. The death rate of *Bacillus coli* is much higher in media which are frozen solid than it is in the same media not solid and at a slightly lower temperature.

"Crystallization, probably resulting in mechanical crushing, is an important germicidal factor in causing the death of bacteria at 0° C. and below. The greatest reduction occurs promptly upon freezing and refreezing, but is not caused so much by the sudden change in temperature as by this mechanical factor."

A bibliography of 26 titles is included.

The chloramin antiseptics and disinfectants, N. S. Mayo (*Jour. Amer. Vet. Med. Assoc.*, *54* (*1918*), *No. 2*, *pp. 139–144*).—A brief discussion is given of the chlorin-containing antiseptics. It has been the observation of the author that in badly infected wounds or those discharging considerable pus the aqueous solutions used freely and frequently give the better results, while in wounds where the oil solution can be applied directly to the infected surface, or where it is desired to close a wound immediately, dichloramin-T in chlorcosane is preferable.

The use of dichloramin-T in veterinary practice, C. P. Fitch, W. L. Boyd, and W. A. Billings (*Cornell Vet.*, *8* (*1918*), *No. 4*, *pp. 292–296*).—Case reports are given of the successful use at the Minnesota Experiment Station of dichloramin-T as an antiseptic in the treatment of navel ill of a colt, suppurative pododermatitis, suppurative arthritis, and empyemia of facial sinuses.

The use of dichloramin-T in the treatment of infections and infected wounds, W. E. Lee and W. H. Furness (*Surg., Gynecol., and Obstet.*, *26* (*1918*), *No. 2*, *pp. 155–159*; *abs. in Abs. Bact.*, *2* (*1918*), *No. 2*, *p. 80*).—The advantages of dichloramin-T over the original Dakin's solution are explained, and results are summarized of its use in the treatment of 6,028 civil cases and 1,200 cases of war wounds. It is stated that the results obtained with it have been as good as those obtained when using the Dakin hypochlorite solutions with the complicated Carrel technique.

Among the suggested advantages in the use of dichloramin-T, as pointed out by the authors, are (1) that skin irritation will not occur if the wounds are not covered with thick occlusive gauze; (2) that the small amount of exudate from wounds treated with it makes it practical to use thin dressings; (3) that, unlike the aqueous hypochlorite solution, it has no disintegrating effect upon catgut, thus diminishing the tendency to secondary hemorrhages; and (4) that it is an excellent deodorant.

The use of dichloramin-T in the prevention and control of surgical infection, W. E. Lee and W. H. Furness (*Jour. Amer. Med. Assoc.*, *71* (*1918*), *No. 11*, *pp. 873–875*).—Essentially noted above.

Treatment of infections and infected wounds with dichloramin-T, W. E. Lee and W. H. Furness (*Military Surg.*, *43* (*1918*), *No. 3*, *pp. 312–341*; *abs. in Jour. Amer. Med. Assoc.*, *71* (*1918*), *No. 16*, *p. 1344*).—This is a more detailed discussion of the subject noted above.

Remarks on dichloramin-T, E. K. Dunham (*Surg., Gynecol., and Obstet.*, *26* (*1918*), *No. 2*, *pp. 152–155*, *fig. 1*; *abs. in Abs. Bact.*, *2* (*1918*), *No. 2*, *pp. 79, 80*).—This is a brief survey of the subject of the antiseptic treatment of wounds from the laboratory viewpoint, with special reference to the principles involved in the action of dichloramin-T as a representative of the chlorin group of antiseptics.

Dichloramin-T has been found to be a superior antiseptic in respect to the three properties which should be known about an antiseptic before it is chosen for a given purpose: The speed or rate of disinfection, the stability of the substance under the conditions of its use, and the permissible concentration. Laboratory tests on the disinfection of a mixture of blood serum and muscle extract inoculated with *Staphylococcus aureus* gave the following results: A 5 per cent solution of phenol failed to sterilize the mixture in 24 hours, mercuric chlorid (1:1,000) completely sterilized in 7 hours, acriflavin (3:1,000) in 4 hours, Dakin's solution (0.5 per cent) in 4 minutes, eusol (0.27 per cent) and chloramin-T (2 per cent) in 5 minutes, and dichloramin-T (2 per cent in oil solution) in less than half a minute. Dichloramin-T, being more stable than the aqueous chlorinated solution, acts continuously instead of with explosive rapidity and can be used in much greater concentration.

The application of the teachings of war surgery to civil hospital conditions, J. A. HARTWELL and E. F. BUTLER (*Surg., Gynecol., and Obstet.*, *27 (1918)*, *No. 4, pp. 377–385, fig. 1*).—This article includes a discussion of the mode of action of Dakin's solution in the treatment of traumatic wounds.

The authors consider that its power to clean the surface of infected suppurative wounds is due to the following properties of the solution: "It is a powerful digestant of protein substances. This includes the protein of bacteria, hence it is a bactericide. It stimulates wound surfaces to pour out albuminous materials and leucocytes, hence it still further destroys bacteria." Its greatest use is thought to be in the treatment of wounds in which suppuration is well established and an abundance of more or less devitalized tissue is present.

Contrary to the conclusions of Dunham and of Lee and Furness, noted above, dichloramin-T is considered by the authors to be less efficient than the hypochlorite solution, owing to the fact that it lacks the property which makes the hypochlorite solution potent, namely, any appreciable proteolytic power.

The prevention of blood clotting by Dakin's sodium hypochlorite solution, T. S. GITHENS and S. J. MELTZER (*Proc. Soc. Expt. Biol. and Med.*, *15 (1918)*, *No. 8, pp. 127, 128*).—Experiments are cited which show that Dakin's solution added to blood in vitro is able to prevent clotting. A slight difference in this respect was noted between the blood of different species. Blood preserved from clotting by Dakin's solution is not affected by calcium salts, but is readily clotted by tissue extracts.

The value of flavine. A clinical appreciation, H. M. SAVERY (*Brit. Med. Jour., No. 3011 (1918), pp. 283, 284; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 17, p. 1441*).—The use of flavine in septic injuries is recommended, and suggestions are given in regard to the technique of its use.

The composition of certain patent and proprietary medicines, J. P. STREET (*Chicago: Amer. Med. Assoc., 1917, pp. 274*).—This is a compilation of data relative to the composition of about 2,800 brands of the patent and proprietary medicines most extensively advertised in the United States.

Plants poisonous to domestic animals (*Agr. Gaz. Canada, 5 (1918), No. 10, pp. 981–987*).—Annotated lists are given of plants poisonous to domestic animals in New Brunswick, by W. M'Intosh; in Quebec, by W. Lochhead; and in Ontario, by J. E. Howitt.

Plants poisonous to stock, F. W. HILGENDORF (*Jour. Canterbury Agr. and Past. Assoc., 3. ser., 6 (1918), pp. 15–21*).—This deals with a number of plants poisonous to stock under ordinary or unusual conditions.

Sixth annual report of the commissioner of animal industry, 1917, L. H. Howard (*Ann. Rpt. Comr. Anim. Indus.* [*Mass.*], *6* (*1917*), *pp. 57*).—This report deals particularly with the occurrence of and work with the more important infectious diseases of live stock.

Report of State veterinarian and State live stock sanitary board for 1916, C. J. Marshall (*Ann. Rpt. Penn. Dept. Agr.*, *22* (*1916*), *pp. 114–172*).—This is the usual annual report, including data on meat hygiene, horse breeding, transmissible diseases of animals, and enforcement of laws. A detailed report is given of investigations in regard to hemorrhagic septicemia.

The use of 48-hour cultures of *Bacillus bovisepticus* subcutaneously in the dose of 0.5 cc. for sheep and 1 cc. for cattle was found to be harmless and of evident value in conferring immunity. Incubation at 42.5° C. for 17 days failed to render the strains virulent for rabbits in the dose of 0.2 cc. The death of a few apparently healthy animals within one week following vaccination seemed to indicate that sufficient immunity is not developed within that time. The use of an antiserum simultaneously with the vaccine is recommended.

Annual report of the State Live Stock Sanitary Board of South Dakota for the fiscal year ended June 30, 1917, A. E. Beaumont (*Ann. Rpt. State Live Stock Sanit. Bd. S. Dak.*, *1917*, *pp. 15*).—Included in this report is a report by the superintendent of the board dealing with the occurrence of and work with contagious diseases of live stock during the year, particularly scabies in cattle, infectious stomatitis, and dourine. Eradication work with dourine in which about 12,000 horses were tested demonstrated that the center of infection is in Perkins County, being more prevalent in the eastern part.

Report on live stock sanitary inspection in Uruguay in 1917, R. Muñoz Ximénez (*Min. Indus.* [*Uruguay*] *Insp. Nac. Pol. Sanit. Anim.*, *Labor Año, 1917*, *pp. 136*).—This report includes discussions of the occurrence of, and work of the year with, infectious diseases of live stock.

Annual report of the civil veterinary department, Bihar and Orissa, for the year 1917–18, D. Quinlan (*Ann. Rpt. Civ. Vet. Dept. Bihar and Orissa*, *1917–18*, *pp.* [*6*]+*8*+*XIV*+*2*, *pl. 1*).—The usual annual report (E. S. R., 38, p. 482).

Hemorrhagic septicemia: Stockyards fever, swine plague, fowl cholera, etc., H. J. Washburn (*U. S. Dept. Agr., Farmers' Bul. 1018* (*1918*), *pp. 8*).—This is a general account of the affection caused by *Bacillus bipolaris septicus* which attacks various animals, especially cattle, sheep, and swine, and is attended by a very high mortality. The losses from this disease are greatest among young animals, particularly those that are thin in flesh and poorly nourished. No remedial measures are effective. Preventive measures include the separation of healthy from diseased animals and the use of bacterins.

Rabies, P. Remlinger (*Vet. Rev.*, *2* (*1918*), *No. 3*, *pp. 303–306*).—This is a review of ten recent papers.

Rabies and its control in New York State, J. G. Wills (*N. Y. Dept. Farms and Markets, Div. Agr. Bul. 107* (*1918*), *pp. 26*).—A discussion of rabies, its occurrence in New York State, and control work therewith.

Is conceptional rabies possible? P. Remlinger (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 8*, *pp. 418, 419*).—A study of the possible presence of rabic virus in the seminal vesicles, testicles, and ovaries of rabic guinea pigs by means of injections of emulsions of the finely divided substance into healthy animals gave negative results, showing that "conceptional rabies does not exist and that all cases of hereditary rabies must be due to placental contamination."

The passage of rabic virus from the mother to the fetus, A. Lanfranchi and F. Lenzi (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 8*, *pp. 396–398*;

Ann. Ig. [*Rome*], *28* (*1918*), *No. 5, pp. 233–237*).—Observations are reported leading to the conclusion that the rabic virus of dogs naturally infected can be transmitted to the fetus by filtration through the maternal plasma. This filtration, at least in dogs, does not produce an attenuation of the virulence of the virus.

Recent aspects of streptococcus infection, F. P. Gay (*Jour. Lab. and Clin. Med., 3* (*1918*), *No. 12, pp. 721–757*).—This review of the present status of knowledge of streptococcus infection includes a bibliography of six pages, arranged alphabetically by authors.

An experimental study of serum therapy in trichinosis, M. C. Hall and M. Wigdor (*Arch. Int. Med., 22* (*1918*), *No. 5, pp. 601–609*).—"Our experiments bear out the conclusions of Schwartz [E. S. R., 37, p. 784] to the effect that serum from animals convalescent from trichinosis, when injected into other animals or fed to them mixed with trichinous meat, does not inhibit the customary development of trichinæ.

"On the other hand, theoretic considerations, the clinical observations of Salzer,[1] and the longevity data from our experiments lead us to the conclusion that such a serum may be of decided value in combating the toxic features of trichinosis, a conclusion which is in general agreement with Salzer's belief in the value of such a serum."

Further studies on Bacterium abortus and related bacteria.—III, Bacterium abortus and related bacteria in cow's milk, Alice C. Evans (*Jour. Infect. Diseases, 23* (*1918*), *No. 4, pp. 354–372*).—This is a report of studies by the Dairy Division of the U. S. Department of Agriculture, carried on in continuation of those previously noted (E. S. R., 39, p. 289).

"*B. lipolyticus* and other abortus-like bacteria were isolated from the milk of 10 of 24, or 41.7 per cent, of cows which had not aborted. The cows belong to a herd in which there was an occasional abortion, but no general outbreak. The same kinds of bacteria were isolated from the milk of 100 per cent of 12 cows which had aborted as a result of natural infection. *B. lipolyticus* was cultivated from the milk of 66.6 per cent of these cows, and other abortus-like bacteria were cultivated from the milk of 50 per cent of them.

"Typical virulent strains of *B. abortus* could not be isolated from the milk of either of the groups mentioned above. Typical *B. abortus* was found to be present in very large numbers in the milk of two cows that had been repeatedly inoculated with a mixture of strains of that organism. It was found only once, in rather small numbers (450 per cc.), in the milk of a cow which had aborted after being inoculated once with the same mixture of strains of *B. abortus*. It was not found in the milk of another cow which aborted after receiving one inoculation. The data indicate that virulent strains of *B. abortus* are not eliminated continuously in large numbers in the milk of cows which have aborted, even though the blood serum continues to react positively to the agglutination test.

"The characteristics of *B. lipolyticus* and other abortus-like bacteria are described, and their relation to the typical *B. abortus* is discussed. The possibility that some of these strains may cause abortions in those cases in which the blood serum reacts negatively to *B. abortus* antigen is also discussed.

"The bacterial flora of the udders of a herd in which there existed an outbreak of abortions was found to be abnormal in the large number of udders which were infected with streptococci, and it was also abnormal in showing a general infecion with a streptothrix. Abortus-like bacteria were found in 66.6

[1] Jour. Amer. Med. Assoc., 67 (1916), No. 8, pp. 579, 580.

per cent of the samples of milk. The abortus-like bacteria included seven acid-producing strains which had never before been found."

A streptothrix (Nocardia) infection of cows' udders, ALICE C. EVANS (*Jour. Infect. Diseases, 23 (1918), No. 4, pp. 373-376*).—During the course of investigations of the bacterial contamination of cow's milk, by the Dairy Division of the U. S. Department of Agriculture, begun 4.5 years ago, from 20 to 30 samples of milk from the Dairy Division herd at Beltsville, Md., have been carefully examined two or three times each year.

At the time of the examination in January, 1918, it was found that some time since October, 1917, when the preceding examination was made, there had been a general infection of the udders with a streptothrix which was isolated from 18 of 21 of the samples studied. This organism, which had never before been isolated from the milk of this herd, varied from 140 to 2,600 per cubic centimeter. A search through the literature yielded only two references to the finding of streptothrix in milk.

A description is given of this streptothrix which is not apparently causing any serious udder trouble. That it may prove pathogenic is suggested.

Coccidiosis in young calves, T. SMITH and H. W. GRAYBILL (*Jour. Expt. Med., 28 (1918), No. 1, pp. 89-108, pls. 3*).—In the prosecution of certain researches upon the diseases of calves in New Jersey coccidiosis, unexpectedly encountered in association with other infectious diseases, led to the studies here reported.

"Discharges of blood per rectum, associated with oocysts of coccidia, were observed occurring in young calves during the warmer season of the year. In a small percentage of the cases death was probably due directly to the coccidiosis. Although the disease, known as red dysentery in Switzerland, may have existed in this country for some time, there seems to have been no knowledge of its existence and no reports of it have thus far been published. The coccidia have been artificially cultivated and shown to produce four spores. Two oocysts of quite different dimensions and having minor differential characters were encountered in the same animal in several instances.

"The invasion of the epithelium of the small intestine was slight. The chief seat of the parasitism was the large intestine. The lesions following the loss of epithelium were superficial hemorrhages and filling up of the denuded tubules with polymorphonuclear leucocytes."

It is further stated that during 1918, up to May 31, but one case of bloody dysentery was observed in the same herd.

Hairless pigs.—The cause and remedy, E. B. HART and H. STEENBOCK (*Wisconsin Sta. Bul. 297 (1918), pp. 11, figs. 6*).—This is a report of investigations of which an account has been previously noted (E. S. R., 39, p. 187).

"Goiter, or an enlarged thyroid gland the function of which is disturbed, is the cause of hairless pigs. Both sow and young are afflicted with enlarged glands. The enlarged glands are deficient in iodin, which is essential to the proper action of this gland and the production of normal young. Iodin supplied the female breeding stock during the gestation period will prevent this trouble. One-third to one-sixth of an ounce of potassium iodid to each 100 lbs. of feed will prevent hairless pigs. Do not use more.

"Rearing the breeding sows with plenty (25 per cent) of good roughage, such as alfalfa or clover hay, in the ration and not an excessive amount of protein may do much toward preventing this trouble and thus avoid the necessity for using the potassium iodid treatment later."

Avian tuberculosis in swine, L. E. DAY (*Jour. Amer. Vet. Med. Assoc., 54 (1918), No. 2, pp. 92-96*).—This report confirms the work of Mohler and Washburn (E. S. R., 23, p. 84), Christiansen (E. S. R., 33, p. 283), and others that swine are susceptible to avian tuberculosis. In cases examined by the author the lesions have been usually confined to the skin extending over the back and sides, and to the superficial inguinal and the prescapular lymph nodes. The tubercles are very oily and in some cases encapsulated. Caseation and calcification do not take place readily.

Observations relative to the intradermal palpebral malleinization as a method of diagnosing glanders, A. Louis and D. Lecompte (*Rev. Gén. Méd. Vét.*, *27* (*1918*), *No. 320*, *pp. 361–368*).—Case reports are cited showing the necessity of confirming the intradermal palpebral malleinization test by a subcutaneous injection in doubtful cases.

Oxidotherapy in the treatment of tetanus, Belin (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 4*, *pp. 172–174*).—Case reports are given of the treatment of tetanus in horses by intravenous injections of potassium permanganate (E. S. R., 38, p. 585). An attenuation of symptoms was noted in all cases shortly after the injection of the oxidizing agents, although a cure was not effected in cases where the contractions were generalized.

Necrobacillosis in horses and mules, W. F. Nolechek (*Jour. Amer. Vet. Med. Assoc.*, *54* (*1918*), *No. 2*, *pp. 150–155*, *figs. 3*).—The general pathology, mode of infection, symptoms, and treatment of necrobacillosis are described. The author states that great losses of horses and mules have occured in the various Army camps in this country from this disease.

The occurrence of tapeworms Anoplocephala spp., of the horse in the United States, M. C. Hall and H. P. Hoskins (*Cornell Vet.*, *8* (*1918*), *No. 4*, *pp. 287–292*).—The authors have brought together the available records of the occurrence of three species of Anoplocephala in the horse in the United States, namely, *A. magna* [*A. plicata*], *A. perfoliata*, and *A. mamillana*, and give a brief description of them.

Immunity of fowls and pigeons to anthrax, C. Sarti (*Ann. Ig.* [*Rome*], *28* (*1918*), *Nos. 5*, *pp. 226–233*; *6*, *pp. 291–299*).—An historical review of the literature on the subject is given, followed by a report of original investigations with normal and starving fowls and pigeons leading to the following conclusions:

Immunity of fowls and pigeons to anthrax is due to the nature of the body fluids and cells, which prevent the multiplication of the anthrax bacilli. In the fluids this is due to the action of ferments which attack the organisms and render them harmless by destroying their toxic property, and in the cells to their incorporating and digesting the organism. Starvation predisposes the birds to infection by lowering the powers of defense, that is, by weakening the bactericidal property of the blood and diminishing the phagocytes, so that the bacilli find all the conditions necessary for resisting, forming capsules, and multiplying. Aggressions favor the progress of infection by means of their toxic action on the phagocytes.

Some studies on Belascaris marginata and Toxascaris limbata, including a simple method of differentiating them, M. Wigdor (*Cornell Vet.*, *8* (*1918*), *No. 4*, *pp. 273–281*, *figs. 12*).—A report of comparative studies of the two common ascarids recorded from the dog in this country. The resistance and development of the eggs of both species in formalin and alcohol preservative are noted.

The tissue-invasive powers of the flagellated and ciliated protozoa, with especial reference to Trichomonas intestinalis.—A critical review, F. G. Haughwout (*Philippine Jour. Sci.*, *Sect. B*, *13* (*1918*), *No. 5*, *pp. 217–258*, *fig. 1*).—A critical review in which the author finds it impossible to draw any very definite conclusions, but which adds force to the already very prevalent impression that the flagellated intestinal protozoa should be viewed with suspicion and regarded as pathogenic until the contrary is proved beyond dispute.

Particular reference is made to the studies of Hadley previously noted (E. S. R., 37, p. 183). A list of 53 references to the literature is included.

Some studies on the resistance of the ova of Toxascaris limbata, M. WIGDOR (*New Orleans Med. and Surg. Jour., 71 (1918), No. 6, pp. 264–281*).—"Parasitic ova are very resistant to various chemical disinfectants. The usually advocated germicidal strengths are markedly effective against the ova of *T. limbata* for many substances. The ova of *T. limbata* show surprising resistance toward acids, alkalis (especially against caustic soda and lime), and metallic salts. Ethyl alcohol in strengths up to 70 per cent and formaldehyde in varying strengths up to approximately 40 per cent are remarkable in their ovocidal action against the ova of *T. limbata*.

"The phenol derivatives, primarily the cresols which have been dissociated by means of soap solutions, such as preparations of [Kreso, Kreso Dip, Septico, Cresylone, and Neko] (varying in their lethal action on parasitic ova according to their corrosiveness), offer the best possibilities as ovocides against parasitic ova of all substances tested. Most of the volatile disinfectants are apparently efficacious in killing the ova of *T. limbata*.

"The ova of *T. limbata* are evidently very resistant to conditions of drought and to low temperatures and require an ample supply of oxygen for the best development. Rapid development is possible at temperature as high as 37.8° C. [100° F.], but the ova are killed at temperatures of 49 to 60° C., and development is materially retarded at temperatures as low as 10°."

Anthelmintics: Their efficiency as tested on earthworms, T. SOLLMANN (*Jour. Pharmacol. and Expt. Ther., 12 (1918), No. 3, pp. 129–170*).—The author finds that all clinical anthelmintics are markedly toxic to earthworms. This test may therefore be used to determine whether a given substance has any anthelmintic properties, and also to determine the relative activity of different samples of a given drug. The results of tests of the effect of many anthelmintics are reported.

RURAL ENGINEERING.

Measurement of water to farms, methods, limitations of accuracy, its importance to the water user, and project interests, J. S. LONGWELL (*Reclam. Rec. [U. S.], 9 (1918), No. 10, pp. 480–484*).—This article is of interest to both the engineer and water user.

Use of water on projects of the United States Reclamation Service, E. A. MORITZ (*Reclam. Rec. [U. S.], 9 (1918), No. 9, pp. 428–430, fig. 1*).—This article presents some general tabular data on the experience of the U. S. Reclamation Service in the use of water on its several irrigation projects.

Tables showing quantities of water used on projects of the United States Reclamation Service, its monthly distribution, and other data for the years 1912 to 1917, inclusive, E. A. MORITZ (*Reclam. Rec. [U. S.], 9 (1918), No. 11, pp. 532–538*).—Detailed tables are given.

Use of water on the Salmon River tract, E. B. DARLINGTON (*Reclam. Rec. [U. S.], 9 (1918), No. 5, pp. 225–228, figs. 5*).—Data of general interest to irrigation engineers and water users are given.

On ground-water movements according to isothermal curve systems, P. FORCHHEIMER (*Abs. in Sci. Abs., Sect. A—Phys., 21 (1918), No. 246, pp. 252, 253*).—This paper, dealing with subterranean water movements, is entirely mathematical.

On the variation of underground water level near a tidal river, E. G. BILHAM (*Quart. Jour. Roy. Met. Soc. [London], 44 (1918), No. 187, pp. 171–189,* *figs. 6*).—The general conclusion from the results of two years' observations on a well in proximity to the River Thames is that the river " is not only the predominating factor in deciding the movements of subsoil water, but also that every variation of level in the river, whether periodic or casual, must to some extent affect the water level."

Graduated slope gauge and movable stilling box, W. G. STEWARD (*Reclam. Rec.* [*U. S.*], *9* (*1918*), *No. 11, pp. 538–540, figs. 4*).—A combination of gauge and stilling box is described, which has given the best results for general use of any of the several forms tested by the author during many years of work on canal measurements.

Calaveras Dam slide.—Report on failure of hydraulic fill dam during construction, D. C. HENNY and C. H. SWIGART (*Reclam. Rec.* [*U. S.*], *9* (*1918*), *No. 9, pp. 433–435, figs. 2*).—The general conclusion of this investigation is that a sliding factor of about 0.5 for the dry mixed rock and earth fill used in the dam is safe, but that when this factor reached 0.8 sliding took place.

Hydraulic sluicing for blanketing porous canal banks, Sun River project, R. B. STEVENS *Reclam. Rec.* [*U. S.*], *9* (*1918*), *No. 3, pp. 125–127, figs. 4*).—This is a report of experiments in which electrically driven pumping plants were installed at various points on the upper slope of a canal, where suitable material was found and ground-sluiced into the canal in such a manner that it was carried down the canal in suspension and gradually deposited as a blanket over the sides and bottom. Cost data are included.

Pumping on irrigation projects, J. M. GAYLORD (*Reclam. Rec.* [*U. S.*], *9* (*1918*), *No. 2, pp. 75–79, figs. 4*).—The author deals with centrifugal pumps, screw pumps, scoop wheels, hydraulic rams, and boosters, and gives data on costs. He concludes in general that the success of a pumping plant depends upon accurate determination of the physical data, the selection of apparatus adapted to the conditions, and systematic attention to details of operation and maintenance of equipment.

Pumping from wells, J. M. GAYLORD (*Reclam. Rec.* [*U. S.*], *9* (*1918*), *No. 10, pp. 485–487, figs. 2*).—This article gives data based especially on irrigated areas of southwestern United States, and calling attention particularly to the use of an automobile engine for power pumping.

Control of algæ by copper sulphate, R. K. TIFFANY (*Reclam. Rec.* [*U. S.*], *9* (*1918*), *No. 11, p. 531*).—Experiments on the Tieton canal of the Yakima project are reported. The designed capacity of the canal when clean was 325 sec.-ft., with a freeboard of 7 in., based on a value of Kutter's n=0.012. The growth of algæ for a certain time was found to raise the value of Kutter's n to 0.014.

Copper sulphate to the amount of 200 lbs. was suspended in burlap sacks in the water near the head of the canal, the entire quantity being dissolved in three or four hours. The canal was cleared of algæ within a week, and no deleterious effects were noted upon vegetation supplied with water thus treated.

Terracing farm lands, C. E. RAMSER (*U. S. Dept. Agr., Farmers' Bul. 997* (*1918*), *pp. 40, figs. 38*).—Systems of terracing farm lands to prevent erosion are described, including the bench and the narrow and broad base ridge types. The methods employed in building terraces and their subsequent care are outlined. A more technical treatment of the subject has been presented in a previous publication (E. S. R., 37, p. 87).

Public Roads (*U. S. Dept. Agr., Public Roads, 1* (*1918*), *No. 5, pp. 48, figs. 30*).—This number of this publication includes the following articles of special engineering interest: Utilizing Local Stone, by G. E. Ladd; Maintaining Earth

Roads with Oil, by T. H. MacDonald; and Standard Sizes of Crushed Stone from the Standpoint of the Producer, by R. W. Scherer. A special report on Reinforced Concrete Slab Bridge Design Based on Full-Sized Tests, by A. T. Goldbeck, is noted below.

Reinforced concrete slab bridge design based on full-sized tests, A. T. Goldbeck (*U. S. Dept. Agr., Public Roads, 1 (1918), No. 5, pp. 3–7, figs. 7*).—This paper summarizes the results of experimental work on the design of reinforced concrete slab bridges as conducted by the Bureau of Public Roads, dealing especially with effective width.

It is shown that when the load is placed in the center of the slab and the width of the slab is more than about twice the span length the effective width may be considered as equal to seven-tenths of the span length of the slab. With reference to slabs having widths less than twice their span, the following table shows effective widths which may be used for spans up to 16 ft. at least and probably for longer spans:

Effective widths of concrete slabs.

Total width ÷ span.	Effective width ÷ span.	Total width ÷ span.	Effective width ÷ span.	Total width ÷ span.	Effective width ÷ span.	Total width ÷ span.	Effective width ÷ span.
0.1	0.1	.6	0.50	1.1	0.67	1.6	0.72
.2	.2	.7	.55	1.2	.68	1.7	.72
.3	.28	.8	.58	1.3	.70	1.8	.72
.4	.37	.9	.62	1.4	.71	1.9	.72
.5	.44	1.0	.65	1.5	.72	2.0	.72

With reference to slabs having two loads, it is pointed out that the effective widths may, in general, be assumed as equal to the effective width due to a single load plus 4 ft.

With reference to eccentric loads, the effective width to be used in design may be calculated as follows: (1) When the distance of the load from the nearest side is more than half of the effective width of the centrally loaded slab, use the effective width for central loads, and (2) when the distance of the load from the side of the slab is less than half the effective width under central loads, the effective width is to be taken equal to $\frac{b_o}{2}+D$, in which b_o = the effective width of the slab under central loads and D=the distance of the load to the nearest side of the slab. In order to make a slab bridge eccentrically loaded equal in strength to one centrally loaded, it is necessary to supply extra strength at the sides by means of a parapet wall. The following procedure for the design is given: (1) Use the formulas for narrow rectangular beams, substituting for the breadth b the value obtained from the above table, (2) determine the loss in effective width due to the assumed eccentricity of the load, and (3) supply the deficiency by designing the curb of the parapet to provide a resisting moment equal to that of the slab width lost due to eccentricity. Allowance will have to be made for the stiffness of the section under the parapet. An unfinished test thus far indicates that this method of design is safe at least.

Farm machinery problems under war conditions, E. A. White (*Gas Engine, 20 (1918), No. 3, pp. 151–155*).—This paper gives extracts from an address presented at the War Conference at the University of Illinois, on January 30, 1918. A general review of the situation at that time is given.

Farm tractor engineering charts, J. Jandesek (*Gas Engine, 20 (1918), No. 3, pp. 113–118, figs. 4*).—Engineering charts showing graphs of data are given, the purpose of which is to enable the engineer to determine quickly and without much calculation the more important data of light farm tractors such as weight, drawbar pull, rolling resistance, speed, size of engine, gear ratio, etc. The data are all based on well-known mechanical formulas.

Economic size of farm tractor, E. Goldberger (*Gas Engine, 20 (1918), No. 6, pp. 273-276, figs. 3*).—This is a paper read before the Mid-West Section of the Society of Automotive Engineers, based on service observations. A conclusion is reached in favor of the four-plow tractor, as being the most economical owing to its production in large quantities and the fact that its price per horsepower will not be 25 per cent higher than that of the two-plow outfit.

Design of an enduring tractor, F. H. Craven (*Gas Engine, 20 (1918), No. 2, pp. 98-102*).—This is a theoretical design, but based on service observations in which the author gives his views as to the design of what ultimately will be generally accepted as the standard design of farm tractor.

Gears for tractors, A. W. Scarratt (*Gas Engine, 20 (1918), No. 6, pp. 278-284, fig. 1*).—This is a paper read before the Minneapolis section of the Society of Automotive Engineers, in which the materials for gears are discussed and tabular data showing tensile strength, elastic limit, machining quality, and characteristics of different metals for gears are given. The particularly noteworthy point as to these data is the fact that the author indicates that close-grain semi-steel having a tensile strength of 31,000 lbs. per square inch is satisfactory for high or low speeds and low pressures, and wears well. This is particularly important owing to recent developments in semi-steel practices, on which very materially depends its production. Data are also given on the strength of gear teeth.

Tractor transmissions, E. R. Greer (*Gas Engine, 20 (1918), No. 4, pp. 200-204, figs. 5*).—This paper was presented at the tractor section meeting of the Society of Automotive Engineers, and gives a general discussion of the subject of particular interest to engineers.

Magneto ignition for farm tractors, J. G. Zimmerman (*Gas Engine, 20 (1918), No. 6, pp. 265-271, figs. 7*).—This is a paper read before the Mid-West section of the Society of Automotive Engineers on April 26, 1918. It attempts to bring out the essential factor of the proper installation of magnetos in the tractor engine for constant duty work. It is shown that the spark for a given charge, regardless of its voltage, must be sufficient and with a good factor of safety.

With reference to wiring, the use of metal tubes to carry high-tension wires is shown to be a bad practice. The ideal wiring is considered to consist of the shortest possible wires of equal length from the ignition device to the plugs. All wires should be kept at least 1 in. away from grounded parts and should be kept at least 0.5 in. apart.

With reference to spark requirements it is shown that the spark must occur exactly when wanted, and that the ignition should occur at a definite time relative thereto.

Further data are given on the spark-gap setting of plugs, the initial kick voltage, and the energy of the spark. The importance of the starter coupling with the magneto is also brought out.

Fuels for tractor engines, J. L. Mowry (*Gas Engine, 20 (1918), No. 5, pp. 239-243*).—This is a paper read before the Minneapolis section of the Society of Automotive Engineers, and based on both field observations and laboratory tests. The author's conclusions are that the substitution of lower-grade fuels for higher-grade fuels under present conditions will require better spark plugs, development of the manifold, particularly with reference to the hot-spot principle, carbureter development providing for quickly changing to a lighter fuel to take care of over-load and throttling conditions, and engine design, with special reference to cooling and elimination of moving parts.

Adaptation of carbureters to low volatile fuels, J. H. V. FINNEY (*Gas Engine, 20 (1918), No. 5, pp. 220–227, figs. 2*).—This is a brief report of results of numerous tests made in the laboratory and under service conditions of commercial carbureters with a view to the development of a carbureter adapted to the use of low volatile fuels, particularly heavy distillate.

It was found that with low volatile fuels an efficient carbureter must offer a minimum resistance to the suction of the engine and should take in the charge at a comparatively low temperature. It should break up the particles of fuel so fine that it is all vaporized before ignition takes place. It was also found that a carbureter which will enable a gas engine to use the less volatile fuels, probably for use in tractors or automobiles, should fulfill the same requirements as a carbureter for gasoline.

It is concluded that the charge should go to the engine as cool as possible and that the heat necessary to vaporize the fuel should be applied to the fuel only, the vapor being mixed with comparatively cool air.

A discussion of the fundamental principles of the carbureter is also given, and as a result of the experiments a vaporizer was developed which was found to be satisfactory in service. This carbureter is described.

Antifreeze solutions, C. T. SCHAEFER (*Gas Engine, 20 (1918), No. 1, pp. 39–41*).—Data are given showing the properties of various mixtures of alcohol, glycerin, and calcium chlorid fór antifreezing and cooling solutions to be used in gas engines. The following table summarizes some of these data:

Antifreezing solutions and their freezing points.

Water-glycerin.			Water-alcohol.			Water-alcohol-glycerin.		
Water.	Glycerin.	Freezing point.	Water.	Alcohol.	Freezing point.	Water.	Alcohol-glycerin.	Freezing point.
Per cent.	*Per cent.*	*Degrees F.*	*Per cent.*	*Per cent.*	*Degrees F.*	*Per cent.*	*Per cent.*	*Degrees F.*
95	5	30	95	5	25	95	5	28
90	10	28	90	10	18	90	10	25
85	15	25	85	15	11	85	15	20
80	20	23	80	20	5	80	20	15
75	25	19	75	25	−2	75	25	8
70	30	15	70	30	−9	70	30	−5
65	35	12	65	35	−15	67	33	−15
60	40	5	60	40	−23	60	40	−23
50	50	−2	....	....	....	....	....	....
45	55	−10	....	....	....	....	....	....

Potato storage cellars, Minidoka project, H. L. CRAWFORD (*Reclam. Rec. [U. S.], 9 (1918), No. 11, pp. 524, 525*).—A brief description is given of a type of potato cellar which has been built for the use of farmers on the Minidoka project. The walls are built of concrete, reinforced with steel at the corners and over the doorways. The roof consists of wire netting laid on rafters and covered with a compacted layer of straw. This in turn is covered with about 1 ft. of earth. A makeshift cellar for speedy construction on account of danger to unstored crops was roofed with 1 in. lumber covered with tar paper with walls of the same material.

A form of contract for the construction of these cellars is included.

RURAL ECONOMICS.

The determination of farming costs, C. S. ORWIN (*Oxford, Eng.: Humphrey Milford, 1917, pp. 144*).—This investigation of farming costs was undertaken by the Institute for Research in Agricultural Economics at the University of Oxford to show the marginal value of farm bookkeeping, by discussing the principles involved and by the analysis of methods used in a few actual cases. The conclusions drawn state that artificial stability of prices is advisable to increase food supplies during the war and to act as a kind of war insurance in time of peace. An exact knowledge of costs of production, normal and actual, may prevent farmers from being exploited, either consciously or unconsciously. Better life for the workers and more food for the nation can be provided when records of social, financial, and productive results are available for both large and small-scale production. This knowledge will show whether it is more advisable to combine large holdings into farms bigger still, for the purpose of applying to agriculture the organization for large-scale production, or to split up large farms into small holdings, which is now being promoted by private action and by legislation. Knowledge of cost of distribution as well as the cost of production may help to solve the problems regarding the elimination of the middleman and the distribution of the divisible surplus of farming as between landlord, farmer, and farm laborer.

Cost accounts on a fruit farm, J. WYLLIE (*Scot. Jour. Agr., 1 (1918), No. 3, pp. 301–306*).—This article shows the progress made since 1914 by the West of Scotland Agricultural College in keeping cost records on a fruit farm of 50 acres near Lanark to obtain data as to the relative efficiency of various fruit rotations. Among other statistics, tables are given showing the average cost of labor per man and per horse on a given acreage of strawberries in 1915, 1916, and 1917.

Minimum wages for agricultural workers (*Scot. Jour. Agr., 1 (1918), No. 3, pp. 325–336*).—Under the Corn Production Act of 1917, Scotland has been divided into 12 districts in which the conditions of farm labor are similar. Each of these districts has a district wages committee, composed of a chairman and an equal number of farm laborers and employers of farm labor, and empowered to fix the minimum rates of wages for workmen employed in agriculture. There is also a central committee which defines the general principles on which benefits (such as a house or allowances in kind) are valued in lieu of cash payment and considers complaints.

Farmers and income tax, A. M'CALLUM (*Scot. Jour. Agr., 1 (1918), No. 3, pp. 315–325*).—This article explains the basis of assessment of farmers' income under the amended statutory income-tax act in Scotland. Up to 1915, if he elected taxation under Schedule B, the farmer was taxed on one-third of the annual rent. Under the 1915 act, he was subject to taxation on the whole annual rental, with an abatement of £120. Beginning with the fiscal year April, 1918–19, he will be subject to assessment on double the amount of rental, with an abatement of £100. As an alternative, he still has the privilege of electing assessment under Schedule D—taxation on his ascertained profits from employment, based on the average income of the profits of the past three years. This requires that the farmer keep accurate accounts. It is maintained that this choice of assessment has been a real benefit to the farmer, even when the one-third rental basis was in force.

Private colonization of the land, R. T. ELY (*Amer. Econ. Rev., 8 (1918), No. 3, pp. 522–548*).—This paper concerns landed property and endeavors to stimulate studies of the private ownership of land. A brief outline of plans for colonization as they have existed in the United States is given, together with comments and comparisons of the plans employed in Australia, New Zealand, and the city of Ulm, Germany.

The author suggests that we must regard land as the chief public utility, and that we should have land settlement divisions of our departments of agriculture to exercise functions analogous to the railway and public utility commissions. These activities should consist in the expansion of present services—agricultural education, university certification of farms as to labor and living conditions, and the organization of suburban and country homes and farm homes companies to furnish the land purchaser with the best possible dwellings compatible with a modest return of capital, say, 6 per cent. The companies acting in conjunction with the universities should advise would-be purchasers of land with regard not only to their own well-selected lots but also other lands. A portion of the profits of these companies should be devoted to scientific investigation of land problems. The problem of the returning soldiers and sailors of the present war is thought to add an urgent reason for action by the Government with regard to colonization methods.

The agricultural accident insurance at Baden (*Landw. Jahrb. Schweiz, 32 (1918), No. 2, pp. 209–221*).—This is a report as to the methods and policy of agricultural accident insurance as applied at Baden.

Cooperation and markets branch (*Rpt. Min. Agr. Ontario, 1917, pp. 55–59, fig. 1*).—This article discusses the act passed by the Ontario Legislature in 1917 providing for the incorporation of cooperative companies and associations as such. The author states that a standard set of by-laws has been issued, and lists the cooperative companies thus far incorporated.

Conference of representatives of the grain trade of the United States (*Conf. Represent. Grain Trade U. S., 1918, pp. III+252*).—This is a report of the discussions of representatives of the grain trade of the United States during a conference held in April, 1918, at New York City. The subjects discussed included the problems of the country dealer, such as storage, grades, competition, etc.; terminal and the seaboard problems, such as elevators, insurance, commissions, etc.; milling questions as affecting grain handling; and new crop problems.

Facts for the farmer (*St. Paul, Minn.: Nat. Nonpartisan League, 1917, pp. 128, figs. 6*).—Among the subjects discussed in this book are farm tenancy and farm mortgage, taxation, grain, butter and eggs, meat supplies, etc. The preface indicates that the data given are taken from official or other authoritative records and relate to conditions important to the farmer as a producer and to the wage worker as consumer, and that while the book is issued as a Minnesota handbook, much of its contents apply in more or less pertinent degree to other States as well.

Facts kept from the farmer (*St. Paul, Minn.: Nat. Nonpartisan League, 1917, pp. 79*).—This book maintains that farmers must organize to protect their interest and insure " their proper place in a reconstructed society."

Eugenics and the agricultural community, O. C. GLASER (*Abs. in Rpt. Mich. Acad. Sci., 19 (1917), pp. 105–106*).—The author maintains that in times past agriculture has retained the less alert and less ambitious and that agricultural communities have resulted too much in intermarriage among a small group of families. This period, however, is passing, and general education in the laws of natural inheritance and other matters of eugenic importance may be one of the most positive methods of improving such conditions. A second influence may be the use of the eugenics registry. It is pointed out that to reduce the frequency of disgenic marriages and their unfortunate chain of consequences will increase the liberty of the individual and free the community as a whole from the necessity of caring for so many incompetents.

The future of the country church, R. Phillips (*Rpt. Mich. Acad. Sci., 19 (1917), pp. 133–142, figs. 3*).—The problem of the country church to-day is deemed analogous to the church problem within the cities. The author discusses the future of the country church under three heads—organization, pastoral requirements, and equipment and program—based on the idea that religion should permeate completely the social order in which men move. He suggests a central organization for all denominations, with social service work concentrated under various department heads, to the end that the church may again become a neighborhood center and reestablish itself in its rightful place as a leader in rural life.

Area, farms, and farm lands [of California], G. Robertson (*Statis. Rpt. Cal. Bd. Agr., 1917, pp. 1–19*).—These pages give statistics regarding the vacant public lands; homesteads; Indian reservations; school lands; dry farming; number, value, and size of farms by counties; improved and unimproved farm land; mortgage debt on farms; and irrigation on farms.

The total acreage of land unappropriated and unreserved on July 1, 1917, was 19,505,217 acres, showing a decrease of more than 500,000 acres since July 1, 1916. A recent regulation, designed to encourage dry farming, has increased the area of a homestead from 160 to 320 acres on land having no water supply, in four of the southern counties.

[The census of farms, live stock, and agricultural production], E. R. Danielson (*Bul. Nebr. Bd. Agr., No. 245 (1918), pp. 108–151*).—These pages contain a census, by counties, of farms in Nebraska occupied by owners and by tenants; acreage under cultivation and irrigation; improved land acreage and money value of improvements on land; live stock, including horses and mules, cattle, hogs, dogs, and bees; and the acreage value and amount of the cereal, feed, and vegetable crops for 1917. Agricultural machinery, including automobiles, gasoline and steam tractor engines, cream separators, and butter-making machines, used in 1917 is listed, and tables are given showing a résumé of the Nebraska live-stock record from 1880 to 1917 and agricultural production of cereals in Nebraska for 28 years (1890 to 1917).

Cuba, what she has to offer to the investor or the homeseeker, G. Reno (*Habana, Cuba: Govt., 1917, pp. 73, figs. 29*).—This book treats of the physical aspects of the island, its location with reference to channels of trade, the population, educational facilities, climate, crops, etc. The discussion of the principal crops, among which are cane, tobacco, coffee, cacao, cereals, and cotton, considers Cuba as a whole as well as its separate provinces.

Acreage and live stock returns of Scotland, J. M. Ramsay (*Agr. Statis. Scotland, 5 (1916), pt. 1, pp. 53*).—This report continues data previously noted (E. S. R., 37, p. 392).

Prices and supplies of grain, live stock, and other agricultural produce in Scotland, J. M. Ramsay (*Agr. Statis. Scotland, 4 (1915), pt. 3, pp. 81–108*).—This report continues data previously noted (E. S. R., 35, p. 497).

Agricultural statistics of Italy (*Ann. Statis. Ital., 2. ser., 5 (1915), pp. 121–134; 6 (1916), pp. 135–158, pl. 1*).—These reports continue data previously noted (E. S. R., 34, p. 896), adding information for 1915 and 1916.

[Agricultural exploitation and production of Morocco], F. Bernard (*Ann. École Nat. Agr. Montpellier, n. ser., 15 (1917), No. 1–3, pp. 154–204*).—These chapters deal with the soil, climate, colonization, agricultural machinery, and capital available for agricultural purposes in Morocco. Comparative statistics are given for the principal crops and live stock, and general information concerning the cotton, wine, and orchard fruits produced.

The material resources of Burma, H. ADAMSON (*Bul. Imp. Inst.* [*So. Kensington*], *16* (*1918*), *No. 1, pp. 40–79, fig. 1*).—This article discusses the problem of attracting British capital to Burma. It discusses the soil fertility, rainfall, forests, fisheries, and mineral resources as a field for commercial enterprise. It points out that deficiency in transportation facilities and scant population, with consequent dearness of labor, are causes of former failures to exploit Burma, and it includes statistics with respect to land holdings, crops, rubber, and forestry, including timber and teak.

[Land tenure and settlement: Agriculture and live stock in New Zealand, 1917] (*New Zeal. Off. Yearbook 1917, pp. 424–493, pls. 2, figs. 2*).—These pages continue the data previously noted (E. S. R., 37, p. 791).

AGRICULTURAL EDUCATION.

The land grant of 1862 and the land-grant colleges, B. F. ANDREWS (*U. S. Bur. Ed. Bul. 13* (*1918*), *pp. 63*).—This bulletin gives a brief history of the management of the land grant of 1862, together with the text of the Morrill Act and amendments thereto.

It is found that under the act and supplementary legislation 28 States were allotted 8,160,000 acres of land in scrip and 20 received 2,890,000 acres in place, making a total allotment of 11,050,000 acres, of which 10,929,215 acres actually passed to the States. In 1914 there were 1,209,837 acres still unsold, part of which were leased, and 451,850 acres unlocated.

The scrip and lands have been sold for $12,643,309.43, of which $119,164.90 was used in four States to purchase land. The remaining capital increased during 52 years of existence (1862–1914) until it amounted to $13,621,712.07. Of this amount $2,205,489.08 in 10 States draws interest at less than 5 per cent, but only four States fail to make up the deficit in some way. Every State now applies all the income for the support of the agricultural and mechanical college, with no diminution or diversion to other uses.

[Papers on horticultural instruction] (*Proc. Amer. Soc. Hort. Sci., 14* (*1917*), *pp. 23–30, 128–147, 178–180*).—The papers presented at the meetings of this society previously noted (E. S. R., 39, p. 541) include the following relating to instruction in horticulture:

A Plan for Cooperative College Training in Practical Horticulture, by B. S. Brown (pp. 23–30).—This is a discussion of the problem of the need of greater efficiency in horticultural skill, which involves not only the practical training for the regular students but also the short courses and the students from the cities, who in some cases comprise over 50 per cent of the total enrollment. Present methods to increase skill in practical work and their defects are noted, and a list of prerequisites in horticultural practice work, applying to New England conditions, is suggested. A cooperative plan is presented for the agricultural colleges of several States or groups of States, under which a series of specialized farms would be acquired in accredited centers of production, preferably scattered through 10 or 12 States. Students could then be passed from farm to farm, thus permitting of a considerable diversity of experience without excessive cost. The plan would also permit of a uniform training for the students through the several States cooperating and tend to give the smaller colleges the same advantages as the large universities. It would tend to standardize methods and practices, and assist the colleges to obtain a better hold upon the rural people and take a larger part in shaping farm policies.

Experiments in Horticultural Teaching, by W. L. Howard (pp. 128–130).—Experiments in practical training in horticultural teaching which the University of California has tried out or is planning to try out are briefly described.

Report of Committee on Undergraduate Work, by B. S. Pickett (pp. 130–132).—The committee finds a growing endeavor to improve the pedagogy of horticultural instruction. In connection with the presentation of horticultural courses attention is called to the relative value of equipment and instructor. It is especially in the laboratory that progress has been marked in horticultural instruction in recent years, and some of the difficulties of the instructor in field laboratory work are pointed out. The lack of instruction on the plant materials of horticulture is deplored.

Methods of Providing Practical Work in Horticultural Courses, by S. W. Fletcher (pp. 133, 134).—The author briefly discusses some of the methods employed in providing practice work in horticultural courses.

Courses in Pomology at Cornell University, by W. H. Chandler (pp. 135–137).—These courses are briefly described, including the farm-practice requirements.

Pomological Field Laboratories, by E. W. Bailey (pp. 138–140).—A system of field laboratories conducted at the University of Illinois is described, with special reference to instructional work in field practice and a plan for a field laboratory for advanced pomological students. This laboratory contemplates a series of annual deciduous tree fruit plantings for a period of years, each successive planting being a duplication of the previous year's planting in the closest possible detail. It is thought that such a system of pomological field laboratories might, after a period of years, offer ideal material for graduate students.

Report of Committee on Graduate Work, by M. J. Dorsey (pp. 140–147).—This report deals with the place of the thesis in graduate training in horticulture.

Report of the Committee on Score Cards for Vegetables, by W. W. Tracy, sr., (pp. 178–180).—A few sample score cards for vegetables are given.

Agricultural education, T. H. EATON (*Rpt. Proc. Conn. Dairymen's Assoc., 36 (1917), pp. 137–145*).—In discussing the educational needs of the farm boy, the author suggests certain considerations for guidance in determining what the farmer should know because he is a producer and because he lives on the farm.

Vocational education, compiled by EMILY ROBISON (*New York: The H. W. Wilson Co., 1918, pp. XLIX+303*).—This is source book for teachers and students, in which the author attempts to represent the leading points of view in the discussion of both vocational education in general and the teaching in the public schools of industrial, commercial, agricultural, and household arts subjects.

The selections dealing with agricultural education are as follows: Agriculture Enlarges Consciousness and Helps Adjustment, by A. D. Cromwell; General Instruction in Agriculture, by W. A. McKeever; Agricultural Education, by H. J. Waters, previously noted (E. S. R., 36, p. 193); Agricultural High Schools in Ontario, by J. B. Dandeno; Flathead High School, Kalispell, Mont., by Florence Clark; Student Creamery at Duluth Central High School, by E. P. Gibson; What the County Agricultural High School is Doing for Mississippi Boys and Girls, by W. H. Smith; and The Massachusetts Home Project Plan of Vocational Agricultural Education, by R. W. Stimson. The statements on household arts include the following: A Bavarian School of Housekeeping, by Mary Parkinson; Educating the Consumer, by Martha B. Bruère; and Business of Homemaking, by Mrs. H. M. Hickok.

A very comprehensive bibliography on the different phases of vocational education considered is included.

[Instruction in rural science in Prince Edward Island] (*Dept. Ed. Prince Edward Island School Circs., 1916, Nos. 1, pp. 8, figs. 2; 2, pp. 9+[3], figs. 4; 3, pp. 4, fig. 1; 4, pp. 8, fig. 1; 1918, No. 5, rev., pp. 11, figs. 8; 1917, Nos. 6, pp. 8, figs. 3; 7, pp. 10, figs. 9; 1918, Nos. 8, pp. 4, fig. 1; 9, pp. 8, figs. 3*).—These circulars contain announcements with reference to special grants to teachers for giving instruction in rural science and the work of the summer school for teachers, and suggestions for teaching school gardening, nature study, and elementaary agriculture; and for conducting school fairs, home projects, boys' and girls' clubs, and patriotic work.

Proceedings of the high school conference of November 22, 23, and 24, 1917, compiled by H. A. HOLLISTER (*Univ. Ill. Bul., 15 (1917), No. 15, pp. 53–80, 93–97, 164–174*).—Among the proceedings included in this bulletin are the following papers: Laboratory Work in Farm Crops, compiled by W. Scott; Laboratory Work in Animal Husbandry, by A. Tate; Teaching the Insects, by J. C. Isenbarger; The Need of Household Accounts and Budgeting in the High School Curriculum, by Lorinda Perry; and Household Arts from the Vocational Standpoint, by Mrs. W. E. Stillwell.

An outline of instruction for school gardening and agriculture (*Los Angeles City School Dist., School Pub. 9 (1918), pp. 101*).—This suggestive tentative course of study, with outlines of project work in school gardening and agriculture, has been prepared for use in the elementary, intermediate, and high schools of Los Angeles, Cal.

To assist in meeting the demand for an increase of food production caused by the war, the work of the department of agriculture of the Los Angeles school system, both in the elementary and high schools, is now conducted 12 months in the year instead of 10, a number of teachers have been assigned to continuation work in the elementary schools, and the amount of instruction has been increased to provide more careful supervision for home gardening. It is stated that the time and effort given to the cultivation of flower gardens has been reduced, and home gardening projects have been extended. Agriculture is now open to the students of all the intermediate and high schools who desire to take it up as a vocation.

A course of study for homemakers, NINA B. CRIGLER and LILLIAN PEEK (*Col. Indus. Arts Tex. Bul. 61 (1918), pp. 34*).—This is a revision of the 1914 practical course of study for the homemakers of Texas, previously noted (E. S. R., 34, p. 599). The necessity for an intelligent comprehension of living conditions brought about by the war has been recognized and provided for in each of the seven divisions of the course, which comprise housing, feeding, and clothing the family; sanitation and civic attractiveness; child study, women in war; and the art of living. A bibliography is appended to each division.

A course in food economies for the housekeeper (*U. S. Bur. Ed., Home Econ. Circ. 6 (1918), pp. 8*).—This circular outlines lessons for the use of home economics teachers in giving lectures to groups of women who desire to do their part in the campaign for food economy. Every lesson includes a list of references to recent publications dealing with food study.

Home economics outline for teaching food conservation (*Agr. Col. Ext. Bul. [Ohio State Univ.], 13 (1917–18), No. 14, pp. 65*).—These lessons are planned to develop food work along the conservation lines laid out by the Food Administration.

Lessons in community and national life (*U. S. Bur. Ed., Lessons Community and Nat. Life, 1918, Ser. A, 1–29, pp. 264; Ser. B, 1–31, pp. 264; Ser. C, 1–32, pp. 264*).—These lessons have been prepared to assist teachers and other school officers in giving students a new appreciation of the problems of community and national life and a deeper understanding of the meaning and aims of democracy. The three series are intended for use in the upper classes of high schools, in the first class of the high school and the upper grades of the elementary school, and in the intermediate grades of the elementary school, respectively.

Among the lessons pertaining to agriculture and home economics the following may be mentioned: In Series A, the history of the Federal Departments, the United States Food Administration, substitute foods, and women as the family purchaser; in Series B, the varied occupations of a colonial farm, feeding a city, a cotton factory and the workers, saving the soil, an intelligently selected diet, the work of women, price control of wheat, concentration of production in the meat-packing industry, concentration in the marketing of citrus fruits, good roads, and women in industry; and in Series C, spinning and dyeing linen in colonial times, conservation as exemplified by irrigation projects, preserving foods, preventing waste of human beings, the effects of machinery on rural life, market reports on fruits and vegetables, sugar, and the family and social control.

MISCELLANEOUS.

Thirtieth Annual Report of Illinois Station, 1917 (*Illinois Sta. Rpt. 1917, pp. 20*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, brief notes as to the principal lines of work, and a list of publications of the year. Data are included as to 1917 yields of wheat in soil fertility tests previously noted (E. S. R., 38, p. 624).

Report of the director for 1917, J. G. Lipman (*New Jersey Stas. Bul. 317 (1917), pp. 55*).—This contains the organization list and a report of the director on the work and publications of the station during the year. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of Ohio Station, 1918 (*Ohio Sta. Bul. 325 (1918), pp. XXVI+6, fig. 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1918, and a report of the director summarizing the work and publications of the station during the year.

Thirtieth Annual Report of Rhode Island Station, 1917 (*Bul. R. I. State Col., 13 (1918), No. 4, pp. 35–42, 46–48*).—These pages include a report of the director and a financial statement for the year ended December 31, 1917. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 3 (1918), No. 10, pp. 289–318, figs. 10*).—This contains several articles abstracted elsewhere in this issue, together with the following: Selection and Care of Seed Corn, by C. G. Williams; and Root Rot of Corn, by A. D. Selby.

NOTES.

Kentucky University and Station.—Mrs. H. B. Wolcott, State leader of home demonstration work, and R. L. Pontius, veterinarian in the station, have resigned. P. L. Blumenthal and William Rodes, chemists, and Roger Jones, inspector of feeds and fertilizers, have returned to the station from military service.

Recent appointments include James Speed as editor in the college of agriculture, Roy Milton as farm superintendent, O. F. Floyd and J. W. Lindsay as extension assistants in marketing, and A. S. Chapin as extension poultry specialist.

Maryland College and Station.—Dr. A. G. McCall, in charge of soil investigations, has been granted leave of absence to take up educational work in Europe. C. L. Opperman, superintendent of the Ridgely substation, has been appointed agricultural editor in the extension service, and has been succeeded by Albert White. P. E. Richards and John Paul Jones have been appointed assistants in soil investigations and plant physiology, respectively.

Massachusetts College and Station.—William D. Hurd, director of the extension service since its establishment in 1909, has resigned, effective about June 1, to accept a position with the National Fertilizer Association and with headquarters in the Middle West. Lieut. John B. Smith of the Sanitary Corps has returned to the station as assistant chemist.

Montana College and Station.—C. N. Arnett has resumed his duties as head of the department of animal husbandry, following a year's service in France with the American Red Cross. W. E. Joseph, assistant in animal husbandry, Charles Haller, assistant in the grain laboratory, and R. M. Pinckney, assistant chemist, returned to the station early in January after several months absence in Army service.

Cornell University and Station.—Dr. Vern B. Stewart, assistant professor of plant pathology, died December 3, 1918, at the age of 30 years. Dr. Stewart was a graduate of Wabash College in 1909 and received the Ph. D. degree from Cornell in 1913. He had been subsequently engaged, for the most part, in research, notably on fire blight and other diseases of horticultural and ornamental nursery stock. In July 1918, he became pathology adviser to the eastern market inspectors of the U. S. Department of Agriculture, this work dealing particularly with the detection of incipient diseases in shipments of perishable plant products for the Army and Navy. He was also an associate editor of *Phytopathology*.

Pennsylvania College and Station.—Fred Rasmussen, professor of dairy husbandry, has been appointed Secretary of Agriculture for the State and entered upon his new duties January 21. G. C. Given, associate professor of experimental agricultural chemistry, resigned February 14. John B. Scherrer, assistant professor of vegetable gardening extension, A. R. Haas, instructor in botany, M. D. Leonard, instuctor in entomological research, and A. F. Yeager, instructor in pomology, have also resigned. Recent appointments include H. S. Adams as assistant professor of agricultural extension, effective March 1; J. F. Olney, instructor in bacteriology; R. D. Lewis, assistant in agronomy; J. S. Owens, assistant in experimental agronomy; and G. F. Miles and P. R. Smith as assistants in plant pathology extension.

Tennessee University and Station.—President Brown Ayres, widely known in educational circles, died January 28 after a brief illness.

President Ayres was born in Memphis, May 25, 1856. He received a technical education, Stevens Institute of Technology awarding him the B. S. degree in 1878, and that of doctor of philosophy in 1888. His long period of educational service began at Tulane University in 1880 and continued at that institution until 1904, when he resigned as acting president to become president of the University of Tennessee. During his administration at the latter institution its resources and prestige greatly increased. In the words of one of his colleagues, "he made the university a State university in fact as well as in name. He reorganized the institution in all of its colleges, increased the faculties, extended the curricula, and enlarged the equipment and facilities for instruction and research."

President Ayres was the recipient of many educational honors and had received the honorary doctor's degree from five southern universities. He was a fellow of the American Association for the Advancement of Science and a member of numerous engineering and educational bodies. He was president of the National Association of State Universities in 1910. For many years he had been a prominent figure in the American Association of Agricultural Colleges and Experiment Stations, serving on the executive committee and in numerous other capacities. He was nominated as president of the association at the Baltimore meeting shortly before his death, and upon declining the position was reelected as the ranking vice-president.

Samuel M. Bain, associated with the institution since 1893, and professor of botany since 1901, died January 30 at the age of 50 years. His experimental work dealt particularly with red clover and its diseases, cotton, and alfalfa. He was a fellow of the American Association for the Advancement of Science and a member of numerous scientific organizations.

The extensive building program of the university has now been tentatively adopted. Among the first structures to be erected is a laboratory building for agriculture, including the departments of agronomy, horticulture, dairying, and animal husbandry, and also with provision for the office of the extension division and the laboratories of the station.

The department of animal husbandry and dairying of the college and station has been divided, C. A. Willson assuming charge of the department of animal husbandry and C. Elmer Wylie of that in dairying.

Utah College and Station.—A department of range management has been established under the direction of Raymond J. Becraft. L. M. Winsor, specialist in irrigation and drainage, has been granted leave of absence to take up commercial irrigation work in Chile. Irving J. Jensen, assistant agronomist, has returned from military service. W. S. Hansen of Fielding and George W. Skidmore of Logan have been appointed members of the Board of Trustees vice J. William Knight and Elizabeth C. McCune.

Wisconsin University and Station.—Dr. H. C. Taylor, professor of agricultural economics, has been appointed chief of the Office of Farm Management in the U. S. Department of Agriculture. D. H. Otis, professor of farm management has been granted leave of absence to engage in the Y. M. C. A. overseas educational campaign and will be in charge of the organization of the instruction in farm management. J. B. Borden, formerly assistant State superintendent of public instruction, has been appointed assistant dean and has entered upon his duties.

The land clearing investigation and demonstration work has been put in charge of John Swenehart, transferred from the position of county representative of Forest County. O. R. Zeasman, county representative of Green Lake County, has also been transferred to the agricultural engineering department.

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EXPERIMENT STATION RECORD.

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[1] On leave of absence for military service.

METEOROLOGY.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

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FORESTRY.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

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U. S. Dept. of Agriculture—Contd.

[1] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

VOL. 40. ABSTRACT NUMBER. No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Chemical studies on physiology and pathology.—I, Protein chemistry as the basis of the life process, E. HERZFELD and R. KLINGER (*Biochem. Ztschr., 83 (1917), pp. 42–61; abs. in Physiol. Abs., 2 (1918), No. 11, pp. 660, 661; Chem. Abs., 12 (1918), No. 8, p. 809*).—The theory is advanced that the protein molecule consists of a solid nucleus surrounded by layers of higher and lower cleavage products, each cleavage product being the best solvent of the next higher product in the series. The application of this theory to cell metabolism, to certain diseases, and to glandular secretion is discussed.

On the amino-acid content of nutrient media, I. W. HALL ET AL. (*Brit. Med. Jour., No. 3015 (1918), pp. 398–401*).—Studies are reported of the amino-acid content of ordinary and special media, the percentage of amino acids necessary for bacterial growths, and the influence of vitamins on the amino-acid content of media.

Ordinary media were found to vary widely in their amino-acid content. The bacterial growth in media varying in amino-acid content showed that a content represented by a formaldehyde figure of 40 is the optimum for growth. An examination of the effect of different vitamins on the growth of organisms showed that the source of the vitamins was apparently immaterial, with the exception of the soy bean, which led to a much more marked growth than the other vitamins.

In conclusion the authors propose the general adoption of a uniform amino-acid standard content for nutrient media.

The inversion of cane sugar by colloidal silica, ALBERT and ALEXANDRE MARY (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 18, pp. 644–646*).—Three series of experiments are reported, the first with dialyzed hydrosols and the other two with nondialyzed hydrosols of colloidal silica, from which the following conclusions are drawn:

Colloidal silica, as well as mineral acids, acetic acid, invertase, and the hydrosols of palladium, gold, and platinum, invert cane sugar in an appreciable manner. Its inverting power is a function of its state of dispersion. It is inactivated by the physico-chemical circumstances which destroy the dispersal phase of its pseudo-solutions. In certain conditions of physical instability its activity increases with the temperature up to a variable optimum (below 100° C.), and then decreases to complete inactivation. Its conditions of activity are thus comparable in certain respects to those of colloidal metals and of the invertase extracted from various Saccharomyces or Penicilia. The coincidence of progressive inactivation with progressive coagulation is considered to be attributable only to the influence of heat on the degree of dispersion of the inverting colloid.

The constitution of pectin bodies, T. VON FELLENBERG (*Biochem. Ztschr., 85 (1918), No. 1–2, pp. 118–161*).—A résumé of the literature on the pectin bodies is given, followed by a report of a detailed study of the three classes of pectins—protopectin, pectin, and pectic acid—occurring in unripe, ripe, and overripe fruits, respectively. The properties observed are recorded in tabular form, including the constitution; solubility; behavior with ammonia, sodium hydroxid and other electrolytes, tannic acid, protein, and dyes; and ability to form jelly. On heating with sugar and pectin-free fruit juices only the second form of pectin was able to form jelly.

Attention is called to the fact that the so-called bassorin of gum tragacanth also yields methyl alcohol on treatment with sodium hydroxid and is converted into bassoric acid, which resembles pectic acid in certain of its properties.

Crystallography and optical properties of three aldopentoses, E. T. WHERRY (*Jour. Amer. Chem. Soc., 40 (1918), No. 12, pp. 1852–1858, figs. 3*).—The author, at the Bureau of Chemistry of the U. S. Department of Agriculture, reports the results of an examination of the crystallographic and optical properties of the aldopentoses, *α-d*-xylose, *α-d*-lyxose, and *β-d*-arabinose. A determinative table is given by means of which it is said to be possible to distinguish the sugars of this group through differences in optical properties.

On constituents of oil of cassia, II, F. D. DODGE (*Jour. Indus. and Engin. Chem., 10 (1918), No. 12, pp. 1005, 1006*).—In addition to the constituents of oil of cassia previously noted (E. S. R., 34, p. 501), the author has isolated from the oil benzaldehyde and methyl salicylaldehyde.

Experiments with an isomer of caffein, W. SALANT and HELENE CONNET (*Proc. Soc. Expt. Biol. and Med., 15 (1917), No. 1, p. 9*).

Simplification of the technique of gasometric determinations, A. RENAUD (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 4, pp. 104–106; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 22, p. 719A*).—For the determination of urea in urine a standard volume of air equal to the volume of nitrogen obtained from a definite weight of urea is kept for comparison with the volume generated from a definite volume of the urine under examination. The use of a similar standard is recommended for the gasometric examination of ammonium salts, carbonates, etc.

An accurate method for measuring the density of gases, O. MAASS and J. RUSSELL (*Jour. Amer. Chem. Soc., 40 (1918), No. 12, pp. 1847–1852, fig. 1*).—The method described is applicable to gases which can be condensed by liquid air or some other freezing agent. A known volume of gas at known pressure and temperature is liquefied in a small bulb attached to the containing vessel, the bulb is sealed off, and the liquefied gas is weighed at room temperature. In this way a large quantity of gas can be weighed on a small sensitive balance and in a vessel whose weight is of the same order as that of the gas itself.

A special stopcock for dropping liquids arranged for equalizing the pressure above and below the outlet in the stopcock, H. L. FISHER (*Jour. Indus. and Engin. Chem., 10 (1918), No. 12, pp. 1014, 1015, fig. 1*).—A stopcock is described and illustrated which was designed in connection with a generator for carbon dioxid to be used alternately with pressures below and above atmospheric.

On the quinone phenolate theory of indicators. A spectrophotometric study of the "end-points" and "fading" of phenolsulfophthalein indicators, C. L. BRIGHTMAN, J. J. HOPFIELD, M. R. MEACHAM, and S. F. ACREE

(*Jour. Amer. Chem. Soc.*, *40* (*1918*), *No. 12*, *pp. 1940–1944*).—This article is one of a series of quantitative studies of the various chemical and physical factors governing the growth of fungi on culture media and trees, made at the New York State College of Forestry at Syracuse University in cooperation with the Bureau of Plant Industry, U. S. Department of Agriculture.

The indicators reported upon in this paper are phenolsulfophthalein and the tetrabromo and tetranitro derivatives. The general plan of study was to find the wave-lengths at which the indicator solutions give a transmission of 20, 40, 60, 80, etc., per cent and to calculate the corresponding absorption indexes. From the results obtained the following conclusions are drawn:

"These sulfophthaleins are twice as deeply colored as phenolphthalein in alkalis and show sharper color changes. The excess of alkali necessary to produce the end-point of the neutralization of the indicator does not cause any appreciable fading in either short- or long-time periods in the case of phenolsulfophthalein and its tetrabromo derivative. The color of phenolsulfophthalein in phosphate buffer solutions does not fade appreciably, even in considerable time periods. Standardized stock solutions of phenolsulfophthalein can be kept in an ice box without appreciable change, or even at ordinary temperatures if care is given to prevent contamination, and will then show the same absorption index when treated with an excess of alkali at different time periods. Different samples of the same lot of solid well-mixed phenolsulfophthalein will give the same absorption index when treated with an excess of alkali. An excess of alkali in solutions of tetranitrophenolsulfophthalein causes a fading of the intense red color to a light yellow, the time of fading depending upon the amount of alkali and other experimental conditions."

A modified method for the preparation of picramic acid, G. EGERER (*Jour. Biol. Chem.*, *35* (*1918*), *No. 3*, *pp. 565, 566*).—A modified method of preparing picramic acid is described which is said to yield 76.5 per cent of the theoretical value. The usual method of neutralizing a cold saturated alcholic solution of picric acid with ammonium hydroxid and then saturating the solution with hydrogen sulphid is modified by using an excess of ammonium hydroxid to prevent the crystallization of unchanged picric acid and by cooling the mixture during saturation with hydrogen sulphid to prevent the formation of the ammonium salt of the diamino acid.

On the extraction of ammonia from soil, T. E. RICHMOND (*Soil Sci.*, *5* (*1918*), *No. 6*, *pp. 481–486*).—This is a report of a study conducted at the Ohio Experiment Station of the relative amounts of ammonia extracted from soils by water and by 5 per cent hydrochloric acid.

The soils used were all surface soils, air dried, and ground sufficiently fine to pass through a 2-mm. sieve. Three types of soil were used—an acid silt loam deficient in bases and organic matter, a basic black clay rich in organic matter, and a very acid peat soil. Portions of the soils were placed in 1-liter bottles, and ammonium sulphate sufficient to supply 0.1484 gm. of nitrogen was added to half the bottles. Water or 5 per cent hydrochloric acid was added at the rate of 500 cc. per 100 gm. of soil and the extraction continued for 30 minutes with constant shaking in a machine. Nitrogen as ammonia was determined by distilling duplicate 200-cc. portions with 0.5 gm. of freshly calcined magnesium oxid, first neutralizing the acid extracts with sodium hydroxid. Further data were obtained by the use of soils treated with casein, sulphur, and calcium carbonate.

The results show that, while in no case did the water extraction give the full amount of ammonia from different soils, in each group a certain ratio appeared to exist between the amounts extracted by the two methods. From this the author concludes that for comparative use the ammonia found in the water extract would be as useful as the somewhat larger amount found by extracting the soil with 5 per cent hydrochloric acid.

The detection and estimation of methyl alcohol, its occurrence in various foodstuffs, and the behavior in the body of foods containing methyl alcohol, T. von Fellenberg (*Biochem. Ztschr., 85 (1918), No. 1–2, pp. 45–117, figs. 6; abs. in Chem. Abs., 12 (1918), No. 20, pp. 2085, 2086*).—This paper discusses the following topics: Detection and estimation of methyl alcohol in alcoholic solutions, a concentration method for determining methyl alcohol when present in small amounts, the origin of methyl alcohol in alcoholic beverages, the determination of methyl alcohol in pectin-containing foodstuffs, the closely-bound methoxyl (lignin and suberin) and its determination, and the behavior of pectin-methyl alcohol in the organism.

The general method used for determining methyl alcohol is a modification of that of Denigès, consisting essentially of the oxidation of the liquid with potassium permanganate and the colorimetric determination of the formaldehyde thus formed by oxidation under standard conditions with fuchsin-sulphurous acid solution. When the alcohol is present in small quantities, the method employed by the author consists in the fractional separation of the mixed alcohols by potassium carbonate, and the fractional distillation of the residue after separation of the portions containing only minute amounts of methyl alcohol. The distillate richest in methyl alcohol is converted into iodids, from which a fraction rich in methyl iodid can be separated. Methyl alcohol in certain beverages is shown to be derived from pectin substances from which it is readily obtained by treatment with dilute sodium hydroxid. The lignins of wood yield methyl alcohol, but not so readily as the pectins. After the removal of pectin alcohols the lignin alcohol is obtained by treatment with sulphuric acid.

An investigation of the effect of ingestion of substances containing pectins showed that a small increase is produced in the amount of methyl alcohol in the urine. This is more marked when ethyl alcohol is ingested at the same time.

A direct and practical method for the determination of starch, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 7, pp. 369–383*).—A gravimetric method for the determination of starch is described which consists essentially of dissolving the starch in hot calcium chlorid solution, precipitating it with iodin, and decomposing the starch iodid compound thus formed with alcohol. Tables are given of the starch content, as determined by this method, of spices and materials used in their adulteration.

An apparatus for the determination of water in food materials, F. Schaffer and E. Gury (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 7, pp. 394–397, fig. 1*).—An apparatus for the determination of water in food materials by distillation with xylol is described, which is considered by the authors to overcome the disadvantages of the apparatus of Gray (E. S. R., 18, p. 710). A diagram is given of the apparatus, and analyses are reported of the water content of various food materials as determined gravimetrically and by the use of the apparatus.

Calculation of the alkalinity of the ash of food materials, T. von Fellenberg (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 3, pp. 81–116, pl. 1, fig. 1*).—The investigations reported include a study of the sources of error in ashing food samples, a discussion of the chemical changes involved in determining the alkalinity of the ash with the use of various indicators, a complete description of the methods employed by the author, and tables of results obtained in determining the alkalinity of the ash of spices, materials used for adulteration of spices, and a few food materials.

The author considers that errors due to contamination of the ash with sulphur from the gas and to loss on ignition may be overcome by the use of a perforated asbestos plate sealed with sand and heated over a mushroom burner. Loss of acid in samples in which there is an excess of acids over bases and the formation of metaphosphates and pyrophosphates may be avoided by the addition of known amounts of sodium hydroxid.

The method described for determining the alkalinity of the ash consists of three titrations of the ash with hydrochloric acid, first against methyl orange, then against phenolphthalein, and finally against phenolphthalein after the addition of calcium chlorid or disodium phosphate. From these figures calculations can be made for carbonate plus oxygen, phosphoric acid, and calcium.

Determination of purin bases in food materials, T. von Fellenberg (*Biochem. Ztschr.*, *88* (*1918*), *No. 5–6*, *pp. 323–336*).—This is a report of the analyses of various food materials for their content of purin bases. The results calculated on the fresh and dried substance are reported in tabular form.

Among animal products the internal organs were found to be richest in purins. Blood contains very little purin. Tendons, bones, marrow, fat, milk, and eggs are almost purin-free. Vegetable products show a wide range of purin content, the largest amount being in the alkaloid-containing substances. Lettuce, spinach, and cabbage are rich in purins, also certain tubers such as radishes and kohl-rabi. Potatoes are poor in purins, as are also the legumes and to a still greater extent the cereals. The smallest purin content is found in oil seeds and spices, and in fruits and beverages obtained from them. Alcoholic and acetic fermentation do not increase the purin content.

The determination of the hexabromid and iodin numbers of salmon oil as a means of identifying the species of canned salmon, H. S. Bailey and J. M. Johnson (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 12*, *pp. 999–1001*).—The authors, at the Bureau of Chemistry, of the U. S. Department of Agriculture, have developed a modified method for the determination of the so-called hexabromid value of fish oils, in which an acetic acid solution of bromin is used as the precipitant. This value and the iodin number have been determined for the oil obtained from canned salmon of five different species.

It was found that oils expressed from canned salmon and dried with anhydrous sodium sulphate, after the mechanical removal of the greater part of the water, have practically the same iodin and hexabromid value as the oils extracted with ether, provided proper precautions are taken to prevent oxidation during the extraction. The results reported indicate that it may be possible to distinguish the variety of canned salmon by a determination of the hexabromid and iodin values of the oil.

The detection of eggs in pastes, F. Schaffer and E. Gury (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt.*, *7* (*1916*), *No. 5*, *pp. 217–222*; *abs. in Chem. Abs.*, *11* (*1917*), *No. 11*, *pp. 1693*, *1694*).—The method described depends upon the reduction of an alkaline copper solution by the action of egg albumin. The technique is as follows:

To 50 cc. of water at room temperature, add 5 gm. of the finely ground paste and shake at intervals for 2 hours. Filter, and to 10 cc. of the filtrate add 1 cc. of N sodium hydroxid and 2 cc. of a 1 per cent copper sulphate solution. Warm on a water bath at 50° C., and note the length of time before the blue color disappears. If this is from 21 to 23 minutes, the paste contains no egg. With paste containing 1 egg per kilogram, the color was found to persist from 32 to 34 minutes, 2 eggs from 39 to 43, 3 eggs from 49 to 54, and 3 egg yolks from 31 to 36 minutes. The age of the paste did not seem to affect the determination.

The determination of fat in cocoa, KREIS (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt.*, *7 (1916), No. 6, pp. 315–319*).—The method proposed is as follows:

A mixture of 1 gm. of cocoa with 20 cc. of a 1.5 per cent solution of hydrochloric acid is boiled gently for 15 minutes over a free flame. After cooling to about 30° C., it is shaken with ether for 5 minutes and centrifuged for 15 minutes. After reading the volume of ether-fat solution, 25 cc. of it is pipetted into a nickel dish, the ether evaporated, and the residue dried for 10 minutes in a Soxhlet drying oven.

Methods of determining the true sucrose content of molasses, T. VAN DER LINDEN (*Meded. Proefstat. Java-Suikerindus., Chem. Ser., No. 6 (1917), pp. 1249–1272; Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 30, pp. 1249–1272*).—The newer acid, neutral, and special methods of determining the sucrose content of molasses are outlined, and experimental data are reported of a comparative study of several of these methods.

A new method for the determination of crude fiber in meal, W. HUGGENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 6, pp. 297–302*).—The following method is proposed as a substitute for the König method, previously noted (E. S. R., 10, p. 411), to obviate the necessity of using glycerin:

To 2.5 gm. of the substance is added from 10 to 15 cc. of 8 per cent alcoholic potassium hydroxid, the mixture is heated for about five minutes on a water bath at from 45 to 50° C., 20 cc. of concentrated hydrochloric acid (sp. gr. 1.19) is then added, and the heating continued with frequent shaking for half an hour. The contents of the flask are filtered on an asbestos filter and washed with from 20 to 25 cc. of 25 per cent hydrochloric acid (2:1) until the filtrate is colorless. The residue is then washed with 200 cc. of hot water, with hot 8 per cent sodium hydroxid until the filtrate is colorless, again with hot water, with from 20 to 25 cc. of hot 96 per cent alcohol, and finally with from 10 to 15 cc. of alcohol-ether mixture. The residue is transferred to a platinum crucible, dried to constant weight, incinerated, and weighed, the loss in weight on ignition being taken as ash-free crude fiber.

Determination of urinary carbon, L. BAUZIL (*Jour. Pharm. et Chim., 7. ser., 17 (1918), No. 10. pp. 317–319*).—The method described consists essentially of the destruction of organic matter and liberation of carbon dioxid by chromic and sulphuric acids, the transformation of carbon dioxid into barium carbonate by barium hydroxid, and the alkalimetric determination of the barium carbonate.

Determination of total carbon in various biological products, A. RENAUD (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 4, pp. 106–108*).—The method, which is similar to that of Bauzil (noted above) for the determination of carbon in urine, consists essentially in treating the substance to be analyzed with a sulphochromic acid oxidizing agent and absorbing the carbon dioxid and chlorin set free by means of an ammoniacal solution of calcium chlorid. The carbon dioxid is precipitated as calcium carbonate and determined volumetrically after washing.

The substitution of calcium chlorid by barium chlorid is considered to offer certain advantages in that the precipitation of barium carbonate is rapid and complete. On treating the precipitate thus obtained with an excess of sulphuric acid, barium sulphate is precipitated which is washed, dried, and weighed.

A simple method of determining uric acid and tyrosin in the same sample, E. HERZFELD and R. KLINGER (*Biochem. Ztschr., 88 (1918), No. 4, pp. 283–285*).—The method described makes use of the phenol reagent of Folin and Denis (E. S. R., 28, p. 805), a saturated solution of sodium carbonate, and a standard solution of either uric acid or tyrosin prepared as follows: One-tenth gm. of the substance (tyrosin or uric acid) and 0.1 gm. of lithium carbonate are dissolved in 100 cc. of water at room temperature. One cc. of this solution is shaken with 10 cc. of the phenol reagent for about five minutes, 30 cc. of the saturated solution of sodium carbonate is added, and the whole made up with water to 100 cc. The blue color which develops within 24 hours remains unchanged for a longer time and is deeper in the case of tyrosin than of uric acid. The tyrosin standard can be used in the determination of uric acid by multiplying the figure obtained by the factor 0.68 and the uric acid standard for tyrosin determination by the use of the factor 1.45. The technique of the method is as follows:

If the solution to be tested contains protein and sugar, these must be removed, the former by heat coagulation and the latter by fermentation with yeast. One cc. of the protein sugar-free solution is then mixed with 10 cc. of the phenol reagent, shaken for about five minutes, and treated with sodium carbonate solution exactly as the standards. After standing overnight, the color matched against the tyrosin standard indicates the amount of uric acid and tyrosin. One cc. of a fresh sample of the solution is then heated for a few minutes with 0.5 cc. of 33 per cent sodium hydroxid solution and 3 drops of a 3 per cent hydrogen peroxid solution to destroy the uric acid. After cooling and adding 1 cc. of glacial acetic acid, the determination is repeated and the solution matched against the tyrosin standard. The difference between the figures obtained in the first and second determinations, calculated by means of factors noted above, gives the amount of uric acid.

The construction and use of a simple apparatus for the determination of urea in blood, C. N. PELTRISOT (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 3, pp. 73–80*).—The apparatus consists of a small bottle in which is tightly fitted a glass tube 9 cm. by 8 mm., the latter graduated to tenths of a cubic centimeter. Into the apparatus are successively introduced by means of pipettes 5 cc. of sodium hypobromite solution, 5 cc. of a 33 per cent sodium hydroxid solution, 12 to 15 cc. of water, and finally 10 cc. of defecated serum prepared by mixing equal volumes of serum and 20 per cent trichloracetic acid, shaking and filtering. The meniscus in the tube is read, after which the apparatus is inverted with the opening closed by the finger. After the contents are thoroughly mixed, the inverted apparatus is immersed in water in a vessel about 20 cm. deep, the orifice is opened, and the inner and outer surfaces of the liquids are adjusted to the same level. After closing the orifice again, the apparatus is removed and inverted and the position of the meniscus again read. The difference indicates the volume of nitrogen produced.

A method for the determination of fat in dried feces and its distribution as soap, free fatty acids, and neutral fat, L. E. HOLT, ANGELIA M. COURTNEY, and HELEN L. FALES (*Amer. Jour. Diseases Children, 17 (1919), No. 1, pp. 38–42, fig. 1*).—The method described is an application to feces of the Röse-Gottlieb method for determining fat in dried and condensed milk. The use of ammonia to facilitate the separation of the fat from the protein is omitted on account of the presence of the free fatty acids which would be saponified by the ammonia.

The method is considered to be superior to the Soxhlet extraction method in that the technique is more simple, the amount of ether required for each determination is not large, the results can be obtained in from 18 to 24 hours from the weighing of the sample, and the distribution of the fat is given as soap fat, free fatty acids, and neutral fat.

A volumenometer, J. S. Rogers and R. W. Frey (*Jour. Indus. and Engin. Chem., 10 (1918), No. 7, pp. 554, 555, figs. 2*).—An apparatus is described which is said to be satisfactory for measuring the volume of comparatively large pieces of leather. The principle involved is the measurement of the overflow of mercury caused by the immersion in it of the sample of leather.

Note on the analysis of soda-sulphur dips, B. J. Hill (*So. African Jour. Sci., 14 (1918), No. 11, pp. 474–476*).—The author points out that in the analysis of soda-sulphur dips the direct iodin titration method used for lime-sulphur dips is not applicable. The older method of determining monosulphid equivalent by titration with ammoniacal zinc and subsequent determination of thiosulphate in the filtrate by iodin titration is considered to give more reliable results. The amount of carbonate should be roughly determined by an ordinary acid titration to methyl orange. A higher acid than zinc titration usually indicates carbonate and a lower acid than zinc, hydrosulphid. If the two titrations are the same it indicates that all the titrable base is in combination with sulphur or that carbonate is in equilibrium with hydrosulphid.

Four sample analyses are given to illustrate the interpretation of results on the basis of the efficacy of the soda-sulphur concentrate in relation to the eradication of scab.

The refining of raw sugars, C. G. Leonis (*Sugar [New York], 20 (1918), Nos. 10, pp. 394–397; 11, pp. 440, 441*).—This is a report of investigations and tests of the various steps in the refining of raw sugars. A number of tables are given, including one on the composition of raw cane sugar of different qualities from various countries.

The seeding method of graining sugar, H. E. Zitkowski (*Jour. Indus. Engin. Chem., 10 (1918), No. 12, pp. 992–994*).—Some of the problems in connection with producing granulated crystals of sugar are pointed out, and a brief discussion is given of a large-scale practical application of the seeding method of inducing crystallization. The method is as follows:

The sugar-bearing sirup, properly prepared, is introduced into the vacuum pans and under the usual conditions of vacuum and temperature is concentrated until slightly supersaturated. At this point a quantity of sugar dust or powdered sugar, varying from 0.5 to 2 qts. for each 1,000 cu. ft. of vacuum pan capacity, is introduced by aspiration beneath the surface of the boiling mass. Evaporation is continued until about that density is reached which is usually obtained by the older methods of graining, and the customary procedure is then followed.

The results obtained, especially on the lower products, are considered uniformly superior to those obtained by the older method.

The improvement of the indigenous methods of gur and sugar making in the United Provinces, W. Hulme and R. P. Sanghi (*Agr. Research Inst. Pusa Bul. 82 (1918), pp. 22, pls. 7, fig. 1*).—A brief description is given of the indigenous methods of gur and sugar making in the United Provinces, together with a description of a new experimental factory at Bareilly. Tables are given showing the average analyses of products obtained in the years 1915–16 and 1916–17.

The "springing" of tins of preserved fruit, W. W. L'Estrange and R. Greig-Smith (*Proc. Linn. Soc. N. S. Wales, 43 (1918), pt. 2, pp. 409–414*).—An examination is reported on the cause of the springing of tins containing preserved fruit.

Observations showed that the trouble evidently lay with the closing of the containers. The margin of the lids in the process under examination is painted with a mixture containing flour or starch which fills up the spaces between the interlocked edges when the cans are closed. A greater leakage in the cans containing pears and plums than in those containing peaches and apricots is considered by the authors to be due to the greater solvent action upon the starch jelly of the juice of pears and to a less degree of plums, and that consequently a different sealing mixture should be employed. An alternative plan is suggested of allowing the tins to cool after processing, in a current of filtered, sterile air and, when cold, painting the joints with a lacquer varnish.

METEOROLOGY.

Frost and the growing season, W. G. Reed (*U. S. Dept. Agr., Atlas Amer. Agr., pt. 2, Sect. 1, 1918, pp. 12, figs. 33*).—This atlas contains maps, charts, diagrams, and descriptive notes dealing with dates, distribution, and conditions favoring killing frosts in the United States, variations in the length of the growing season, and suitable planting and harvesting dates.

Discussing the season available for plant growth, it is stated that "in general the length of period in which the chance of killing frost is small enough to permit profitable agriculture is, depending on the locality, between 15 and 50 days less than the average number of days without killing frost."

A selected list of references to literature on frost is given

The measurement of atmospheric pollution, J. S. Owens (*Quart. Jour. Roy. Met. Soc. [London], 44 (1918), No. 187, pp. 149–170, figs. 4*).—This article discusses the investigations undertaken by the British Advisory Committee on Atmospheric Pollution, describes the methods used, summarizes the results obtained, and calls attention to some of the unsolved problems.

It is stated that the results of three years' observations, 1914 to 1916, have been compiled and that a fourth year's results are about ready for publication. During the earlier years, observations were made largely in cities, only one station being in the open country. In the more recent observations, another country station has been added. The author is of the opinion that the value of the investigations would be increased if there were more country stations, properly distributed so as to give comparative figures for country air and the air of cities.

In general, the results show that the air deposits are greater in winter than in summer, although the proportion of dust as compared with products of combustion are greater in summer than in winter. The amounts of sulphate and chlorin were also highest in winter, but the amount of ammonia appeared to bear no relation to the season. The effect of the wind was apparently obscured by other influences. Among the unsolved problems referred to are the relation of atmospheric pollution to disease and bacterial content of the air, the vertical distribution of impurities, and various factors governing the deposit of floating matter in the air.

[Observations on aerology] (*U. S. Mo. Weather Rev. Sup. 13 (1918), pp. 81, pl. 1*).—This supplement contains the following articles: Free-air Data at Drexel, Nebr., and Ellendale, N. Dak., Aerological Stations, April to June, 1918, Inclusive, by W. R. Gregg; and Notes on Kite Flying, by V. E. Jakl.

Daily river stages at river gauge stations on the principal rivers of the United States, 1917, A. J. Henry (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 15 (1917), pp. 286*).—This is the fifteenth part of the series of river gauge readings maintained by the Weather Bureau.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and H. Berman (*Massachusetts Sta. Met. Buls. 359–360 (1918), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1918, are presented. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.70, February 21, December 19; minimum, 28.84, January 15; mean, 30.023. *Air temperature*, in ground shelter (degrees F.).—Maximum, 100, August 7; minimum, —22.5, February 2. *Humidity*.—Mean dewpoint, 37.8; mean relative humidity, 76.4. *Precipitation*.—Total rainfall or melted snow, 37.47 in.; number of days on which 0.01 in. or more rain or melted snow fell, 123; total snowfall, 50.75 in. *Weather*.—Total cloudiness recorded by sun thermometer, 1,920 hours, or 43 per cent; number of clear days, 106. *Bright sunshine*.—Number of hours recorded, 2,532, or 57 per cent. *Wind*.—Prevailing direction, west; total movement, 50,435 miles; maximum daily movement, 606 miles, March 3; minimum daily movement, 4 miles, December 20; maximum pressure per square foot, 20 lbs., February 26, west-northwest. *Dates of frost*.—Last, April 26; first, September 11. *Dates of snow*.—Last, April 13; first, November 4.

Some common fallacies about Kansas weather, S. D. Flora (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 55–60*).—Reviewing the available data on the subject the author concludes that the climate of Kansas "has not changed any since the Pilgrims landed at Plymouth Rock and will probably not change for centuries to come; also that the golden harvests of the last twenty years have been the result of increased skill and industry in making the earth productive, and have been independent of any change in climate."

Report on the phenological observations in the British Islands, from December, 1916, to November, 1917, J. E. Clark and H. B. Adames (*Quart. Jour. Roy. Met. Soc. [London], 44 (1918), No. 187, pp. 191–214, pls. 2*).—Observations from 114 stations in different parts of the British Isles are reported and briefly discussed.

"The official returns show that in spite of the bad harvest weather, the yield per acre in England of wheat in 1917 rather exceeded 1916, though barley and oats were a little below. All were below the 10 years' mean, wheat about 5 per cent, barley 6 per cent, and oats 4 per cent. Owing to increased acreage the total yield of all was greater, and so also of peas, but beans, with only some 17 bu. against 30, on a smaller acreage, gave under half the crop. Hay of both kinds was short. Potatoes gave a record yield, over 6½ tons per acre (Wisley grew up to 40 tons in trials), or ⅞ ton above the mean. Mangolds gave 2½ tons per acre over the mean of 19.26, but turnips, at 12½ tons, were ⅞ ton below.

"Irish and Scottish returns per acre were in all the above crops well over the average. The three countries yielded 8,600,000 tons of potatoes off 1,364,000 acres, compared with 5,468,000 tons off 1,134,400 acres in 1916. Tree fruit crops also gave excellent returns, the heavy gales in August leaving a marked effect only upon apples. Pears and plums proved excellent crops. . . .

"The year, which opened in an apparently disastrous fashion, thus resulted well on the whole. The effect of the prolonged winter was not only less prejudicial than expected, but was more than compensated by the propitious weather of late spring and early summer. Again the heavy rains and gales of late July and August, laying great stretches of grain and decimating the orchards, were compensated by September conditions, November in the same way making amends for October in securing the root, and, above all, potato crops. Shortage of man-power alone prevented this being realized to the full, so that the severe December frosts in some parts did damage in unharvested fields."

The weather of the past agricultural year, F. J. Brodie (*Jour. Roy. Agr. Soc. England, 78 (1917), pp. 127–138*).—The usual meteorological data from stations in different parts of England and Wales for 1917 are summarized and discussed. Attention is called especially to the "extraordinarily long, cold, and dreary winter" of 1916–17 and the unusually late spring of 1917.

SOILS—FERTILIZERS.

Interpretation of field observations on the moistness of the subsoil, F. J. Alway, G. R. McDole, and R. S. Trumbull (*Jour. Amer. Soc. Agron., 10 (1918), No. 7–8, pp. 265–278*).—In connection with work done at the Nebraska Experiment Station during 1907–1913, a definite correlation was found to exist between notations made in the field on the apparent moistures of soil samples at the time of sampling for moisture determinations in semiarid southwestern Nebraska and in the humid eastern portion of the State and the data later obtained in the laboratory. A numerical interpretation has been placed on the field observations and expressed as the ratio of the moisture content to the hygroscopic coefficient. Later studies were also made in Minnesota but are deemed to be of limited value.

When the soil was too dry to be removed from the boring by the ordinary open auger the condition was designated as "powder," and the ratio was found to be 1.3 or lower, whereas with soil sufficiently moist to adhere well to the auger a ratio of 1.5 or above, was obtained. In the semiarid soils examined having hygroscopic coefficients ranging from 2 to 14 and representing the common tillable types, the powdered state was found to be very common and a mere field examination gave a quite satisfactory estimate of moisture conditions. Data secured on very fine textured soils and on coarse sands are said to be too few to warrant similar interpretations. With humid soils this dry condition was comparatively rare, being limited chiefly to well-established alfalfa fields. Ordinary mineral subsoils rarely showed a ratio above 2.5. Roots appeared to be unable to penetrate a soil stratum having a ratio below 1.5, and the lower limit to which the plant roots could reduce the subsoil moisture is said to be approximately 1 or 1.1.

This method of interpretation is thought to give promise of usefulness in dry-land regions, both as a field aid for soil investigators and agronomists and as a practical method for county agricultural agents and the more intelligent farmers.

The influence of the height of the water table in swampy meadows, E. Nyström and H. Osvald (*Svenska Mosskulturför. Tidskr., 32 (1918), No. 1, pp. 42–114, figs. 16*).—This article is divided into a report by E. Nyström on the plans and methods followed and the yields obtained in the study presented, and a description by H. Osvald of investigations on the development of the root systems of the plants under the conditions of the experiment.

A special installation was provided in which the height of the water table in two duplicate series of plats was maintained at 20, 40, 60, 80, and 100 cm. below the surface of the soil. One of the series was devoted to studies with a bog soil and the other to experiments with a sphagnous moss soil. A mixture of clover and grass seed was sown and the behavior of the different species is briefly noted. The work was in progress from 1912 to 1916.

The two types of soils gave quite different results. In the bog soil the height of the water table had but little effect on yield, as the roots of the meadow plants went deeper as the water table was lowered. It is pointed out that the plants were thus enabled to obtain the necessary moisture supply even in time of drought. On the moss soil the plants developed a shallow root system regardless of the water table, which placed them at a disadvantage during dry periods. The clovers were not successful on the bog soil, and hence the use of grasses on this soil type is recommended. The results indicated that the best growth of grass on the bog soil may be expected with the water table about 60 cm. (2 ft.) below the soil surface. On the moss soil the grasses as compared with the clovers made the poorer growth, and it is stated that on this soil type, as shown by the experiment, the water table should not be deeper than 40 cm. under the surface of the soil.

Of the grasses, orchard grass (*Dactylis glomerata*) on the bog soil was the only species thriving best when the water table was lowest. Meadow foxtail (*Alopecurus pratensis*) and meadow fescue (*Festuca pratensis*) gave the best yields when the water table stood about 60 cm. below the surface of the soil. Timothy (*Phleum pratense*) and canary grass (*Phalaris arundinacea*) proved more indifferent in this regard. Orchard grass even on the moss soil made the best growth with the water table at the greater depth, but all other grasses gave the best returns with the water table standing nearest the surface of this soil type. On both kinds of soil the clovers grew best when the water table stood high. Among the grasses, meadow foxtail and orchard grass were most successful on the moss soil, while on the bog soil all grasses developed equally well when the soil moisture conditions were favorable. Timothy, orchard grass, and meadow fescue reached their highest yields the first or second year. While meadow fescue and timothy lost in productive power from year to year the reduction in yield of orchard grass was unimportant. Meadow foxtail and canary grass contributed little to the yield during the first years but continued each year to increase in importance, and were as a rule the dominating species toward the last.

H. Osvald, in addition to describing his own experiments on the development of root systems and reporting his results, briefly reviews the methods employed and the results obtained in earlier work of this nature by other investigators. A list of 52 references on the subject is given.

The results indicated that the nature of the soil is of decided importance in relation to soil moisture and root development in different soil strata. This importance, it is pointed out, depends upon the degree of capillarity which determines the upward movement of soil moisture and the retention of precipitation. The moss soils are considered equally efficient with the bog soils in retaining the moisture derived from snow or rain, but as standing far behind this type of soils in capillary power. It is believed that, as the roots are not likely to reach the ground water when this stands low, draining moss soils to too great a depth exposes them to drought injury, especially in view of the fact that these soils in comparison with bog soils must hold relatively more moisture to supply the growing plants.

The relationship between absorption and coagulation with respect to the mineral colloids of the soil, A. de Dominicis (*Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 9, pp. 1036, 1037*).—This article reports the results of a continuation of investigations previously noted (E. S. R., 35, p. 813), the general plan of the previous work being "to determine the relationship between that which is absorbed and that which is coagulated, considering that each time a saline solution acts on a colloidal solution the resulting coagulation always determines a lowering of the concentration of one of the electrolytic constituents of the dissolved salt."

The conclusions reached are that " (1) there is a real and constant relation between absorption and coagulation. (2) The action of the electrolytes determines a single process in the unstable hydrosols consisting of coagulation by absorption. When atoms and ions of opposite sign come into contact they attract each other reciprocally, causing the neutralization of their respective charges and the formation of insoluble absorption combinations. This causes a lowering of the concentration either in the colloidal solution or in the electrolyte solution. (3) Considered separately, the two processes proceed in parallel, as the function of identical factors and in function one of the other; that is, they advance as the opposed signs of charge between the atoms and ions drop, and are seen to be connected by the relation of cause and effect. (4) The existence of this relation is of great importance as regards the physical-chemical properties of the soil, which are always influenced by it in a manner advantageous to fertility."

Soil acidity methods, R. E. Stephenson (*Soil Sci., 6 (1918), No. 1, pp. 33–52*).—In this paper, a contribution from the Iowa College, the author reviews preliminary tests of various methods for determining soil acidity, including those proposed by Tacke (E. S. R., 9, p. 32), Veitch (E. S. R., 14, p. 418), Hopkins (E. S. R., 24, p. 397), Jones (E. S. R., 32, p. 610), Truog (E. S. R., 35, p. 503), and MacIntire (E. S. R., 35, p. 715). He concludes that a modification of the Tacke procedure is alone reliable for research work. It is stated that methods depending upon the liberation of an acid from its salt do not give total acidity and indicate a lime requirement depending both upon the soil and the salt used. Methods employing heat or a strong base are likewise deemed unreliable, since their indications are thought to be both excessive and inconsistent. The nature of the soil acids is also regarded as a very important factor to be considered in studies of lime requirement.

Experiments testing various modifications of the method proposed by Tacke are described and the following conclusions reached: Pure water was a reliable medium for bringing about the reaction between the acid soil and the carbonate. The use of dilute solutions of calcium or sodium chlorid hastened the reaction to only a limited extent, while a concentrated solution of these salts may have prevented fermentative reactions, altthough such a provision proved unnecessary. The rate of reaction was somewhat depressed by concentrated chlorids. Toluene proved to be of no value to the method, an antiseptic evidently being unnecessary. The use of normal sodium nitrate hastened the reaction, but its value has not yet been established. The length of time of running, the rate of aeration, and the vigor of shaking are said to be the most important factors in the Tacke method. The rate of aeration should be maintained at a maximum. The effects of temperature and the partial pressure of carbon dioxid can not be determined. A run of from 5 to 10 hours added to the reliability of the method, tending to overcome many momentary influences. The activity of soil acids varied greatly as measured by the rate of evolution of carbon dioxid. The more reactive acids reacted at once, the less reactive only after long contact and thorough mixing of soil and carbonate and after more complete removal of the dioxid liberated. The method is believed to be not only consistent in indicating total acidity but also in a limited way is thought to measure the toxicity of the soil acids.

The decomposition of organic matter in soils, F. G. Merkle (*Jour. Amer. Soc. Agron., 10 (1918), No. 7–8, pp. 281–302, figs. 6*).—This paper, a contribution from the Massachusetts College, describes experimental work in which observations were made upon the relative rate of decomposition of different oven-dried materials in a fine sandy loam soil as measured by the amount of carbon dioxid produced each week over a period of several weeks. The materials employed included soy beans, alfalfa, red clover, sugar-beet and rutabaga roots, rape tops, pine needles, oak and maple leaves, white-pine shavings, barley, oats, and buckwheat. The effect of sulphate of ammonia, nitrate of soda, ammonium phosphate, calcium cyanamid, and acid phosphate upon the decomposition of soy-bean fodder was also studied. The residues from the oxidation experiments were dried and the humus content of each determined. The data are presented in tabular form and illustrated graphically. The conclusions reached may be summarized as follows:

Legumes high in nitrogen showed a more rapid rate of decay than straws and litters which were low in nitrogen, nitrogen appearing to influence decomposition. These results are held to indicate that on farms where animal manures are not available the choice of cover crops and green manures is important. Cyanamid appeared to be toxic to soil bacteria, or at least to arrest the decay of organic matter for two weeks after application. Although commercial fertilizers seem to act upon soil humus, decomposing it quite rapidly, they apparently fail to act upon crude organic matter in the same way.

A list of 44 titles comprising the literature cited is appended.

Protozoa and the phenomena of reduction in soil, C. A. H. von Wolzogen Kühr, jr., (*Arch. Suikerindus. Nederland. Indië, 25 (1917), pp. 1125–1182; Abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 7, pp. 788–790; Chem. Abs., 12 (1918), No. 23, p. 2647*).—The principal biochemical reduction phenomena occurring in the soil and the methods employed for recognizing them are reviewed, namely "(1) the 'reduction index' ('reductiegetal'), expressed in cubic centimeters of a decinormal solution of $KMnO_4$ required to oxidize the quantity of 'ferrous' iron liberated by 100 gm. of soil (dried at 105° C.) in a sulphurous solution, and (2) the 'ferro-index' ('ferro-cyfer'), expressed in cubic centimeters of a decinormal solution of $KMnO_4$ required to oxidize the ferrous iron extracted from 100 gm. of soil (dried at 105°) in an acetic solution."

Recognizing that protozoa form a biological indicator of the reduction phenomena in soils, the author attempted to correlate the number of protozoa, reduction phenomena, and productive power in a large number of soils from sugar-cane plantations in Java. These investigations showed a relation between the water content, reduction index, ferro-index, and the number of protozoa per gram of soil. By this means he was able to divide the soils into three classes, as follows: "(1) Good soils, showing little or no reduction, containing few or no protozoa (from 0 to 50 protozoa per 1 gm. of soil), (2) bad soils, with a high 'reduction index' and many protozoa (50 to 100 or more per gram), and (3) very bad soils, with a very high 'reduction index' and few or no protozoa (0 to 50 per gram)."

The occurrence of Azotobacter in cranberry soils, S. A. Waksman (*Science, n. ser., 48 (1918), No. 1252, pp. 653, 654*).—Azotobacter and Actinomyces were found in a limed sandy bog soil having a hydrogen-ion concentration of pH=6.2 to 6.4. but not in the same soil unlimed and having a hydrogen-ion concentration of pH=5.4 to 5.6.

The occurrence of Bacterium lactis viscosum in soil, C. R. Fellers (*Soil Sci., 5 (1918), No. 6, pp. 487, 488*).—The author briefly describes observations made on organisms isolated from a Sassafras sandy loam and from a Penn shaley loam soil known to have been free from applications of cow manure for several years. These are said to have corresponded to written descriptions and laboratory cultures of *B. lactis viscosum*. It is thought that the soil may be a natural habitat of the organism.

Tests of commercial cultures for legume inoculation, H. A. Noyes and C. O. Cromer (*Soil Sci., 6 (1918), No. 1, pp. 69–79, figs. 2*).—Investigations of legume inoculation made at the Indiana Experiment Station are described. Pot experiments included a comparison of soil obtained from fields growing the respective legumes and four commercial cultures applied to each seed, planted in either its exact proportion of the commercial culture, or its proportion of bacteria in the weight of soil used per acre, together with a study of the inoculating ability of 1 lb. and of 0.5 lb. quantities of soil per acre.

In addition greenhouse plat tests were undertaken to study the effect of fertilization upon the percentage of inoculation obtained with a specific culture. Soy beans, sweet clover, cowpeas, and hairy vetch were employed in the pot experiments, and 3 per cent hydrogen peroxid was used as a sterilizing agent for the seed. Air-dry Wabash sandy loam soil was placed in greenhouse pots 8 in. deep and 8 in. in diameter, and both the soil and pots were sterilized by dry heat. Nine seeds were planted in each pot and the plants thinned to three per pot. Sterile, distilled water was used in watering the pots until the plants were harvested seven weeks later. All treatments were made in triplicate. Inoculated and uninoculated soy bean seeds were seeded in a bank sand and in a brown silty loam soil in greenhouse plats without previous sterilization. The plats had been twice cropped to lettuce and fertilized seven months and again four months previously with various combinations of acid phosphate, sodium nitrate, potassium chlorid, and manure.

Both soil and commercial cultures gave 100 per cent inoculation with sweet clover in the pot experiments, while in the case of the other legumes all treatments failed to give satisfactory inoculation. Since both quantities of soil failed to produce inoculation with three of the legumes the double quantity could not be regarded as superior to the single quantity. A commercial culture applied to soy bean seeds at a double rate produced an average inoculation of 75 per cent, as compared with 20 per cent for plants sown to uninoculated seed. Sodium nitrate tended to reduce the percentage of inoculation secured.

It is concluded that "larger quantities of commercial cultures and soil than those used in these tests would be necessary to furnish satisfactory inoculation over the entire area for which the culture was put up."

Report on the examination of commercial cultures of legume-infecting bacteria, C. R. Fellers (*Soil Sci., 6 (1918), No. 1, pp. 53–67*).—The results of an examination of about 30 official samples and of some 20 unofficial samples of commercial legume cultures made at the New Jersey Experiment Stations are noted. The number of organisms contained in the culture was determined, as well as the purity of the cultures and their efficiency in nodule production.

Only two cultures were classed as "poor," indicating that less than one nodule per plant was produced, and four as "partly poor." Two of the latter were classed as "good" in all tests except those with the pea bean. In most cases the purity and general condition of the culture was found to be very good. Soy beans appeared to be harder to inoculate than most of the common legumes, many of the cultures failing to give satisfactory results with this plant. The soil-transfer method of inoculation is recommended for soy beans unless the commercial cultures are known to be of good quality.

Soil or muck cultures are said to be excellent carriers of legume bacteria. The plate method of testing pure cultures gave a good indication of the infecting ability of the organisms, although it is thought best to verify this test by growing the plants and examining the roots for nodules. The establishment of a standard for a lower limit of "bacteria per acre-size sample" is not deemed justified at the present time, and possibly not at all because of the variability in the physiological efficiency of the organisms themselves.

Soil survey of Lowndes County, Ala., L. R. SCHOENMANN and R. T. A. BURKE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 68, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama, deals with the soils of an area of 453,120 acres situated in the south-central part of the State and lying within the high part of the Coastal Plain province. The topography of the county varies from level to hilly and broken, with elevations ranging from 100 to 600 ft. above sea level. Natural drainage is obtained chiefly through the drainage basin of the Alabama River and is generally well established.

The upland soils of the county are derived from marine or lacustrine deposits, the oldest of these formations influencing the soils of the region being a pale-bluish, soft, argillaceous limestone known as the Selma chalk. The other soils are of sedimentary origin and include unconsolidatel sands, sandy clays, and heavy clays. In addition to rough stony land, 27 soil types of 18 series are mapped. Oktibbeha clay, Sumter clay, and Catalpa clay, occupying 25.9, 12.4, and 11.2 per cent of the total area, respectively, are the principal types.

Soil survey of Clay County, Iowa, E. H. SMIES and T. H. BENTON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 45, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 360,320 acres in the northwestern part of the State. In general, the surface is that of a broad, undulating glacial-drift plain, while the eastern fourth of the county is somewhat knolly or ridgy. Natural drainage is rather slow over most of the area.

The soils of the region are described as upland, high terrace, and first-bottom soils and are said to be derived from the bowlder clay of the unmodified glacial drift and to be unrelated to the underlying rocks. Exclusive of muck and peat, 13 soil types of 8 series are mapped. Carrington loam, Webster silty clay loam, Carrington silt loam, and Lamoure silty clay loam predominate, occupying 31.3, 20.2, 15, and 11.9 per cent of the total area, respectively.

Pottawattamie County soils, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 2 (1918), pp. 54, pls. 2, figs. 12*).—This report contains data secured in a survey of the county made in cooperation with the Bureau of Soils of the U. S. Department of Agriculture (E. S. R., 34, p. 616), as well as additional information supplied by the station regarding particularly the composition and fertility of the soils as determined by chemical analyses and pot tests of typical soils in the area.

The analyses show wide variations in the plant food content of the different soil types, not only between the large soil groups, but also between the types within the groups. The soils generally are well supplied with potash. They are not so abundantly supplied with phosphorus and nitrogen, the swamp and bottom-land soils being notably low in nitrogen. The greatest immediate need of the soils is for organic matter. It is stated that the loess soils, which are widely distributed in the area, are not necessarily lower or higher in any one constituent than terrace, swamp, and bottom-land, or other soils. Means of supplying the deficiencies and increasing the productiveness of the soils, as indicated by pot experiments, are suggested.

Muscatine County soils, W. H. STEVENSON, P. E. BROWN, and H. W. JOHNSON (*Iowa Sta. Soil Survey Rpt. 3 (1918), pp. 64, pl. 1, figs. 16*).—This report, like that noted above, is based on data secured in a survey made in cooperation with the Bureau of Soils (E. S. R., 35, p. 117) and additional data regarding composition and fertility supplied by the station.

It was observed that phosphorus is not found in any large amount in the soils of the county and may become a limiting factor. Nitrogen is much more abundant than phosphorus. The need of lime is very pronounced. Manuring, next to liming, is considered the most essential need of the soils. As is the case in practically all Iowa soils, potash is present in such large amounts that applications of potash fertilizers "are quite unnecessary if proper soil conditions are maintained."

Soil survey of Anoka County, Minn., W. G. SMITH, G. H. NESOM, and E. G. ROTH (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 30, fig. 1, map 1*).—This survey, made in cooperation with the Minnesota Experiment Station, deals with the soils of an area of 275,840 acres, situated in the southeastern part of the State a few miles north of Minneapolis. The greater part of the county comprises glacial drift and outwash plains having a rolling to nearly level surface. Numerous level areas of peat occur throughout the region, lying from 2 to 10 ft. or more below the general level of the upland. The upland ranges from 850 to 1,060 ft. above sea level. Natural drainage is well established in all of the county except the peat areas.

The soils of the area are derived from young gray glacial drift, red glacial drift, deep wind-laid sand, and glacial-river terrace material washed from the glacial drift sheets. In addition to peat, 9 soil types of 5 series are mapped. The peaty areas occupy 37.6 per cent of the total area, while the predominating soil types are Merrimac loamy fine sand and Merrimac loamy sand, occupying 32.3 and 15.5 per cent of the area, respectively.

Soil survey of Halifax County, N. C., R. B. HARDISON and L. L. BRINKLEY (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 47, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 455,040 acres situated in the northeastern part of the State, partly in the Piedmont Plateau and partly in the Coastal Plain. The topography of the county varies from flat or undulating to steeply rolling and hilly. Natural drainage is well established.

The soils of the area are of residual, sedimentary, and alluvial origin. The residual soils have been derived from the underlying crystalline rocks and the sedimentary soils from the unconsolidated sands and clays. Twenty-nine soil types representing 19 series are mapped. Norfolk fine sandy loam is the principal type, occupying 23.2 per cent of the total area.

Soil survey of Stanly County, N. C., R. C. JURNEY and S. O. PERKINS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 261,120 acres situated in the south-central part of the State. The topography of the county varies from almost level to gently rolling, rolling, steep, and broken, the greater part of the region being rolling. Natural drainage is complete.

The area lies wholly within the Piedmont Plateau province, and the soils with the exception of a small area of alluvial soil, are residual in origin, being derived from the underlying slate and igneous dike rocks. Exclusive of rough stony land, 13 soil types of 6 series are mapped. Georgeville gravely silt loam and Alamance slate loam, occupying 44.7 and 11.1 per cent of the total area, respectively, predominate.

Soil survey of Marion County, Ohio, T. M. MORRISON, O. GOSSARD, and G. K. SIVASLIAN (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 37, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Experiment Station, deals with the soils of an area of 261,769 acres situated just northwest of the center of the State. Topographically, the county is said to be remarkably uniform, occupying a broad, smooth to rolling plain more or less dissected by drainage ways. Natural drainage is quite inadequate.

The soils of the county are largely of glacial origin and belong chiefly to the Glacial and Loessial and the Glacial Lake and River Terrace provinces. The underlying rock is prevailingly limestone or shale. Excluding muck, 12 soil types of 10 series are mapped. The heavy-textured soils predominate, Miami silty clay loam, Clyde silty clay loam, and Brookston silty clay loam occupying 43.6, 18.5, and 16.6 per cent of the total area, respectively.

Fertilizer trials, Wentzville experiment field, M. F. MILLER and F. L. DULEY (*Missouri Sta. Bul. 157 (1918), pp. 23, figs. 5*).—This reports the results of experiments made during the period of 1913 to 1917 on Putnam silt loam soil to determine the immediate effects of steamed bone meal, acid phosphate, and two grades of mixed fertilizers on corn, oats, wheat, and clover grown in rotation (with cowpeas substituted for clover when the latter failed) and on wheat grown continuously. The crops are considered individually and the net returns computed on the basis of both 1913 and 1918 prices for fertilizers and crops. The following conclusions were reached:

Only the lighter applications of acid phosphate and bone meal paid a net return when applied to corn. This return was small, due in part to two very dry seasons and one exceptionally wet season. Exceptionally dry weather during July and August preceded by wet weather during May and June was deemed unfavorable to the action of the fertilizers. The application of 150 to 200 lbs. per acre of acid phosphate, bone meal, or one of the highly phosphatic mixed fertilizers applied in advance of the corn planter with a fertilizer grain drill is said usually to prove profitable on this soil, as well as a smaller application, 60 to 90 lbs., of the same fertilizers made in the row with a fertilizer attachment on the corn planter.

Based on a three-year average, the use of fertilizer on oats was not accompanied by paying returns, due partly to unfavorable seasons for oats, since very good returns were obtained in the one season when weather conditions were favorable. Clover and grass following oats may show returns as large or larger than the oats crop.

Fertilizing wheat produced excellent net returns in practically all cases where this crop was grown in rotation with others, while wheat grown continuously for five years and fertilized each year gave a much lower yield and average net return. The average yield of wheat grown in rotation was 5 bu. per acre more than where wheat was grown continuously. The returns from all the trials with wheat indicated that there was little choice between acid phosphate, bone meal, and the medium-grade mixed fertilizer, each giving substantial net returns at prewar prices and much better profits at the 1918 prices. It was shown further that the larger applications were not as profitable, on the whole as the smaller ones, the average net returns at prewar prices from all fertilizer treatments on wheat grown in rotation being $4.16 for the smaller applications and $2.17 for the larger ones. At 1918 prices the net returns were $9.46 and $6.45, respectively.

"These wheat experiments seem to warrant the use of from 125 to 200 lbs. per acre of acid phosphate, steamed bone meal, or one of the highly phosphatic mixed fertilizers, limiting the use of potash in the mixed fertilizers during the potash shortage to 2 per cent or less. On lands where the supply of nitrogen and organic matter is kept up, acid phosphate or highly steamed bone meal is doubtless to be preferred."

The influence of ammonium sulphate on the germination and the growth of barley in sand and soil cultures kept at different moisture contents and at various osmotic concentrations of the soil solution, M. I. WOLKOFF (*Soil Sci., 5 (1918), No. 6, pp. 421–479, figs. 6*).—This paper describes investigations conducted at the New Jersey Experiment Stations on the effect of ammonium sulphate used in various combinations with monopotassium phosphate, calcium carbonate, magnesium sulphate, and ferrous sulphate upon the germination and growth of barley grown in pots containing sea sand or Sassafras light sandy loam soil. The sand and soil were maintained at different moisture contents representing 20, 40, 60, and 80 per cent of their water-holding capacity. The effect of different amounts of potassium chlorid, sodium chlorid, sodium nitrate, calcium sulphate, aluminum sulphate, and sodium silicate upon the main fertilizer treatment was also studied. In many cases the osmotic concentration of the nutrient solutions was determined both before and after application to the sand or the soil. Observations were also made on the effect upon the germination of barley of the different moisture contents noted above, and of 10 and 15 per cent of the water-holding capacity for both the sand and soil and in addition for Sassafras medium silty loam, Elkton clay loam, and muck. Considerable data are presented in tabular form and fully discussed. The results are summarized as follows:

The moisture content of the soil has a very marked influence on the growth and development of plants. In the sand cultures the plant yield increased with an increase in moisture content from 20 to 80 per cent of the water-holding capacity of the sand. In the soil the plant yield increased with an increase in moisture content up to 60 per cent, while a further increase in moisture brought a considerable decrease in the yield of dry matter of barley. Plant growth in both the soil and sand maintained at a moisture content equivalent to 20 per cent of saturation was very small, and had no direct relation to the water present, as compared with the series of the higher moisture content.

With a constant moisture content in the sand, the plant yields increased with an increase in the application of ammonium sulphate, calcium carbonate, or monopotassium phosphate, the response to the applications of these salts in the amounts used being in the order named. In the Sassafras light sandy loam a similar response to applications of nitrogen was observed, but not to those of lime and very little to those of phosphorous. Differences in plant growth with various moisture contents were attributed to two factors, the total plant food remaining the same: (1) Differences in concentration of the soil solution and (2) aeration of the soil.

The osmotic concentration of the soil solution increased with a decrease in the moisture content of sand or soil, but the changes were not proportional to one another. The change in the osmotic concentration of the soil solution with the change in water content from one series to another was greater than the change in the osmotic concentration of the soil solution due to the different fertilizer treatments with the water content the same. In cultures with the moisture content corresponding to 80 and 60 per cent of the water-holding capacity, the osmotic concentration of the soil solution varied from 0.7 to 1.5 atmospheres in the sand and from 0.31 to 0.85 atmosphere in the soil. With a moisture content corresponding to 40 per cent of the water-holding capacity the corresponding values for sand were 1.2 and 2.6 atmospheres, and for soil, 1.7 and 2 atmospheres. With 20 per cent of the water-holding capacity the maximum and the minimum values in sand were 3.6 and 6.2 atmospheres, and in soil, 7.5 and 9.4 atmospheres, respectively. The osmotic concentration of the soil solution following the normal application of a fertilizer is not deemed great enough to influence plant growth, providing the moisture content of the soil is at its optimum (about 60 per cent of saturation), becoming an important factor only when this is considerably reduced (40 per cent of the saturation or lower).

On adding the nutrient solution to the soil its osmotic concentration decreased, as measured by the cryoscopic method, if the moisture content of the soil was maintained at 60 or 80 per cent of its water-holding capacity. In the 40 and 20 per cent series, the osmotic concentration of the soil solution after the addition of the nutrient solution was greater than that of the nutrient solution itself. By adding the nutrient solution to the sand at any of these four moisture contents its osmotic concentration increased, this being attributed to the formation of acid or acids with the high moisture content, and to the formation of acid or acids and the adsorption of water with the low moisture content.

The adsorptive and the absorptive capacity of the soil for salts prevented the effect of these two agencies from becoming noticeable in the change of the osmotic concentration of the soil solution in the Sassafras light sandy loam with 60 and 80 per cent of the water-holding capacity. The osmotic concentration of the soil solution at the end of the growing period (30 days) was smaller than that at the beginning of the experiment. The decrease was greater in the sand than in the soil, and also in the lower moisture content than in the higher moisture content of either the sand or the soil.

The nutrient solution consisting of 0.4 gm. ammonium sulphate, 0.8 gm. monopotassium phosphate, 2 gm. calcium carbonate, 0.2 gm. magnesium sulphate, and 0.05 gm. ferrous sulphate per 2 kg. of sea sand cultures with a moisture content equivalent to 60 per cent of the water-holding capacity was benefited by the additional application of magnesium sulphate and ferrous sulphate and also by small applications of potassium chlorid, sodium chlorid, sodium nitrate, calcium sulphate, and sodium silicate. The beneficial effect of these salts on plant growth was attributed to the improvement in the balance of the ions of the component salts in the resultant soil solution. Aluminum sulphate under similar conditions had caused some injury to plants. The rigidity of the straw of plants was modified by different salts added to the nutrient solution. A proper balance in the nutrient solution was found to be essential for the rigidity of the straw. The lodging effect of the large amount of nitrogenous material may be entirely subdued by modifying the proportions between the component salts in the nutritive solution in sand cultures.

When the evaporation of water from the surface of the sand or of the soil was taken together with the transpiration of water by plants, it was found that the water requirement of plants diminished with an increase in plant yield, and vice versa. The use of water by plants in Sassafras light sandy loam was most economical with a moisture content equivalent to 40 per cent of the water-holding capacity, and was followed by that of 60 and 80 per cent in the order named. If plant-food is the limiting factor in either soil or sand, the variations in the moisture content are said not to affect the plant growth.

The germination of seeds of barley was influenced by the same general agencies that affected the growth of the plant, although not to the same extent. Germination in the sand occurred even when the moisture content was reduced to 10 per cent of the water-holding capacity (2.48 per cent based on the dry sand), or when it was raised to 80 per cent of saturation (19.49 per cent water). In the soils the limits in moisture content between which the germination of seeds could normally take place was much narrower. In two soils germination could not occur at 20 per cent of the water-holding capacity, while in no case with the soils studied did it take place below this point. In all of the soils studied germination was retarded at 80 per cent of saturation. In three soils out of four the best germination was observed at 40 per cent, followed by 60 per cent. Treatment of the sand or soil with a nutrient solution at high moisture contents had very little, if any, effect on the germination of barley seeds. With a decrease in moisture content some retardation in seed germination was observed when it was accompanied by the application of nutritive salts.

A bibliography of 270 titles is appended.

The utilization of niter cake in the manufacture of superphosphate, F. T. SHUTT and O. E. WRIGHT (*Agr. Gaz. Canada, 5 (1918), No. 11, pp. 1040–1045; abs. in Canad. Chem. Jour., 2 (1918), No. 8, p. 196; Chem. Abs., 12 (1918), No. 21, p. 2223*).—Experiments are reported in which it was found that, "(1) employing finely ground Florida pebble phosphate (total P_2O_5 32.3 per cent), a dry mix of one part niter cake to one part Florida pebble phosphate yielded a superphosphate 15.77 per cent available phosphoric acid as determined by 1 per cent citric acid method, or 6.81 per cent by the A. O. A. C. methods. The wet mix, 6 parts niter cake, 6 parts Florida pebble phosphate, and 1 part H_2O gave 16.09 and 9.26 per cent available phosphoric acid, respectively, by the two methods of analysis.

"(2) Canadian apatite (total P_2O_5 39.4 per cent) is less readily acted upon by the niter cake than Florida pebble phosphate, the products of the several mixes showing lower percentages of available phosphoric acid than the corresponding mixes with the latter phosphate. The dry mix, one part niter cake to one part Canadian apatite, gave a product containing 8.43 and 4.37 per cent available phosphoric acid, respectively, by the 1 per cent citric acid method and the A. O. A. C. methods. The wet-mix product from 6 parts niter cake, 6 parts Canadian apatite, and 1 part H_2O contained 9.9 and 7.02 per cent available phosphoric acid, respectively, by the two methods of analysis employed. While in the case of the Florida pebble phosphate no very marked increase in the percentage of available phosphoric acid resulted from mixing the materials wet and allowing them to stand, the wet mixes using Canadian apatite were decidedly richer than the corresponding dry mixes in this constituent."

Plants tolerating salt, E. O. FENZI (*Bul. R. Soc. Toscana Ort., 4. ser., 3 (1918), No. 5–6, pp. 37–39; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 9, pp. 1041, 1042*).—From investigations in Italy, North Africa, and elsewhere where alkali soils and brackish water occur, the author classifies various plants, with reference to those which do well in soils free from chlorids even if they are impregnated with water containing more than 1.5 per cent of salt, those capable of growing and doing well in soils containing not more than 5 per cent of chlorids, even if impregnated with water containing not more than 3 per cent of chlorids, and those capable of living and doing well in soil containing up to 5 per cent of chlorids, even if impregnated with water containing the same proportion of chlorids.

Peat in 1917, C. C. OSBON (*U. S. Geol. Survey, Min. Resources U. S., 1917, pt. 2, pp. IV+257–283, pl. 1*).—It is stated that the quantity of peat produced and sold in the United States in 1917 exceeded that marketed in any preceding year, and, with the exception of the manufacture of peat for use as fuel, all branches of the industry shared in the general prosperity.

The most striking development was the greater use made of peat, both as a direct fertilizer and as a culture medium for nitrifying and other bacteria in the manufacture of bacterial fertilizer. The quantity of raw peat marketed was 97, 363 short tons in 1917 as compared with 52,506 tons in 1916. The amount of peat fertilizer and fertilizer filler marketed in 1917 was 92,263 tons, valued at $658,500, as compared with 48,106 tons, valued at $336,004 in 1916. The amount of peat used in 1917 in compounding stock feed by use as an absorbent for the uncrystallized residues of beet and cane sugar refineries was

5,100 tons. The imports of moss litter was 506 tons. No peat fuel was produced on a commercial scale.

The occurrence, properties, and uses of peat are discussed, and attention is called to a process now in commercial use in this country in which "peat is mixed with tricalcium phosphate and used as a culture medium for nitrifying and other bacteria which produce phosphorus compounds and which, when applied to the soil, react upon and free its natural potash content from insoluble chemical combinations." It is stated that "bacterized peat is being used for fertilizer in England with varying degrees of success. In the United States commercial quantities have been manufactured and sold."

Commercial fertilizers, P. L. Hibbard (*California Sta. Bul. 300 (1918), pp. 123–152*).—This bulletin reports the results of fertilizer inspection work in California for the year ended June 30, 1918. A total of 302 samples of fertilizers and fertilizing materials were received during the year.

AGRICULTURAL BOTANY.

Catalase and oxidase content of seeds in relation to their dormancy, age, vitality, and respiration, W. Crocker and G. T. Harrington (*Jour. Agr. Research* [U. S.], *15 (1918), No. 3, pp. 137–174, figs. 3*).—Studies carried on in the seed testing laboratories of the U. S. Department of Agriculture have shown wide variations in the response of certain seeds to alternating temperatures during germination. This has been found particularly true of some rather closely related species, such as Johnson grass (*Holcus halepensis*) and Sudan grass (*H. halepensis sudanensis*), the former germinating best under alternating temperatures and the latter under constant temperatures. The authors have carried on extensive experiments to determine the reasons for the differences in the requirements regarding alternating temperatures for germination, and the present paper gives a report of their study of catalase and oxidase in relation to dormancy, vitality, respiration, etc. In addition to seeds of the grasses mentioned above, seeds of other species of grasses and other families of plants have been included in the investigations.

In the amount of catalase and in the general behavior of their catalases, Johnson grass and Sudan grass seeds are very similar, and observation of these points offers no explanation of their marked differences in dormancy and their requirements for germination. The same was found true of the oxidases of the two seeds, so far as the studies have progressed. The catalase activity of grass seeds was found to rise rapidly as their germination progressed. This parallels the rise in respiratory intensity. There was no rise in oxidase activity with germination. In Johnson grass seeds there seemed to be a close correlation between catalase activity and respiratory intensity, but there was no very close correlation between either of them and the vitality of the seeds or the vigor of the resulting seedings. In amaranthus seeds no evidence was found of a correlation between catalase activity on the one hand and respiratory intensity, vitality, or age on the other.

It is considered, from the great variations in the catalase behavior of the several seeds studied, that general conclusions can not be drawn from the catalase behavior of all seeds but that from the data obtained seeds will fall into several physiological types for which general conclusions can be drawn. Catalase activity of seeds seems to parallel physiological behavior much more generally than does oxidase activity.

A study of some factors influencing the stimulative action of zinc sulphate on the growth of Aspergillus niger.—I, The effect of the presence of zinc in the cultural flasks, R. A. Steinberg (*Mem. Torrey Bot. Club, 17 (1918), pp. 287–*

293).—The author reaches the conclusion that the increased dry weight of *A. niger* occurring in cultures growing in Jena flasks is due to the solution of small amounts of zinc from the material of the flasks.

The nature of the chondriome and its rôle in the cell, P. A. Dangeard (*Compt. Rend. Acad. Sci.* [*Paris*], *166* (*1918*), *No. 11, pp. 439–446, figs. 4*).—The author undertakes to make clear the nature and functions of certain intracellular elements, each alleged to belong to either, but not to both, of two systems which are claimed to be wholly distinct and which are here described and designated by the general names plastidome and chondriome. These two systems are said to be often confused in contributions dealing with the microstructures, microactivities, and microtechnique of cells.

Intramicrosporangial development of the tube in the microspore of Pinus sylvestris, L. H. Harvey (*Ann. Rpt. Mich. Acad. Sci.*, *19* (*1917*), *pp. 333–335, figs. 2*).—Observations of material collected in May, 1910, from an exposed tree 60 or 70 years old are noted. One or two per cent of the microspores examined showed pollen-tube development, two tubes in several cases arising at opposite poles of the microspore. It has been assumed that the tube development here recorded was a chemotropic response to the stimulus arising from a mucilaginous substance secreted by the nucellus (the so-called pollination-drop) or from contact with the nucellus. However, it is here maintained that the chemotropic stimulus of the nucellus is not essential to the development of the pollen tube in *P. sylvestris*.

Further results in desiccation and respiration of Echinocactus, E. R. Long (*Bot. Gaz.*, *65* (*1918*), *No. 4, pp. 354–358, fig. 1*).—Continuing work previously noted from another source (E. S. R., 40, p. 29), an Echinocactus, which had been loaded with carbohydrate by desiccation for eight months in the open, was placed in a ventilated dark chamber where katabolism would go on without extensive repair, and the course of resulting changes occurring during 2½ years are given herein.

The rate of water loss was remarkably uniform, being almost independent of seasonal changes. Several distinct changes in the sugar concentration are noted. Soluble sugars appear to have been largely destroyed, though destruction of stored insoluble polysaccharids seems to have been hardly more than begun. Other changes are noted with discussion. The breaking up of the stored insoluble polysaccharids apparently proceeds very slowly, and this fact, taken in conjunction with that of the resistance of Echinocacti to desiccation, is supposed to explain partly the viability of these plants in spite of prolonged starvation.

Determination of acidity in plant tissues, H. M. Richards (*Mem. Torrey Bot. Club*, *17* (*1918*), *pp. 241–245*).—Discussing the methods of obtaining plant juices for titration and some of the disadvantages of such methods, the author claims to have found that what appears to be a very close approximation of a total acid content may be obtained by repeated pressure.

Dynamic aspects of photosynthesis, W. J. V. Osterhout and A. R. C. Haas (*Proc. Nat. Acad. Sci.*, *4* (*1918*), *No. 4, pp. 85–91*).—The authors, noting means employed to lessen temperature fluctuations in this work, describe in this preliminary communication their studies carried out with *Ulva rigida* and other materials.

It is stated that Ulva, after having been kept in the dark, sets up photosynthesis as soon as exposed to light, the rate steadily increasing until a constant speed is attained. An explanation is offered, and quantitative theories are developed to account for the facts observed.

Effects of rest and no rest periods upon growth of Solanum, W. F. Gericke (*Bot. Gaz.*, *65* (*1918*), *No. 4, pp. 344–353*).—In a study of rest periods carried out in the greenhouse at different seasons of the year with potato varieties under different and comparable conditions of temperature, moisture, and culture, in order to ascertain the effects upon subsequent growth of the plant, it was found that after-ripening occurred either in the ground or in ordinary storage. Potatoes planted immediately after maturation required a much longer time to germinate and appear above ground than did those which had passed through a rest period, and the tubers planted without a rest period produced but one sprout. These plants also had a longer growing period than did those from rested tubers, and in the case of plants from nonrested tubers the seed tubers were usually recovered, having lost but little of their original weight. These tubers when planted the second time germinated and grew sprouts from several buds, the period of growth underground being about equal to that of normal plants and their growing period being nearly equal to that of the first planting.

Regeneration of Bryophyllum calycinum, E. Lucy Braun (*Bot. Gaz., 65 (1918), No. 2, pp. 191–193, figs. 2*).—The author cites observations on pot-grown specimens of *B. calycinum*, the conclusions from which are somewhat at variance with those reached by Loeb (E. S. R., 37, p. 127). From leaves which had received no special treatment shoots grew more abundantly from notches than is usually the case, some leaves producing shoots from all except the basal notches.

Healthy and sick specimens of Bryophyllum calycinum, J. Loeb (*Bot. Gaz., 66 (1918), No. 1, p. 69*).—Referring to the statements noted above, the author states that the plant observed by Miss Braun is abnormal, the bend in the stem acting as a partial block and causing such a stem to behave like an isolated piece of stem whose leaves are destined to give rise to shoots.

Chemical basis of correlation.—I, Production of equal masses of shoots by equal masses of sister leaves in Bryophyllum calycinum, J. Loeb (*Bot. Gaz., 65 (1918), No. 2, pp. 150–174, figs. 18*).—Having shown in a paper previously noted (E. S. R., 37, p. 127) that when in *B. calycinum* one organ inhibits the bud growth of another, the inhibited organ contributes in some cases the material for growth in the inhibiting organ, and having in a preliminary statement (E. S. R., 37, p. 324) shown that the quantity of material available for shoot formation is definite and limited, so that inhibition may result from retention or utilization of a part thereof by the inhibiting organ, the author gives a somewhat detailed account of work bearing more particularly on the latter of these points.

It is stated that in equal time and under like conditions equal masses of sister leaves (those arising at the same point) produce approximately equal masses of shoots, even though the number thereof may vary considerably. The shoots first appearing attract automatically (by a mechanism not yet known) the material available for shoot formation, withholding it from other buds. The inhibiting effect of first-developed buds on other buds is thus explained by the two factors, limitation of available material and automatic attraction of material to the buds first appearing. A liberal amount of water supplied to a given notch would insure priority of shoot formation at that point.

The law controlling the quantity and rate of regeneration, J. Loeb (*Proc. Nat. Acad. Sci., 4 (1918), No. 4, pp. 117–121*).—Having found that if leaves of *Bryophyllum calycinum* are isolated from the stem they regenerate shoots in some or many of the notches, and that if a piece of the stem is cut from the plant it will form shoots from its buds nearest the apex, also that the mass of the shoots is directly proportional in the former case to the mass of the isolated leaf and in the latter to that of the attached leaf, the data supporting this statement having been noted above, the author reviews some of the data formerly obtained, with a discussion, generalizing the facts observed in the form of the law that equal masses of leaves produce equal masses of shoots regardless of the number of the latter.

Experiments testing the validity of this law for the regeneration of shoots on isolated stems showed that the mass of the shoots regenerated on two sets of stems (split longitudinally in halves) was in exact proportion to that of the attached leaves. It is stated that a similar law seems to hold for root formation, and perhaps for other cases of regeneration observed but not discussed in this note.

The generality that the quantity of regeneration in an isolated portion of an organism is, under like conditions and in equal time, proportional to the mass of the growth-producing material circulating in the juices of the piece and required for the synthetical processes giving rise to the regenerated tissues and organs, is seen to be an expression also for rate of regeneration and, in this form, a special case of the law for chemical mass action.

The fact established by recent studies that such mass action, in case of a given bud, is possible only after the portion of the stem supporting it has been isolated is explained on the assumption that the growing apex and leaves of an intact plant furnish some sort of substance which acts as inhibitor to the buds below such apical or foliar portions as regards their utilization of such growth material until isolation therefrom is effected. Thus the two main factors operating in such cases are held to be chemical mass action and elaboration of inhibiting substances by rapidly growing cells.

Statistical studies of flower number per head in Cichorium intybus: Kinds of variability, heredity, and effects of selection, A. B. Stout and Helene M. Boas (*Mem. Torrey Bot. Club, 17 (1918), pp. 334–458, pls. 4, figs. 5*).—Employing largely the same material as in previous reports (E. S. R., 38, p. 226), the author has studied the behavior of *C. intybus*, finding that the number of flowers hereditarily produced per head may range on a given plant from 7 to 31.

Variations within the individual are continuous rather than discontinuous. Position seems to be a factor influencing flower number. The number of flowers per head shows much individual variability. The total number of flower heads and length of blooming period appear to be correlated with vegetative vigor, variations of this sort being noted even in closely inbred and very uniform races. Much more fundamental differences exist between plants of different races or between races as such. The individual variations observed are to be considered as fluctuating and continuous and to indicate that the character of flower number is constantly varying, giving differences upon which selection may operate in the isolation of races.

Methods are indicated of attacking the problem as to the inheritance of variations. The differences between varieties or races of chicory are as a whole quite continuous. The operation of heredity in such a character as flower number is seen in the isolation of races, which may be maintained by such selection as was possible in chicory. Within each race, however, there are further variations, continuous in gradation and of the same nature as those appearing in a more mixed population. These are considered unmistakable evidences of the instability of characters and hereditary units.

Inheritance studies in Pisum.—III, The inheritance of height in peas, O. E. White (*Mem. Torrey Bot. Club, 17 (1918), pp. 316–322, fig. 1*).—In this portion of the present series (E. S. R., 38, pp. 226, 822), the author has given attention to the fact that in certain cases the inheritance of height is more complex than would be supposed from the results obtained by Mendel. Cases of this sort are cited, as are some results of studies by the author continued during several years on height, internode length, and internode number as indicated in over 200 pea varieties. The author admits the validity of the results obtained by Mendel and others and claims that the difference in interpretation results from more detailed studies. The inheritance of height in peas, it is stated, has become complex only because of studies on new or distinctly different material, the characters of which are thought to have arisen by mutation. A large series of crosses involving height is in progress.

Bearing of heterosis upon double fertilization, D. F. Jones (*Bot. Gaz., 65 (1918), No. 4, pp. 324–333, figs. 3*).—Collins and Kempton having shown that in maize the endosperm may be increased in amount as an immediate result of crossing (E. S. R., 29, p. 229), the author has obtained what is regarded as still more conclusive evidence from reciprocal crosses in maize, employing pollen mixtures similar to those used by these contributors. Every one of the 24 ears having both selfed and crossed seeds gave an increase in size of the crossed as compared with the selfed seeds ranging from 5 to 35 per cent. The complete data are to be published elsewhere, as they relate more directly to a different investigation.

An examination of all the data is said to show that there is no significant correlation between the amount of increase and the proportion of the two kinds of seeds (selfed and crossed) that were present in any case. This particular demonstration of heterosis is not known to have been made for any plant other than maize, but since the main facts of xenia and heterosis as determined in maize do not differ appreciably, it is thought from the results obtained that the phenomenon of increased endosperm development by crossing may be producible in many or all angiosperms in which double fertilization occurs.

Abnormalities in Nicotiana, H. A. Allard (*Bot. Gaz., 65 (1918), No. 2, pp. 175–185, figs. 10*).—The abnormalities of *Nicotiana* spp. and hybrids, here reported with discussion, include synanthic blooms, catacorolla resulting from mosaic disease, the development of two growing points, and the production of an abnormal number of corolla lobes.

Sexuality in Rhizina undulata, H. M. Fitzpatrick (*Bot. Gaz., 65 (1918), No. 3, pp. 201–226, pls. 2*).—This is an account of the sexual processes in *R. undulata*, resulting from what is said to be the first study of this kind applied to any member of the Rhizinaceæ.

Polyembryony in Quercus alba, L. H. Harvey (*Ann. Rpt. Mich. Acad. Sci., 19 (1917), pp. 329–331*).—A preliminary account is given of a case of polyembryony noted in 1916 in an acorn which possessed two well-formed and vigorous embryos lying within the same nucellus.

Mistletoe [parasitic on] mistletoe, J. G. Brown (*Bot. Gaz., 65 (1918), No. 2, p. 193, fig. 1*).—This brief statement refers to a specimen obtained near Tucson, Ariz. *Phoradendron flavescens*, which is found on species of Quercus, Fraxinus, and Juglans, was parasitized by *P. californicum*, a common parasite of Parkinsonia, Prosopis, and Acacia.

Ecology of northern Michigan dunes: Crystal Lake Bar region, W. G. Waterman (*Ann. Rpt. Mich. Acad. Sci., 19 (1917), pp. 197–208, pls. 6, figs. 3*).—This contains an account of the Crystal Lake region as regards its geography and geology, the environmental factors, the ecology of the region, and some of the problems suggested by the facts observed.

FIELD CROPS.

Experiments in field technique in plat tests, A. C. Arny and H. K. Hayes (*Jour. Agr. Research [U. S.], 15 (1918), No. 4, pp. 251–262*).—This paper, a contribution from the Minnesota Experiment Station, reports the results of experiments with 5 varieties of wheat, 11 of oats, and 4 of barley, conducted on University Farm during 1917 in an effort to determine the most desirable methods in plat variety testing and cultural trials. Plats 8.5 by 132 feet, comprising 17 6-in. drill rows, were employed with 16-ft. roadways seeded to grass between each two series and 18-in. alleys between each two plats. Each variety was replicated three times. The first and second drill rows were harvested by hand and bound separately, and are referred to as the outside and the inside border rows, respectively. A study was made of the distance within plats at which plants were subject to border effects, the extent of the increase in yield of plats due to alley effects, and the effect of alleys on different varieties.

In summarizing the results obtained it is stated that the outside border rows of oats, wheat, and barley yielded 83.5, 100.4, and 123.3 per cent, respectively, more than the average from the central 13 rows, and the inside border rows 23.23, 49.29, and 50.36 per cent more. The extent of the increase due to the alleys varied with the percentage of total area in at least a 12-in. strip within the margin of the plats, this percentage being greater for small plats as compared with larger ones of approximately the same shape, and for long, narrow plats as compared with those more nearly approaching the form of a square. Plats from 6 to 8 ft. wide and from 64 to 132 ft. or more in length are more readily sown and harvested with ordinary farm machinery than nearly square plats of the same size. The removal of the plants occupying an area at least 12-in. in width in comparatively long, narrow plats apparently obviated the most serious objection to their use in variety testing.

Oats, wheat, and barley grown in plats from which the end borders were cut but with no side borders removed, yielded 9.14, 5.28, and 8.48 bu. more, respectively, than when the two side border rows had been removed. With only one side border row removed from either side of each plat oats yielded 2.2 bu., wheat 1.99 bu., and barley 2.86 bu. more than when two drill rows had been removed. With two border rows removed the rank in yield of different oat varieties was not the same as when no border rows were removed, the performance of one variety proving to be quite satisfactory by the former method and indifferent by the latter. Barley varieties did not appear to be equally efficient in utilizing the additional adjacent space, while the removal of one or two side border rows did not produce any significant change in the rank of the wheat varieties.

It is concluded that "in plats surrounded by alleys plants occupying an area at least 1 ft. within the margins are affected by the additional adjacent space. The indications are that, unless there is a considerable fluctuation in the response of varieties to border effect, when grown in plats surrounded by alleys, superior types may not be given their true rank in tests made in plats from which borders are not removed before harvest. These results have led to the adoption of the plan of removing the plants from an area at least 1 ft. wide within the margins of variety test plats at the central and substations in Minnesota. These borders are to be removed from the plats between the time of fully heading and harvest."

Factors affecting the depth of sowing various crops, F. S. Harris and H. J. Maughan (*Utah Sta. Bul. 164* (*1918*), *pp. 3–18, figs. 12*).—Pot experiments are described in which wheat, oats, flint corn, barley, alfalfa, field peas, white wax beans, sugar beets, and sorghum were planted at different depths in soil maintained at varying moisture contents designated as low, medium, and high. Ten seeds were sown at each of the first 8 in., and the number of seeds germinating in the soil, the length of the roots, the length of the tops, and the height of the plants above ground were determined at 5, 10, 15, and 20 day periods from the time of planting. The results obtained are illustrated graphically for each crop and fully discussed.

A brief review of the literature dealing with the subject is said to indicate that the largest number of plants to emerge and the largest yields obtained usually followed seedings made from 1 to 2 in. deep. As a result of the present experiments, it was found that seedings made from 1 to 8 in. deep seemed to have little effect upon the germination of the seeds studied, but the highest germination usually occurred with seedings made from 3 to 5 in. deep, especially for those seeds most affected by depth of seeding. Deep seeding retarded the growth of small seeds and of those having poor germinating power more than that of larger seeds. Growth was usually more rapid when the seeds were sown from 1 to 2 in. deep, especially with regard to the roots, and this rapid growth is thought to be one of the primary factors causing larger yields from shallow seedings. In general, the height of the plants above the soil decreased as the depth of seeding increased. Maximum growth above ground never occurred from seeds sown deeper than 3 in. Small seeds sown below 3 in. failed to reach the surface in 20 days.

A drill for seeding nursery rows, C. E. Hill (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 165, 166*).—A drill devised by the author and recommended for use in seeding short nursery rows of different varieties or strains of field crops is described. Greater speed and accuracy, operation by one man, elimination of mixtures, seeding possible on a windy day, and better germination than with hand seeding are claimed for the implement.

"The essential parts of the drill are a funnel into which the seed is dropped by hand at the desired rate; a furrow opener; a tube which carries the seed from the funnel to the furrow opener; and a carriage on which these parts are mounted." The drill is said to be suitable for sowing light, fluffy seed such as tall oat grass, which will not feed through the ordinary types of garden drill.

[Work with field crops in Canada] (*Agr. Gaz. Canada, 5 (1918), No. 2, pp. 152–155, 158–166, figs. 3*).—The results of variety and cultural tests with oats, wheat, barley, corn, alfalfa, and root crops conducted in Quebec and Manitoba are reported.

In date-of-seeding tests with small grains in Quebec, the first seedings were made as early in the spring as possible, and later seedings at intervals of one week for 4 weeks. The yields from the last seedings to the first varied from 58.18 to 78.16 bu. for oats, from 18.78 to 35.83 bu. for wheat, and from 55.49 to 60.78 bu. for barley.

The value of pedigreed seed is discussed.

[Report of field crops work in Montserrat, 1916–17] (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Montserrat, 1916–17, pp. 4–11, 14, 18, 19, 20, 21–24*).—The results of breeding and spinning tests and manurial experiments with cotton; variety tests with sugar cane, peanuts, and sweet potatoes; and field tests with peas and beans are reported.

Pen manure applied at the rate of 6 and 18 tons per acre was followed by yields amounting to 1,350 and 1,400 lbs. of seed cotton per acre, respectively, as compared with 1,280 lbs. from an untreated check. With a complete fertilizer composed of cottonseed meal, acid phosphate, and sulphate of potash the yield was 1,300 lbs. per acre. Refisque peanuts produced at the rate of 2,400 lbs. of cured nuts per acre in 1916, with a 3-year average yield of 1,760 lbs. Trinidad No. 1 sweet potatoes gave a yield of 14,967 lbs. per acre.

[Résumé of field crops work in the Philippines during 1916], A. M. Burton (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 4, pp. 361–392, 401–409*).—Variety, cultural, and fertilizer tests with rice, variety tests with sugar cane, and field tests with corn, root crops, and with grasses and legumes for forage and cover crops conducted at various experimental centers are described. Limited variety tests with tobacco are also noted. Experiments in growing corn in alternate rows with tobacco for shade are reported as having been a failure, the corn outgrowing the tobacco and thus necessitating the construction of shade frames.

Experiments with liming rice seed beds before replanting showed yields amounting to 2,160.3 kg. per hectare (about 1,922 lbs. per acre) for applications of 2,800 lbs. of lime per hectare as compared with an average yield from the untreated checks of 1,437.1 kg.

Detailed tabulated data are presented giving the results of analyses of a number of sugar cane varieties grown in the islands.

Fallow and green manuring experiments on sandy soil at Askov, 1888–1914, J. Hansen (*Tidsskr. Planteavl, 25 (1918), No. 1, pp. 1–42*).—Rotation experiments including bare and green fallows, together with the use of barnyard manure, commercial fertilizers, and green manure, in the culture of the crops, were conducted on four series of duplicate plats. Nine combinations of crop rotations and manurial treatment were compared. The rotation was fallow, rye, buckwheat, and oats, but beginning with 1893 potatoes were substituted for buckwheat, and from 1899 to 1914 a mixed crop of oats, barley, peas, and vetch was grown in place of oats. The crops used for green fallow were vetch and oats, mustard and buckwheat, and lupines. The crop of vetch and oats was taken from the land while the other two crops were plowed under for green manure. In connection with the bare and green fallows, the effect of using 20 tons of barnyard manure per töndeland (1.36 acres) for the entire period of the rotation was studied. In one experiment where lupines were plowed under, 1,000 lbs. of 14 per cent Thomas slag and 1,400 lbs. of kainit and in another 460 lbs. of Thomas slag and 480 lbs. of kainit per töndeland were applied during the rotation. In two experiments no manurial treatment was given, but the effect of growing and harvesting a crop of vetch and oats and of plowing under a crop of lupines was observed.

The yield of rye was increased more by means of different methods of fallowing than was the yield of any other crop. The average production of fodder units per töndeland ranged from 1,286 on bare fallow with barnyard manure to 2,780 where lupines were turned under and barnyard manure was applied in the course of the rotation.

Potatoes gave practically 3,300 fodder units per töndeland each on bare fallow and on the green fallows of vetch and oats and of lupines. The highest yield, 4,120 fodder units, was secured on the lupine series receiving barnyard manure, and the yield ranking next, 3,710 fodder units, on the lupine series receiving commercial fertilizers.

The relative value of the different fallows, as based on the average yearly yield per töndeland for all crops grown in the rotation and receiving barnyard manure, is given as follows: Bare fallow 100, vetch and oats 121, lupines 137, and mustard and buckwheat 102. The lupine series treated with commercial fertilizers ranked with the vetch and oats receiving manure.

Moorculture Association's field experiments in 1917, H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 32 (1918), No. 3, pp. 272–283*).—A report is presented on 41 experiments conducted in 20 different localities.

Liming peat soils which according to analysis already were supplied adequately with lime gave varying results, ranging from a marked increase in yield to no appreciable effect. On a bog soil in Norbotten the use of lime showed even negative results. It is concluded that generally no injurious effects result from the use of ordinary applications of lime on peat soils of good quality, including an adequate lime content.

Applications of different quantities of phosphates and potash salts gave varying results, determined mainly by the quality of the peat soil and the preceding fertilizer treatment. Thomas slag used on grass was followed by a higher yield than was secured from the corresponding quantity of phosphoric acid as superphosphate applied with 37 per cent potash salt. When used with kainit, Thomas slag and superphosphate were apparently of equal value. The 37 per cent potash salt showed somewhat better results than those obtained from kainit when both were applied with superphosphate. Nitrate of soda as a top-dressing on peaty soils of a high nitrogen content was not profitable as a rule, but in Norbotten on a sedge bog soil, not yet perfectly reduced, its use gave a good increase in yield, although the total nitrogen content of the soil was high.

Barnyard manure on this type of soil proved quite effective the second year after application. In one experiment the residual effect of the manure the fourth year after application proved unimportant. The total profit derived during a five-year period from 100 kg. (220 lbs.) of barnyard manure, the price of hay being 5 öre per kilogram, was 95 öre (24 cts.). For good yields of different crops in rotation on these peaty soils fertilized treatment was required each year. The addition of commercial fertilizers to barnyard manure in growing root crops proved generally quite profitable.

Oats on moss soils gave an average yield, and of the three varieties grown Guldregn was the most productive. Mixed crops, including legumes, produced good yields of green forage in these tests. On all of the better soils average yields of root crops were secured, and in two of the localities where this work was in progress the common flat turnip proved more productive than either the Östersundom or the Bortfeld turnip.

[Report of field crops work in Nigeria, 1916] (*Ann. Rpt. Agr. Dept. North. Prov., Nigeria, 1916, pp. 11–18*).—The results of rather limited variety tests with cotton, peanuts, tobacco, sugar cane, and miscellaneous forage crops are reported.

[Report of field crops work in Rhodesia], E. A. Nobbs (*Rhodesia Agr. Jour., 14 (1917), Nos. 5, pp. 608–614; 6, pp. 717–726; 15 (1918), No. 1, pp. 4–9*).—Fertilizer, cultural, and rotation experiments with wheat, corn, velvet beans, peanuts, sunflowers, tobacco, sweet potatoes, and miscellaneous forage crops conducted on the Gwebi Experiment Farm during the season of 1916–17 are reported in a continuation of similar work previously noted (E. S. R., 37, p. 436).

Pumpkins and corn grown together resulted in yields of 666 and 1,840 lbs. per acre, respectively, as compared with yields of 6,400 lbs. of pumpkins and 1,800 lbs. of corn when grown alone.

[Report of field crops work in Queensland, 1916–17] (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1916–17, pp. 10, 11, 18–22, 73–75, 134, 137–149, 157–159, pls. 7*).—This reports the progress of cultural and variety tests with sugar cane, wheat, barley, corn, sorghums, cotton, and miscellaneous forage crops, together with considerable tabulated data on crop production and crop values.

[Report of field crops work in Punjab], W. Roberts, Fateh-ud-din, and D. Singh (*Rpt. Dept. Agr. Punjab, 1916–17, pp. XIV–LXXIV*).—This reports the results of variety, cultural, fertilizer, and irrigation tests with cotton, wheat, corn, sugar cane, and miscellaneous native cereal and forage crops on various experimental farms for the year ended June 30, 1917.

[Report of field crops work in the United Provinces of Agra and Oudh, India, 1916 and 1917], G. Prasad and L. C. Sharma (*Rpt. Agr. Stas. West. Circle, United Prov. Agra and Oudh [India], 1916, pp. 1–31; Rpt. Partabgarh and Benares Agr. Stas., United Prov. Agra and Oudh [India], 1917, pp. 2–14*).—Variety, cultural, and fertilizer tests conducted on several experimental farms in the region with cotton, sugar cane, wheat, and miscellaneous field crops are reported.

[Report of field crops work in Fiji, 1916], C. H. Knowles (*Fiji Dept. Agr. Ann. Rpt. 1916, pp. 8–10, 11–13*).—Variety tests with yams, field tests with sweet potatoes, cassava, soy beans, cowpeas, haricot beans, *Phaseolus mungo*, corn, and hemp, and cultural and fertilizer experiments with peanuts, rice, and cotton are briefly reported.

Fodder crops on reclaimed swamp lands, W. J. Spafford (*Jour. Dept. Agr. So. Aust., 21 (1918), No. 6, pp. 480–492*).—The author discusses the adaptation of alfalfa and certain perennial grasses and annual forage crops to irrigated, reclaimed swamp lands.

The fodder pulses, meth, bhringi, and mashyem kalai, A. C. Ghosh (*Agr. Jour. Bihar and Orissa [India], 5 (1917), No. 1, pp. 15–47, pls. 4*).—Brief botanical descriptions are given of meth (*Phaseolus ricciardiannus*), bhringe (*P. aconitifolius*), and mashyem kalai (*P. calcaratus*), together with a more detailed account of the field practices and cultural methods employed in their production.

The principal forage crops of the Philippines, F. C. Kingman and E. D. Doryland (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 3, pp. 261–271, pls. 5*).—Other than the native grasses, which are said to comprise the sole forage in some localities, the following are deemed to be the principal forage crops of the islands: Guinea grass, uba or Japanese forage cane, Sudan grass, desert Indian corn from the United States, peanuts, cowpeas, nonsaccharin sorghums, mungo beans, and field corn. Cultural methods employed in growing the various crops are discussed, and their relative distribution is noted.

Important root crops of the Philippines, F. C. Kingman and E. D. Doryland (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 4, pp. 335–349, pls. 5*).—The production and use of root crops in the Philippines are described, including ginger, arrowroot, cassava, sincamas (*Pachyrrhizus erosus*), gabi (*Colocasia esculentum*), sweet potatoes, and yams.

"Root crops of the sorts mentioned in this paper are to be found abundantly, or at least well established, in practically all parts of the islands, and are growing at practically any period of the year; thus they furnish a constant supply of nourishing food the year around. The majority of these crops do not constitute a regular field crop except in a few localities, but find their place as secondary crops to fill in after the main crops have been removed."

Indian trade in oil seeds (*Bul. Imp. Inst. [So. Kensington], 15 (1917), No. 3, pp. 353–428*).—This is a detailed account, supplemented by statistical information, of the production and disposition of oil seeds, oils, and oil cakes in India with particular reference to the development of trade within the British Empire. The discussion embraces cotton seed, flaxseed, niger seed (*Guizotia abyssinica*), rapeseed, mustard seed, poppy seed, peanuts, sesame seed, castor seed, mowra, mahua or mowa seed (*Bassia* spp.), and copra.

Experiments with clover and timothy at different rates of seeding, S. Rhodin (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 7–8, pp. 575–584; Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 158 (1917), pp. 12*).—The seed mixture used in these experiments, carried on from 1907 to 1915, inclusive, consisted of 70 per cent timothy, 20 per cent alsike clover, and 10 per cent red clover and was sown at the rates of 24, 30, and 36 kg. per hectare (21.4, 26.7, and 32 lbs. per acre, respectively). Not all tests were in progress the entire period but no test was conducted less than six years.

The various tests, including 15 1-year, 11 2-year, and 12 3-year meadows, produced a general average of 5,145, 5,515, and 5,879 kg. of hay per hectare from thin, medium, and heavy seeding, respectively. The heavy rate of seeding seemed to be best adapted to heavy clay soils. On soils of this type an increase in yield of 30 per cent was obtained from heavy as compared with thin seeding, while the corresponding increase on alluvial clay was only 5 per cent. It is pointed out that while the increases in yield from the heavy rate of seeding are comparatively small; thicker seeding has the advantage of tending to crowd out weed growth.

Experiments with Danish and foreign strains of clover and grass, III, 1914–1917, E. LINDHARD (*Tidsskr. Planteavl, 25 (1918), No. 1, pp. 117–175*).—Strains of orchard grass, perennial rye grass, timothy, meadow fescue, white clover, alsike clover, field brome grass, kidney vetch, and black medic were compared in different localities under a cooperative arrangement.

Of nine strains of orchard grass, Olsgaard ranked first in productiveness and Tystofte No. 2 second. Five strains of rye grass, including Irish rye grass grown from commercial seed, were tested. A strain known as Lundbæk gave the highest yield, exceeding the yield of the Irish strain by 10 per cent. Only three strains of timothy, including a commercial sample, were tested, and of these the leading one, known as "Trifolium" No. 12, produced in the first year about 40 per cent more hay than was secured from the commercial strain, but proved less hardy, especially on lowlands.

A strain of meadow fescue designated Fællesforeningen No. 9 was compared with Dæhnfeldt No. 2 and Dæhnfeldt No. 5, strains derived from American stock. These three strains mixed with white clover on ordinary upland soil yielded in two years a total of 9,810, 9,120, and 8,910 kg. per hectare (4.36, 4.05, and 4 tons per acre), respectively, while on moorland soil the corresponding yields were 7,150, 8,000, and 8,630 kg.

Tests of white clover strains grown mixed with meadow fescue showed that the Danish strains Strynö and Morsö, as compared with Bohemian white clover, were much better adapted to the conditions on both upland and lowland soils. Tystofte No. 17 was found to be later than Strynö and also to give higher yields, but the strain is not regarded as sufficiently tested for commercial seed production. A Danish strain of alsike clover designated Fællesforeningen gave in general better results than Swedish commercial samples.

Fællesforeningen field brome grass gave an average of 5 per cent more hay than was secured from an ordinary commercial strain. Two strains of kidney vetch, Tystofte No. 8 and Tystofte No. 28, compared with commercial stock, were found superior in productiveness. Tystofte No. 8 is described as blossoming a week later than the commercial stock and yielding a heavier crop at the first cutting. Fællesforeningen black medic proved to be an early strain of vigorous growth, and yielded in this test about 13 per cent more hay than was obtained from an English strain.

Methods used and results obtained in cereal investigations at the Cornell Station, H. H. LOVE and W. T. CRAIG (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 145–157, pl. 1, fig. 1*).—The authors describe the methods employed in cereal breeding work at Cornell University, with particular reference to the rod-row system of studying plant selections. Briefly, the method of selection is as follows:

"The heads or plants are selected and tested for one year in head or plant rows. The best rows are selected in the field, harvested, thrashed, and grown the second year in rod rows repeated two or three times, depending on the amount of seed available. Only the very poorest are eliminated the second year. The rest are continued in rod rows repeated ten times for at least three years. The best new strains are multiplied and tested in increase plats. The best ones are finally distributed to farmers for further comparison. In this way a sort is tested for at least six years before it is finally put into general use."

Data are presented which show the average probable error as percentage of the mean of some varieties of wheat and oats tested by the rod-row method to have been 2.69 and 3.12, respectively, indicating a marked superiority over the field-plat method. The average yield of wheat varieties grown on 2/100-acre plats repeated three times in 1916 was 40 bu. per acre, while for the same varieties grown in rod rows repeated ten times it was 31.4 bu. With oats about 242 sorts repeated ten times can be handled per acre by the rod-row system, as compared with only 37 sorts by 2/100-acre plats repeated three times.

The methods used in making and studying hybrids of the small grains are also described. It is stated that the best results have been obtained by growing the plants in pots in the greenhouse. The F_1 plants are also grown in the greenhouse, while the F_2 and succeeding generations are grown in the field in 5-ft. rows. Clipping the glumes in emasculating wheat has not produced any better results than removing the anthers without clipping.

Small grain investigations, H. H. LOVE and W. T. CRAIG (*Jour. Heredity, 9 (1918), No. 2, pp. 67–76, figs. 7*).—The authors present a brief outline of their work with small grains at Cornell University, together with some of the more pertinent results obtained. The principal lines of work under way embrace comparisons of varieties, pure-line selections, and selections from hybrids of wheat, oats, barley, and rye; pure-line breeding work with selections of wheat and oats; variation and correlation studies with the different cereals; and hybridization work with wheat, oats, rye, and barley. Cooperative work with the Montana Experiment Station and the agronomy department of the University of Missouri in a study of the effect of widely differing environments upon imported seed is also noted.

Growth of wheat (Triticum) and corn (Zea), D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 85–87*).—Data obtained from daily observations of the rate of growth of single leaves of wheat and corn measured at one-half hour intervals through a horizontal microscope led to the following conclusions:

Retardation of growth occurred at more than one place in the temperature scale and at different times of the day. Cessation of growth, especially in corn, might be attributed to a direct temperature effect, especially with extended periods of temperatures of from 30 to 35° C. (87 to 95° F.). The highest rate maintained by corn for some time was found to lie between 27 and 30° C. It was not possible to fix upon any definite temperature limits within which growth might be continuous in this plant. No retardations occurred in either corn or wheat except after 11 a. m. Corn showed an acceleration late in the day after retardation at high temperatures, but wheat did not. The allowable causes to which might be attributed the slackening or inhibition of growth or actual shrinkage of growing joints after midday and continuing until the following morning are said to be the destruction of enzyms concerned in renewing building material, excessive transpiration, and the accumulation of acids or other respiration products which might clog metabolism and reduce the water-holding capacity of the protoplasm.

Red Rock wheat and Rosen rye, F. A. SPRAGG (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 167–171*).—This paper, a contribution from the Michigan Experiment Station, briefly describes the development of Red Rock winter wheat, Rosen rye, and Michigan Winter barley, together with an account of the method of inspecting and distributing pedigreed seed in connection with the Michigan Crop Improvement Association.

Milling and baking tests of einkorn, emmer, spelt, and Polish wheat, J. A. LeClerc, L. H. Bailey, and Hannah L. Wessling (*Jour. Amer. Soc. Agron., 10 (1918), No. 5, pp. 215–217*).—The results of milling and baking tests made by the Bureau of Chemistry, U. S. Department of Agriculture, with samples of einkorn, emmer, spelt, and Polish wheat, and with a hard spring wheat as a check, are briefly noted. The conclusions are reached that emmer and spelt (both free of hulls) and Polish wheat can be milled into satisfactory flour and the flour made into a good loaf of bread. Einkorn (free of hulls) was not so promising. Alstroum spelt appeared to be specially adapted for the production of a good baking flour, and Black Winter emmer flour possessed a very high absorption capacity. The use of emmer, spelt, and Polish wheat as human food (bread, breakfast cereals, etc.), is recommended in case of wheat deficiency wherever they are available.

Preliminary notes on barleys indigenous to Argentina, L. Hauman (*An. Mus. Nac. Hist. Nat., Buenos Aires, 28 (1916), pp. 263–316, pls. 4, fig. 1*).—Rather detailed descriptions of species and varieties of barleys occurring in Argentina are presented, their geographic distribution briefly discussed, and a systematic classification outlined for their identification.

Hastening the germination of Bermuda grass seed by the sulphuric acid treatment, W. E. Bryan (*Jour. Amer. Soc. Agron., 10 (1918), No. 7–8, pp. 279–281, pl. 1*).—Treating Bermuda grass seed with sulphuric acid for different lengths of time ranging from 5 to 60 minutes at the Arizona Experiment Station resulted in a maximum germination on the twentieth day of from 70 to 71.5 per cent for seed treated from 10 to 20 minutes, as compared with only 22.5 per cent for untreated seed. About 95 per cent of the total germination was obtained at the end of the fourth day for seed treated 10 minutes.

The castor-oil plant: Botany, culture, industry, and commerce, M. Dubard and P. Eberhardt (*Le Ricin, Botanique, Culture, Industrie et Commerce. Paris: Augustin Challamel, 1917, 2. ed., pp. 120, figs. 23*).—A rather comprehensive work on the castor-oil plant, including a brief historical sketch, a botanical study of the plant, notes on varieties, descriptions of general cultural practices with particular reference to the methods employed in India and the French colonies, and a discussion of the commercial and industrial aspects of oil and oil-cake production.

The castor-oil plant in northern Africa, F. Couston (*Bul. Agr. Algérie-Tunisie, Maroc, 24 (1918), No. 1, pp. 1–8*).—A brief account of the methods of production, adapted varieties, and utilization of the crop in Algeria.

Origin of the "Moro" corn, P. J. Wester (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 3, p. 300*).—A brief historical account of the origin of so-called Moro corn, deemed the best all-around variety in the Philippines. It is described as a hybrid strain developed from a cross of Mexican June corn and a native white variety occurring in 1910 in Zamboanga, Mindanao.

Scientific research and the cotton industry, G. Berthey (*Bul. Union Agr. Égypte, 15 (1917), No. 121, pp. 99–114*).—This presents a general discussion of the organization and aims of the British Cotton Research Association.

Cotton experiments, 1917, H. B. Brown and C. T. Ames (*Mississippi Sta. Bul. 184 (1918), pp. 28, figs. 2*).—This describes the continuation of work with cotton along the same general lines as previously noted (E. S. R., 37, p. 334). On the whole the season was rather unfavorable for cotton, although weevil damage was generally less than during the two preceding years.

Wannamaker-Cleveland and selected strains of Trice and Lone Star gave the best results among the short-staple varieties, while Express and Webber-49 were the highest in money value of the long-staple kinds. Lewis-63 and Tri-

Cook proved to be the most wilt-resistant strains tested, while Wannamaker-Cleveland was found to be somewhat wilt-resistant.

Continued observations on the single-stalk method of cotton culture are said to indicate that increased yields obtained in some cases by this practice were due to close spacing rather than to delayed thinning. Spacing experiments again resulted in the highest yields being obtained from close spacing.

Fertilizing cotton at the Holly Springs substation is said to have given good returns on the investment over a period of 12 years.

Much variation was observed in the number of flowers produced by different varieties, but in general it was noted that varieties producing and supporting the most flowers during the first part of the fruiting season were the most satisfactory for growing under weevil conditions. Selected strains developed by the station comprised a majority of the ranking varieties in all the tests.

A study of certain environmental factors and varietal differences influencing the fruiting of cotton, E. C. Ewing (*Mississippi Sta. Tech. Bul. 8 (1918), pp. 95, figs. 40*).—Observations of the fruiting processes of American upland cotton, including flowering, shedding, the effect of removal of flowers upon fruiting, and the developmental period of the boll; and of varietal differences in the fruiting processes are discussed in considerable detail. The seasonal history of the cotton plant, the nature of boll-weevil injury and the problem of its control, and the relation of early maturity in the cotton plant to weevil injury are described. The discussion and the conclusions reached are based chiefly on a statistical analysis of data collected in the field in connection with cotton variety tests made at Agricultural College during 1911, 1912, and 1913, and at Holly Springs during 1914. In 1913 and 1914 meteorological instruments were exposed during fruiting season, and the records obtained, together with daily soil moisture determinations, were used in an effort to study the relation between the diurnal fluctuation in flowering and shedding and environmental conditions.

Neither soil moisture nor air temperatures appeared to be constant controlling factors in the daily fluctuations noted in flower production, although at times they seemed to act as limiting factors when their values became abnormal. Nevertheless the sharp variations observed in flowering are thought to point to the existence of definite environmental relations, however obscure they may be.

The water content of the plant appeared to have an important influence upon shedding, a deficient supply of moisture resulting in excessive shedding. Variations in soil fertility did not seem to greatly disturb the ratio between the amount of flower production and of fruit maturing therefrom. It was concluded that in general shedding was not greatly affected at time of flowering unless pollination was interfered with. Observations upon the relations between flowering and shedding and the several environmental factors have led to no definite conclusion.

It is stated that the cotton plant naturally produces a surplus of flowers, many more than can be matured into fruit, and that the elimination of a large part of these always occurs, regardless of how favorable the conditions may be under which the plants are grown.

The relations between the boll period curve and the temperature curve are deemed very significant. The average daily temperature prevailing throughout the developmental period of the bolls resulting from the first two weeks of flowering was approximately 80° F. at the beginning and 70° at the close. The condition of the soil, including texture, moisture, and fertility; the humidity; and the age of the plant are all said to have influenced the length of the time required for the boll to mature. It is regarded as certain that the boll reaches a stage of immunity from weevil injury before it is fully matured, and that the length of the period before this stage is reached is apparently more or less proportional to the total developmental period of the boll. Thus while a fertile soil is more desirable for growing cotton under boll-weevil conditions than a poor soil due to the larger amount of fruit set, nevertheless a longer period is required on rich than on poor soil for the bolls to harden and reach a stage immune to weevil injury.

From a comparison of varietal differences in the fruiting processes it was concluded that early commencement of flowering, usually associated with a rapid rate of flowering, would be beneficial if the flowering could be maintained in sufficient abundance for a longer period during the season unaccompanied by a too high rate of shedding. However, early blooming varieties showed a tendency to slow up in flowering activity relatively early in the season, and also to lose much of the benefit of early flowering through excessive shedding. These qualities appeared to be characteristic of Trice, Simpkins, and Dodds Prolific Such varieties as Wannamaker-Cleveland, on the other hand, though blooming several days or even a week later than the earlier varieties, were found to maintain nearly as high a rate of flower production per week after flowering began. These latter types also appeared to maintain a fair rate of flower production late in the season and with considerably less shedding than the early types. A low rate of early shedding, thus conserving a large percentage of the early bolls, is regarded as an important advantage under boll-weevil conditions. In the production of new types of cotton, therefore, it is deemed desirable not to overemphasize early flowering but rather to strive for rapid flower production combined with a low rate of early shedding even if accompanied by several days' delay in the appearance of the initial flowers. It is also thought to be desirable in general that a variety continue to grow and fruit relatively late in the season in order to furnish squares with which to occupy the weevils and thus protect the bolls already set as long as possible.

While it would be advantageous in relation to weevil injury, other things being equal, to have the same amount of cotton produced in a large number of bolls rather than in a small number, the studies on flower production have shown that the number of flowers produced by small bolled varieties was not sufficient to counterbalance the lower lint yield of individual fruits. The potential lint production of the big boll group thus considerably exceeded that of the early small boll varieties.

Observations on the relative resistance and susceptibility of the bolls of the different varieties to weevil attack seemed to indicate that those varieties with shorter boll periods got beyond damage earlier than those requiring a longer period for development. Since the former were usually small bolled sorts and the latter usually large bolled, the large bolled varieties were at a disadvantage in this respect. However, some large bolled varieties with relatively high lint factors, for instance Wannamaker-Cleveland, are said to possess a relatively short boll period.

The time at which cotton uses the most moisture, C. K. McClelland (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 185–189*).—This paper, a contribution from the Georgia Experiment Station, reports the results of experiments conducted during 1915 and 1916 to determine the water requirement of cotton. Plants were grown in potometers, maintained at different degrees of saturation, and the quantity of water applied to individual plants per week during July, August, and September and the number of blooms appearing each week on each plant and on the plants studied under field conditions recorded in tabular form.

In 1915 the greatest total amount of water applied to individual plants was 293 liters the fourth week in August, and in 1916, 157.5 liters the second week in August. Observations made during 1916 showed a considerable demand by the cotton plant for water well into the fall (October 7).

The highest total number of flowers appearing weekly on plants grown in the potometers in 1915 was 76 during the second week in August. On 18 field plants the maximum was reached the last week in July and amounted to 129. In 1916 the maximum number of flowers appearing weekly on individual plants grown in potometers was 105, and on 10 plants grown in the field 146, this being during the third week in August in both cases.

These results are held to indicate that later cultivation than is usually given would be beneficial to the cotton plant in conserving soil moisture during the hot summer months.

A plant industry based upon mutation, T. H. Kearney (*Jour. Heredity, 9 (1918), No. 2, pp. 51–61, figs. 9*).—The author briefly discusses mutation in Egyptian cotton, with special reference to the development of the Yuma, Somerton, Gila, and Pima varieties in southwestern United States. It is stated that the maintenance of the Egyptian type of cotton has until recently depended upon the successive appearance of desirable mutants which have given rise to new varieties.

While mutation was observed only in heterozygous stocks, the recombination hypothesis is deemed inadequate to explain the origin of such extreme mutants as Yuma and Pima, as a comparison of the parent stock with any other with which it might have had recent opportunity to hybridize, failed to reveal the source of the distinguishing characters of the mutant. Intermediate forms were also either entirely absent or extremely rare. The presumption that American upland cotton varieties may be of mutational origin is regarded as entirely tenable.

Cotton variety tests, A. C. Lewis and C. A. McLendon (*Ga. Bd. Ent. Bul. 50 (1918), pp. 30, pls. 4*).—This reports a continuation of cooperative tests with cotton varieties in an effort to obtain strains suited to growing under boll weevil and wilt conditions in Georgia, with recommendations similar to those previously noted (E. S. R., 38, p. 233).

Meade cotton, O. F. Cook (*Science, n. ser., 47 (1918), No. 1227, pp. 11, 12*).—Meade cotton, said to be a new upland long-staple variety approaching Sea Island in length and fineness of fiber, is briefly described. The variety was obtained by the discovery and selection of a superior type of cotton by R. M. Meade in 1912 at Clarksville, Tex., in a field of a variety locally known as Blackseed or Black Rattler, but said to be distinct from the varieties bearing these names in other parts of the cotton belt. The new variety is described as producing a fiber of about 1.5 in. in length; as flowering earlier and more abundantly than Sea Island, with bolls nearly twice as large; as having a lint index (grams of lint per 100 seeds) of 5.45, as compared with 4.93 for Sea Island; and as being accepted by buyers as practically equivalent to Sea Island.

A simple method of selecting heavy seeds in cotton, G. L. Kottur (*Poona Agr. Col. Mag., 8 (1917), No. 4, pp. 203–210*).—The author presents tabulated data to demonstrate the correlation between seed weight and variety or strain of cotton and to show that factors materially affecting seed weight include season, soil, and early and late picking.

Dividing cotton seed into four grades, namely, big, medium, small, and red (shriveled, light-colored seed), which are said to have relative percentages of germination of 98, 79, 60, and 35, respectively, a method is described for readily separating big and medium seed from the small and red seed. The seed was first moistened sufficiently to cement the lint to the seed and then placed in a 10 per cent salt solution, the big and medium seed sinking to the bottom and the small inferior seed floating on the surface. The method is said to be applicable to all kinds of cotton seed except that of the American varieties, although certain modifications in the concentration of the salt solution are suggested for some local varieties. Additional data show the germination of the unseparated seed to have been 65.5 per cent, of the heavy seed 88.5 per cent, and of the light seed 41.5 per cent. Three-year average yields amounted to 367 lbs. of seed cotton per acre from light seed as compared with 586 lbs. from heavy seed.

Oil content of cotton seed as influenced by variety and selection, L. E. Rast (*Ga. State Col. Agr. Circ. 70 (1918), pp. 4, fig. 1*).—Analyses of the seed of 48 varieties and strains of cotton grown in Georgia during 1916 are reported as showing a range in the oil content of air-dry seed of from 17.64 per cent for College No. 27 to 23.8 per cent for Mexican. For milling purposes the production of seed with an oil content below 20.5 per cent is deemed unprofitable.

Cotton production and distribution, season of 1916–17 (*Bur. of the Census [U. S.], Bul. 135 (1918), pp. 144, figs. 14*).—Detailed tabulated statistics presented and discussed deal with the production of cotton from the 1916 crop; also with the consumption, imports, exports, and stocks of cotton; number of cotton spindles; cotton seed received, crushed, and on hand; and with cottonseed products manufactured, shipped out, and on hand during the year ended July 31, 1917.

Cotton production and distribution, season of 1917–18 (*Bur. of the Census [U. S.] Bul. 137 (1918), pp. 135, figs. 15*).—Statistical information similar to that noted above is presented for the season of 1917–18.

South African fiber plants.—I, Ambari or Deccan hemp (Hibiscus cannabinus), I. B. P. Evans (*So. African Jour. Indus., 1 (1917), No. 3, pp. 198–208, figs. 9*).—*H. cannabinus*, said to be extensively grown in India and to be indigenous to Africa, is described as an erect annual which attains a height in South Africa of from 5 to 11 ft., and which produces a coarse, harsh fiber suitable for bags, cheap cordage, yarns, etc. The possibilities of its production in Africa are indicated.

The cultivation of jute in Purnea, N. C. Chaudhuri (*Agr. Jour. Bihar and Orissa [India], 5 (1917), No. 1, pp. 72–79*).—The methods employed in growing the crop and the preparation of the fiber for market in Purnea, said to be the most important jute-growing district in the Provinces of Bihar and Orissa, are described.

Tests with lupines on sandy soil at Askov, 1894–1903, M. Bjerre (*Tidsskr. Planteavl, 25 (1918), No. 1, pp. 43–55*).—The results of comparative tests of yellow and blue lupines conducted for 10 years indicated that the best yields of seed were secured from seedings made the first half of April, and that the blue lupine, as compared with the yellow lupine, yielded from 12 to 14 cwt. more seed per töndeland (1.36 acres) and blossomed and ripened from five to six days earlier.

The identification of varieties of oats in New York, E. G Montgomery (*Jour. Amer. Soc. Agron., 10 (1918), No. 4, pp. 171–174*).—This paper, a contribution from the department of farm crops, Cornell University, briefly reviews work done by G. Stewart during the summer of 1917 in a practical test under field conditions of the key to oat varieties prepared by Etheridge (E. S. R., 36, p. 833). Samples of oats were obtained from New York State seedsmen and from two experiment stations and were grown for identification.

Of the 22 varieties listed by seedsmen, 11 proved to be of Swedish Select type and 2 others to contain an admixture of Swedish Select. Of 40 varieties obtained from the experiment stations only 5 were definitely identified as listed.

A survey was made of 418 fields in a representative strip of country across the State from north to south to ascertain the type of oats grown. Thirteen varieties were identified, Lincoln, Swedish Select, Silvermine, and Belyak being found on 28.2, 26.3, 13.6, and 11.3 per cent of the farms visited, respectively.

The relation between color and other characters in certain Avena crosses, H. H. LOVE and W. T. CRAIG (*Amer. Nat., 52 (1918), No. 620-621, pp. 369-383*).—This paper, a further contribution to the subject from the department of plant breeding of Cornell University working in cooperation with the Office of Cereal Investigations, U. S. Department of Agriculture, presents a discussion of the relation of color to awns, pubescence, and wild base as observed in a cross between *A. fatua* and *A. sativa*, variety Sixty Day, already described in detail (E. S. R., 39, p. 234).

The data are held to indicate that there is a definite relation between the color of the glume and the production of awns, the black and gray oats producing awns in varying amounts, while few or no awns were produced on the yellow oats. A form of *A. fatua* was observed having a pubescence factor linked with a factor for black color and another pubescence factor independent of any color factor, which in the absence of an inhibitory effect in the yellow oats would be expected to produce 15 pubescent to 1 nonpubescent form in the F_2 generation. A second form was also found having only one factor for pubescence, which when crossed with a white oat resulted in all the nonblacks being smooth, indicating that the pubescence factor is linked with the black color. Forms having two factors for pubescence gave both pubescent and smooth nonblacks. The theoretical expectations from crosses of these two forms with yellow and white oats and the actual results obtained are discussed. It is also stated that even through the F_4 generation no yellow oat has been found with a wild type of base.

The authors state that they do not claim that yellow color in oats will inhibit the production of awns, pubescence, and wild base, but that yellow color as exhibited in the series studied has done so. In crosses using other yellow forms, it was found possible to obtain the yellow pubescent form and yellow forms with the wild base.

[Fertilizer experiments with oats], W. G. R. PATERSON (*West of Scot. Agr. Col. Ann. Rpt., 14 (1917), pp. 235-246*).—Rather limited fertilizer experiments with oats conducted at the West of Scotland Agricultural College during 1912 to 1914, inclusive, are described. Acid phosphate and kainit applied at the rate of 2 cwt. per acre, together with either 134 lbs. of nitrate of lime or 87 lbs. of sulphate of ammonia, resulted in an average yield of 54.5 bu. of grain and 4,812 lbs. of straw, as compared with 41.25 bu. of grain and 3,164 lbs. of straw from the untreated check.

Paspalum in New Zealand, A. H. COCKAYNE (*Jour. Agr. [New Zeal.], 16 (1918), No. 2, pp. 87-91*).—The production and use of *P. dilatatum*, said to be the best permanent pasture grass in New Zealand, is described.

Culture and fertilization as affecting the oil content of peanuts, H. S. SILAYAN (*Philippine Agr. and Forester, 6 (1917), No. 2-3, pp. 84-97, fig. 1*).—Six standard varieties of peanuts, designated as American, Big Japan, Kinorales, Native Lemery, San Mateo, and Montalban, were grown on field plats receiving ridge and flat cultivation and applications of stable manure, wood ashes, and manure and ashes combined, and the effect of the different treatments on yield and oil content noted.

The American variety was first in yield on the check plat with 3,783 lbs. per hectare (about 1,531 lbs. per acre) and San Mateo second with 3,648 lbs.

Increases in yield ranging from 251 lbs. for American to 1,012 lbs. per hectare for Montalban were obtained from flat cultivation over ridge cultivation. Average increases in yield from the fertilized treatments over the untreated checks for all varieties amounted to 1,026 lbs. per hectare for manure alone, 958 lbs. for ashes alone, and 575 lbs. for manure and ashes together.

The oil content of plants grown on the check plat varied from 47.88 per cent for American to 57.4 per cent for Kinorales. Manure alone resulted in an increased oil content over the untreated checks of from 1.21 per cent for Big Japan to 2.18 per cent for American, with reductions of 0.02 and 2.86 per cent for Native Lemery and Kinorales, respectively. Ashes alone showed an increase in every case ranging from 0.05 per cent for Kinorales to 4.91 per cent for American, while manure and ashes together showed increases ranging from 0 for Kinorales to 6.3 per cent for American.

The average percentage of shelled nuts obtained from the different varieties amounted to 63.62 for San Mateo, 66.02 for American, 66.97 for Native Lemery, 68.46 for Montalban, 69.76 for Big Japan, and 74.32 for Kinorales.

The composition of the potato plant at various stages of development, J. T. Ramsay and W. C. Robertson (*Jour. Dept. Agr. Victoria, 15 (1917), No. 2, pp. 641–655, figs. 2*).—The authors describe experimental work conducted during 1916–17 in an effort to determine the rate of assimilation of plant food from the soil by the potato and the relative proportions of the principal plant-food elements contained in the plant at various stages of growth. A synthetic soil was prepared containing 13 parts sand, 2 parts clay loam surface soil, and 1 part well-rotted farmyard manure, placed in wooden boxes 18 by 18 by 18 in., and the boxes set in trenches to prevent too rapid evaporation. Before planting, each box was fertilized with 0.5 oz. each of acid phosphate and potassium sulphate and 1 oz. each of ammonium sulphate and dried blood. When the plants germinated a top-dressing of 0.75 oz. per box of nitrate of soda was applied. Whole seed pieces were used and averaged 75 gm. per box. The plants were harvested at four intervals of approximately one month each, the total period of maturation for the fully developed plants being 124 days. Determinations were made of the green and dry weight of haulms, tubers, and roots for each harvest, and chemical analyses were made of the different parts for total nitrogen, phosphoric acid, potash, lime, and magnesia, and for soluble nitrogen, phosphoric acid, and potash in the haulms at various stages of development and compared with the above-ground portions of mature mustard, rye and vetch, and alfalfa.

The total dry matter produced per plant for each of the four harvests amounted to 59.14, 320.32, 587.16, and 647.1 gm., respectively, and per acre, 2,083, 11,288, 20,692, and 22,804 lbs., respectively.

The results of the analyses are tabulated and fully discussed. The conclusions reached may be summarized as follows: Nitrogen, potash, and phosphoric acid once absorbed by the potato plant were fully utilized, no migration from the plant to the soil having been observed. The critical period of growth occurred during the first six or eight weeks. The greater part of the phosphoric acid entered the plant in the early stages of growth, concentrating in the haulm and later migrating to the stolons for tuber formation, the very young tubers being richer in phosphoric acid than the semi-mature or mature tubers. Potash and nitrogen played a consistently even part throughout the growing period. Practically the whole root and haulm development occurred during the first two months. The amounts of lime and magnesia assimilated appeared to bear a definite relation. Phosphoric acid and nitrogen present in the seed set were largely utilized in sprout formation, while potash was apparently not directly utilized.

One ton of the dried haulms was found to contain three times as much nitrogen and phosphoric acid and nearly ten times as much potash as 1 ton of farmyard manure. During the growing season the potato plant utilized phosphoric acid, nitrogen, and potash in the proportion of 1:4:6. It is stated that potatoes can be grown successfully on poor sandy soils, provided readily available plant food and farmyard manure are judiciously applied.

Analysis of a potato hybrid, Solanum fendleri×S. tuberosum, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 16 (1917), p. 98*).—This briefly reports the progress of hybridization work with acclimated cultures of the wild potato of Arizona, *S. fendleri*, found at elevations of over 5,000 ft., and a domestic variety at Carmel, Cal., begun in 1914.

Raffia or bass: Its production, preparation, and utilization (*Bul. Imp. Inst. [So. Kensington], 15 (1917), No. 3, pp. 434–440*).—This is a general discussion of raffia production and of the preparation of the fiber for market, with special reference to the development of the industry in East and West Africa.

Rice in Indo-China, G. Capus (*Ann. Géogr., 27 (1918), No. 145, pp. 25–42*).—An historic account of rice production in Indo-China, together with a rather comprehensive discussion of the possibilities of increased production through seed selection and improved cultural methods.

How sorghum crosses are made, T. E. Nafziger (*Jour. Heredity, 9 (1918), No. 7, pp. 321, 322*).—This briefly describes the technique and method of procedure employed by the author in breeding work with sorghum on the plant breeding plats at the Kansas College during the summer of 1916.

Studies in inheritance in sugar cane, H. B. Cowgill (*Jour. Dept. Agr. P. R., 2 (1918), No. 1, pp. 33–41*).—Resemblances of seedling canes to the seed parent and of seedlings to parents in canes from cross-pollinated tassels are briefly described, as noted in plant-breeding work with certain sugar cane varieties (E. S. R., 39, p. 33) in Porto Rico. The following conclusions were reached:

Seedling canes in the first generation showed a degree of resemblance to the parent varieties, that of color being more marked than any other characteristic. Seedlings showed wider variations than canes produced from cuttings of the same variety. The greatest variation in seedlings produced from tassels of a single variety was in the size and form of the plants and of their component parts. Certain varieties produced better seedlings than others. Abnormalities were common in seedling canes, but rare in canes produced from cuttings, some varieties producing many more abnormal seedlings than others.

New types of cane were obtained by crossing different varieties, variation appearing to be increased by a single combination of two sorts. Crossing seemed to produce a recombination of characters of the parents in some of the progeny, this being due to the dominance of certain characters derived from each parent. Only slight differences in the sugar content of the juice were observed between groups of seedlings produced from different varieties.

Cross-pollination of sugar cane, H. B. Cowgill (*Jour. Amer. Soc. Agron., 10 (1918), No. 7–8, pp. 302–306*).—This briefly describes the methods employed, and discusses some of the results obtained in breeding work with sugar cane in Porto Rico already mentioned in the article noted above and elsewhere. It is concluded that sugar cane can be cross-pollinated and protected from outside pollen, that a considerable number of seedlings can be obtained, and that characters of the parent varieties are combined in the seedling.

It is suggested editorially by L. H. Smith that desirable combinations might be perpetuated in hybrid condition by asexual propagation.

[Fertilizer experiments with sugar cane in British Guiana], J. B. Harrison, C. K. Bancroft, and R. Ward (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), No.*

1, pp. 26–33).—Fertilizer tests with sugar cane conducted during 1916 are noted.

An application of 450 lbs. of sulphate of ammonia per acre resulted in 28.3 tons of cane, as compared with 16.8 tons without nitrogen. A comparison of sulphate of ammonia and nitrate of soda at rates supplying 60 lbs. of nitrogen per acre showed respective yields of 25.8 and 22.8 tons per acre. Acid phosphate alone was followed by 17.2 tons of cane as against 16.8 tons from the check and 24.9 tons with nitrogen, as compared with 25.4 tons from nitrogen alone. Additional tests of acid phosphate and basic slag showed yields without nitrogen of 18.1 tons for the check, 19.8 tons for acid phosphate, and 21.1 tons for basic slag, as compared with yields with nitrogen amounting to 23.5, 23.1, and 25.4 tons per acre, respectively. In a comparison of sulphate of ammonia, nitrate of soda, and a so-caled "animal-products manure," in which the materials were applied in quantities supplying 60 lbs. of nitrogen each per acre, yields were obtained amounting to 35.7, 34, and 32.2 tons of cane per acre, respectively, as against 28.5 tons from the untreated check. A comparison was also made of sulphate of ammonia, nitrolim, and animal-products manure applied in amounts representing equal monetary values, the yields amounting to 41.8, 42.2, and 33.2 tons per acre, as against 29.9 tons from the untreated check.

[Report of field crops work in British Guiana, 1916], J. B. HARRISON (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1916, pp. 5–19*).—This reports the results of variety tests and hybridization studies with sugar cane and variety tests with rice, in continuation of similar work previously noted (E. S. R., 38, p. 229), together with a brief summary of the fertilizer experiments described above.

A new forage plant, F. B. LINFIELD (*Jour. Heredity, 9 (1918), No. 3, pp. 135–138, figs. 3*).—The growing of Russian sunflowers in Montana is briefly described. Yields of forage have varied from 25 to 30 tons per acre with the plants sown in rows 30 in. apart, the plants standing 9 to 12 ft. high. The crop is said to be as well liked as corn by dairy and beef cattle, either as a soiling crop or as silage.

A prospective new forage plant for the irrigated mountain valleys of the Northwest, F. B. LINFIELD (*Proc. Soc. Prom. Agr. Sci., 38 (1917), pp. 84–86*).—This briefly presents some of the data noted above.

Sunflower stems from Rhodesia (*Bul. Imp. Inst. [So. Kensington], 15 (1917), No. 3, pp. 329–334*).—Analyses of the pith of the sunflower for the manufacture of pith helmets and as a source of cellulose, and of the pith and entire stem for paper making, indicated that these products were not capable of competing with other raw materials already in use. The ash of the stems, constituting 10.7 per cent of the total weight and containing 49.6 per cent potash, is recommended as a source of crude potash or as a rich potash manure.

Sweet clover on corn belt farms, J. A. DRAKE and J. C. RUNDLES (*U. S. Dept. Agr., Farmers' Bul. 1005 (1919), pp. 28, figs. 9*).—The details of management and the more important farm practices followed in growing sweet clover on successful corn-belt farms, as one of the principal crops of the rotation and as a catch crop for soil improvement, are described. Cropping systems for different types of farms are outlined, and the necessity of liming, inoculating, and scarifying the seed is emphasized. It is stated that the crop has proved excellent for hay and pasture, is unequaled by any other legume for soil improvment, may be used to good advantage for silage, is frequently a profitable seed crop if properly managed, and mixed with blue grass makes a pasture with nearly double the carrying capacity of blue grass alone.

Tobacco seed beds, H. W. TAYLOR (*Union So. Africa, Dept. Agr. Bul. 7 (1917), pp. 12, figs. 3*).—Approved methods of preparation and management of the open-frame type of tobacco seed bed employed in South Africa are briefly described.

Crop-rotation systems adapted to sections infested with tobacco wilt, E. G. Moss and F. A. Wolf (*Bul. N. C. Dept. Agr., 38 (1917), No. 12, pp. 11, figs. 2*).—Fields tests with various cropping systems in an effort to control tobacco wilt in North Carolina are described, and different crop rotations deemed suited to local conditions are outlined.

Data obtained in experiments conducted at Creedmoor in 1916 showed 3.7 per cent wilt for tobacco after corn grown continuously for 5 years, 4.9 per cent after red clover and mixed grasses continuously, and 6 per cent after continuous wheat and cowpeas, as compared with 81.3 per cent after tobacco continuously. On land cropped to peanuts for 5 years tobacco showed 57.7 per cent wilt. Further tests to determine the length of rotation for tobacco showed wilt percentages of 12.6, 18.9, 10.9, and 2.3 for 4, 5, 6, and 7 year rotations, respectively, as compared with 53, 72, 81, and 97.6 per cent of wilt, respectively, for the check plats. Tobacco grown on land cropped to cotton for 4 years showed 5.2 per cent wilt in 1917, as compared with 97.6 per cent for tobacco grown continuously.

Tobacco growing in Cyprus, W. Bevan (*Bul. Imp. Inst. [So. Kensington], 15 (1917), No. 3, pp. 428–434*).—The revival of tobacco growing in Cyprus is noted, with special reference to local economic conditions. The production by Syrian refugees of "Latakia" tobacco, a process requiring fumigation of the leaves for four or five months, is described. A peculiar aroma is said to result, disguising the natural flavor of the tobacco and rendering the quality of the the leaf of less importance.

[The cultivation of ulla grass], R. S. Hole (*Indian Forester, 43 (1917), No. 11–12, pp. 479–[illegible]8*).—Experimental work on the production of ulla grass (*Anthistiria gigantea*), said to be a valuable paper pulp material, is described as conducted on the Pilibhit grasslands, United Provinces, India. Factors which were found to reduce the yield materially are the cutting of the immature leafy shoots, the burning over of the dry grasslands, and extensive grazing. Small areas of grassland treated in various ways indicated that maximum yields were obtained from cutting only the flowering and dead shoots and protecting the area from fire.

Sowing hairy vetch with fall crops at different rates, S. Rhodin (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 7–8, pp. 585–594; Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 157 (1917), pp. 12*).—Experiments were conducted from 1911 to 1915, inclusive, in four different localities to determine the influence of sowing hairy vetch at different rates with either rye or wheat. The vetch was sown throughout the tests at the rates of 70, 100, and 120 kg. per hectare (62.3, 89, and 106.8 lbs. per acre), but in three of the experiments it was sown with 10 or 80 kg. of rye, and in the fourth with 100 or 112 kg. of wheat per hectare, the smaller quantity in each case being used with the 70 kg. of vetch.

On the soils with an adequate lime content, the largest production of dry matter was secured from the lowest rate of sowing, while on the soils poor in lime the heaviest sowing gave the best results. This was brought out especially by the results on a marly clay soil on which the smallest quantity, 170 kg. of mixed seed containing only 41.2 per cent of vetch, produced 30 per cent more dry matter per hectare than was obtained from the largest quantity, 272 kg. of mixed seed with 51.7 per cent of vetch seed.

On soil relatively low in lime content the largest quantity of seed used produced over 25 per cent more dry substance than was obtained from the use of the smallest seed quantity. The yields from the medium quantity of seed on soils either rich or poor in lime were about an average of the yields secured from the lowest and highest rates of seeding.

On the basis of the increase in the yield of dry matter the use of hairy vetch in the seed mixtures was found profitable and the culture of this crop to a greater extent, especially in regions where droughts are likely to occur in spring and early summer, is recommended.

The mechanical factors determining the shape of the wheat kernel, S. BOSHNAKIAN (*Jour. Amer. Soc. Agron., 10 (1918), No. 5, pp. 205–209, fig. 1*).—Factors affecting the shape of the wheat kernel are briefly discussed, the shape and stiffness of the glumes being deemed the principal mechanical influence involved. Other factors of a mechanical nature receiving consideration include the size and shape of the space in which the grain develops, the number of grains in the spikelet and their position, the density of the head, and the pressure caused by the growth of different parts of the head. Purely genetic factors are said to be responsible for the production of certain grain forms, as illustrated by the shortness of the grain of the club wheats, the unusual length of Polish wheats, etc.

The effect of sodium nitrate applied at different stages of growth on yield, composition, and quality of wheat, II, J. DAVIDSON and J. A. LECLERC (*Jour. Amer. Soc. Agron., 10 (1918), No. 5, pp. 193–198*).—In continuation of work previously noted (E. S. R., 38, p. 438), the authors present and discuss additional data to show the effect of various applications of nitrate of soda upon the ash, potash, and phosphoric acid content of the wheat grain and upon the nitrogen content of the straw. Experimental work conducted in Nebraska during 1917 is said to have corroborated fully the previous observations with respect to the specific effect of nitrogen at the different stages of growth and with regard to the advisability of laying out the plats after the crop is up.

No distinct effect of the different treatments upon the ash, phosphoric acid, or potash content of the grain was noted. The protein content of the straw, however, showed the same general tendencies as that of the grain, increasing with nitrate applications at the second stage of growth. Increased yields of straw as well as of grain followed the application of nitrates at the first stage. Potassium chlorid seemed to depress the protein content of the straw.

The wheat problem, W. CROOKES (*New York and London: Longmans, Green, & Co., 1917, 3. ed., rev. and enl., pp. XVI+100, figs. 2; abs. in Nature [London], 100 (1918), No. 2518, pp. 422, 423*).—This is a third and revised edition of a previous work, with an introduction by Lord Rhondda, an additional chapter by the author on Recent Developments of the Wheat Problem, bringing the statistical information up to date, and a chapter by R. H. Rew on Future Wheat Supplies. The author's thesis, briefly stated, is that since a large and progressively increasing proportion of the world's inhabitants feed upon wheat the time will arrive when the world's wheat production will not meet the demand and famine must follow. The possibility of increasing the acreage planted to wheat is shown to be approaching finality, necessitating an increased yield per acre which he maintains can be most readily achieved by the increased use of nitrogenous fertilizers. Maintaining further that the world's demands for these fertilizers would rapidly exhaust all existing supplies (sulphate of ammonia, nitrate of soda, and guano), the fixation of atmospheric nitrogen by chemical processes is deemed to be the only practicable solution of the problem.

The chapter by R. H. Rew, based on more recent and detailed statistics, indicates the possibilities of extending the world's wheat supply without cheap nitrogenous fertilizers.

Yautia and gabi tests, R. A. ABADILLA (*Philippine Agr. and Forester, 6 (1917), No. 2–3, pp. 45–54*).—Field tests of different planting methods, of varieties of yautias, and of the relative value of that crop and of gabis and dasheens in the Philippines are described.

Maximum yields obtained from different varieties of these crops planted 1 by 1 meter (3.28 ft) apart in the field amounted to 33,205 kg. per hectare (about 14.8 tons per acre) for yautias, 5,200 kg. for dasheens, and 5,217 kg. for gabis. Yautias planted 1.5 by 1.5 meters apart produced a maximum yield of only 15,199 kg. per hectare. Several varieties planted as an intercrop among coconuts, on plateaus (about 400 meters in elevation), in cultivated *caiñgins*, in uncleared and uncultivated *caiñgins*, on coffee plantations, and after cogon (*Imperata* sp.) have produced maximum yields of 26,008, 26,116, 28,495, 18,830, 21,010, and 22,772 kg. per hectare, respectively.

Plant breeding and controlled seed farms (*Jour. Bd. Agr.* [*London*], *23* (*1917*), *No. 11*, *pp. 1081–1087*, *pls. 2*).—The necessity of adequate seed control in England, with special reference to the production and distribution of new and improved varieties of seeds and of guarantied "pure" stocks of established varieties, is discussed. The organization at Svalöf, Sweden, for the improvement of seed is described and some of its achievements briefly noted.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr.*, *2* (*1918*), *No. 4*, *pp. 8*).—Statistical data are presented showing the commercial stocks, sales, and seed requirements for the United States of 26 different kinds of field seeds in the different geographical divisions (E. S. R., 39, p. 138), as determined by the seed survey of July 1, 1918. Based on this survey, data are also given showing the average difference in price at which stocks were sold for seed and the price at which they were sold for food, feed, or manufacturing purposes.

The commercial stocks, receipts, and exports of field, vegetable, and root crop seeds in Canada are reported in tabular form from data obtained in a seed survey made July 1, 1918, by the Dominion Department of Agriculture.

Other subjects dealt with include the damage by rain to California vegetable seed crops; the millet seed outlook; timothy, clover, and alfalfa seed prices; and notes on market conditions at Chicago and Milwaukee. The usual tabulated data are presented showing the imports of field, vegetable, and flower seeds into the United States and of forage plant seeds permitted entry into the United States.

HORTICULTURE.

Home gardening in South Carolina, C. C. Newman (*Clemson Agr. Col. S. C., Ext. Bul. 42* (*1918*), *pp. 48*).—Practical directions are given for growing all the more common vegetables, including a list of varieties recommended for the home garden and planting tables.

Gardening for women, Alice de Bleyne (*Le Jardin de la Femme. Paris: Albin Michel, 1919, pp. 95, figs. 7*).—A popular treatise on flower and vegetable gardening, with special reference to French conditions.

How some of our common vegetable diseases and insect pests pass through the winter, and what can be done toward controlling them at that time, A. Frank (*Washington Sta., West. Wash. Sta. Mo. Bul.*, *6* (*1918*), *No. 8*, *pp. 117–120*).—A brief description is given of the way the important vegetable diseases and pests live during the winter season, with methods for their destruction at that time or methods that will aid in their control the following season.

Home storage of vegetables, J. R. Cooper (*Arkansas Sta. Circ. 46* (*1918*), *pp. 4*).—This circular contains practical directions for the home storage of different classes of vegetables.

Fruit growing in the Province of Gelderland between the Rhine and the Meuse, R. van der Veen (*Dept. Landb., Nijv. en Handel* [*Netherlands*], *Verslag.*

en Meded. Dir. Landb., No. 1 (1918), pp. 157, pls. 2).—A report of a survey of the fruit industry in the part of Gelderland situated between the rivers Rhine and Meuse. It includes information relative to the extent of the industry, soils, planting, fertilizing, diseases, pruning, varieties, marketing, financial returns, and instruction in fruit growing. A fruit tree census, showing kinds and varieties of fruits, age, diameter, spread, and yield of trees, is appended to the report.

Dusting fruit trees for insects and disease, W. S. Blair (*Agr. Gaz. Canada, 6 (1919), No. 1, pp. 16–18*).—The results secured by the author during the seasons of 1917 and 1918 indicate that if dusting is properly done it should prove as effective as spraying. The results of tests conducted in 1918 are presented in tabular form and indicate that dusting was practically as efficient as lime-sulphur in controlling scab and insect injury. Dusting resulted in the saving of considerable time, but the cost of four applications per acre (40 trees) was $26.55 more than where the trees were sprayed.

The cutinization of apple skins in relation to their keeping qualities and their environment, Winifred Perry and J. N. Martin (*Trans. Iowa Hort. Soc., 52 (1917), pp. 180–192, figs. 37; abs. in Proc. Iowa Acad. Sci., 24 (1917), pp. 483, 484*).—The authors present the results of a study of several varieties of apples obtained from Iowa, New York, Arkansas, and Washington, with special reference to the relationship existing between the cutinization of the apple skin and the keeping quality and environment of the apple.

The work showed a relation between the thickness of the cutinized area and the records of the keeping qualities of the different varieties of apples studied, as well as a relationship between the amount of cutinization and the moisture during the growing period. No correlation was observed between cutinization and the mean temperature of the different States during the growing period, nor did the percentage of sunshine during the growing period seem to be an important factor in the cutinization of apple skins.

Grape culture, R. E. Marshall (*Va. Polytech. Inst. Ext. Bul. 34 (1919), pp. 23, figs. 5*).—A practical treatise on grape culture, including a list of varieties of the common American grape recommended for planting in Virginia. In addition, notes are given on the methods of growing and pruning Muscadine grapes.

Agricultural explorations in Mexico, W. Popenoe (*Cal. Citrogr., 4 (1918), Nos. 1, pp. 2, 3; 2, pp. 29, 43, 46–48, figs. 4*).—These are the first two of a series of papers dealing primarily with avocados, but also with many other Mexican fruits and economic plants.

The etrog or cedrat of the Hebrews, J. E. Coit (*Cal. Citrogr., 4 (1918), No. 1, p. 3, figs. 3*).—The author presents suggestions relative to the possibility of growing etrogs (*Citrus medica*) in California for supplying Hebrew trade in connection with religious ceremonies.

Furrow-manure method of feeding orange trees, A. D. Shamel (*Cal. Citrogr., 4 (1918), No. 1, pp. 5, 18, figs. 3*).—This paper comprises answers to a number of inquiries relative to the method of distributing manure in citrus orchards in Bahia, Brazil, previously described (E. S. R., 38, p. 845).

Notes on a navel variety of the Satsuma orange, D. B. Mackie (*Cal. Citrogr., 4 (1918), No. 1, pp. 20, 21*).—The author calls attention to a navel strain observed in a variety of the Satsuma, known in Japan as Owari, and gives a summary of a study of this strain conducted by A. Kikuchi, of the Yamagawa Experiment Station. A wide range of variation was observed relative to the number of navel and normal fruits borne on the same tree. Measurements of these fruits showed that the navel fruits averaged larger and heavier as compared with normal fruits growing on the same tree.

Tangelos: What they are.—The value in Florida of the Sampson and Thornton tangelos, W. T. SWINGLE and T. R. ROBINSON (*U. S. Dept. Agr., Bur. Plant Indus., 1918, pp. 3*).—The tangelos described in this document originated as the result of crosses made by the Department of Agriculture between the tangerine orange and the grapefruit. The two varieties here described have been grown in a small way only and, until recently, chiefly for home use. In view of the present tendency to make commercial plantings of tangelos in Florida, special attention is called to the characteristics of these two types and precautions necessary for producing fruit of good quality. The success of these first two hybrids has led to the creation of hundreds of additional hybrids between all the Mandarin types of orange, including several varieties of tangerines, the King and Satsuma oranges, and the better types of grapefruit and pummelo. The resulting tangelos are now being tested out.

The authors state that for the canker-infested portions of the Gulf Coast States west of Florida there is reason to believe that some of these tangelos will be found of marked canker resistance. The Natsu-mikan, a fruit similar to the tangelo and possibly a spontaneous hybrid of an orange of the Mandarin type with a Japanese pummelo, seems to be decidedly canker resistant, both in Japan and in this country. Furthermore, some of the tangelos developed by the Department have been practically canker resistant as tested at the Philippine College of Agriculture. Hybrids between canker-resistant pummelos and other citrus fruits made in Japan in 1915 and in subsequent years are being tested for canker resistance, both in Japan and in the Philippine Islands.

Questions on frozen citrus fruits and trees, H. J. WEBBER and C. S. MILLIKEN (*Cal. Citrogr., 4 (1919), No. 4, pp. 78, 99, 101, 103, figs. 3*).—This paper contains information on the effects of freezing on fruits and trees, based on an investigation conducted by the members of the staff of the California Citrus Experiment Station after the freeze of 1913.

Coconut cultivation and plantation machinery, H. L. COGHLAN and J. W. HINCHLEY (*London: Crosby Lockwood & Son, 1917, 2. ed., pp. XII+128, pls. 10, figs. 7*).—This work deals with the culture of coconuts, with special reference to Malayan conditions. The successive chapters discuss soil and climatic conditions, preparation of the land, seed nuts and cultural operations, pests, management of the crop, copra, coir, estimates of costs and profits from the coconut and coconut products, machinery and plant for coconut factories, and catch crops. A supplementary article briefly discusses various phases of the coconut industry in the West Indies. General information and plantation tables are appended.

Medicinal herbs, J. CHAPPELL (*Jour. Roy. Agr. Soc. England, 78 (1917), pp. 72–84*).—A descriptive account of various classes of medicinal herbs, including methods of gathering and preparing the different parts of the plants for market.

How to propagate bedding plants by cuttings, T. J. SHEWARD (*Gard. Chron. Amer., 23 (1919), No. 2, pp. 46, 47, figs. 68*).—A plate with descriptive text is given illustrating a large number of bedding plants and methods of propagating them.

The ideal farm greenhouse, C. JENSEN (*Okla. Agr. Col., Ext. Div. Circ. 83 (1918), pp. 4, figs. 7*).—This circular contains directions with plans and illustrations for constructing a greenhouse from standard size 3 by 6 ft. hotbed sash.

Beautifying the home grounds, C. JENSEN (*Okla. Agr. Col., Ext. Div. Circ. 85 (1919), pp. 7, figs. 3*).—This circular contains suggestions relative to laying out and planting the home grounds, including a list of planting material adapted to Oklahoma conditions. The text is accompanied by plans of farmstead and town lots.

A plan for the development of the village of Grand Canyon, Ariz., F. A. Waugh (*U. S. Dept. Agr., Forest Serv., 1918, pp. 23, fig. 1*).—This publication outlines a tentative working plan for the physical growth of the village of Grand Canyon, Ariz., and the development of parks and roads in adjacent territory.

FORESTRY.

Notes on North American trees.—II, Carya, C. S. Sargent (*Bot. Gaz., 66 (1918), No. 3, pp. 229–258*).—This is one of a series of papers on the distribution and characteristics of North American trees (E. S. R., 39, p. 50). In the present paper a conspectus of the Carya species of the United States is given, and some 15 species and a number of varieties and supposed hybrid Carya are described.

Notes on North American trees.—III, Tilia, I–II, C. S. Sargent (*Bot. Gaz., 66 (1918), Nos. 5, pp. 421–438; 6, pp. 494–511*).—A paper similar to the above in which are considered 15 species and a number of varieties of Tilia. A conspectus of the Tilia species of the United States is included.

Tree distribution under the Kinkaid Act, 1911 (*U. S. Dept. Agr., Forest Serv., 1918, rev. ed., pp. 13, figs. 6*).—A revised edition of this document (E. S. R., 36, p. 143.)

Landscape engineering in the National Forests, F. A. Waugh (*U. S. Dept. Agr., Forest Serv., 1918, pp. 38, figs. 8*).—This document contains practical suggestions for National Forest supervisors and rangers relative to the layout of special-use permit areas for summer colonies, the location of trails where serious consideration is given to the beauty of surrounding scenery, and the location and development of ranger stations.

Forest fires in North Carolina during 1915, 1916, and 1917, and present status of forest fire prevention in North Carolina, J. S. Holmes (*N. C. Geol. and Econ. Survey, Econ. Paper 48 (1918), pp. 89*).—A statistical report on forest fires during the three years 1915, 1916, and 1917, together with an account of present forest protective activities and needed legislation.

Scientific forestry for Latin America, B. Moore (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 822–834*).—The author discusses the importance and meaning of forest conservation and when it should be begun; the relation of forestry to science; cooperation between foresters and botanists; the development of scientific forestry in the three stages of observations, special studies, and experiment stations; research in forest products and economics; and obstacles to be encountered.

Some problems of re-afforestation, W. Somerville (*Jour. Roy. Agr. Soc. England, 78 (1917), pp. 51–63*).—The author presents notes on a number of conifers that have been tried out on a small scale in Great Britain and are believed to be worthy of attention in re-afforesting cut-over lands.

The forestry museum at Kew, W. Dallimore (*Quart. Jour. Forestry, 13 (1919), No. 1, pp. 38–40*).—A descriptive account of the Museum of British Forestry.

The forests of Alsace Lorraine, G. Huffel (*Rev. Eaux et Forêts, 56 (1918), No. 12, pp. 265–280*).—A statistical and descriptive account of the forests and forest management in Alsace Lorraine.

Note on the preparation of turpentine, rosin, and gum, from Boswellia serrata gum-oleo-resin, R. S. Pearson and Puran Singh (*Indian Forest Rec., 6 (1918), No. 6, pp. 43, pls. 4*).—This paper embodies the results of an inquiry to determine the commercial possibilities of the gum-oleo-resin from *B. serrata*. Parts 1 and 2 deal with the native uses of gum-oleo-resin, the distribution of

B. serrata, method of tapping, effect of tapping on the tree, cost of extraction, and outturn. The succeeding parts comprise a chemical study of the gum-oleo-resin and its constituents, together with recommendations relative to a proposed experimental plant, methods of extraction, and preparation of the products for market. Information is also given relative to the industrial uses of the products and their commercial valuation, as determined by the Imperial Institute at London and a number of firms to which samples were submitted.

DISEASES OF PLANTS.

Botany and plant diseases, H. H. Whetzel (*West. N. Y. Hort. Soc. Proc., 63 (1918), pp. 63–71*).—This is a report with discussion of plant diseases considered important to fruit growers in New York State. It includes apple scab, stippin, and black root rot; cherry-leaf blight (shot hole or yellow leaf); peach brown rot, scab, and leaf curl; and gumming of plum fruits.

Some meliolicolous parasites and commensals from Porto Rico, F. L. Stevens (*Bot. Gaz., 65 (1918), No. 3, pp. 227–249, pls. 2, figs. 5*).—An account is given of about 50 Meliolas and of the fungi found associated with each as parasites or commensals, a large proportion of the fungi so associated being described as new species.

[Plant enemies and diseases in Switzerland], H. Müller-Thurgau, A. Osterwalder, and O. Schneider-Orelli (*Landw. Jahrb. Schweiz, 31 (1917), No. 5, pp. 416–426*).—The department received during the year specimens or accounts indicating injury by a considerable number of animals and microorganisms to fruit, garden, and other economic plants.

[Java plant diseases], W. Roepke (*Meded. Proefstat. Midden-Java, No. 28 (1917), p. 16*).—This report mentions briefly abnormal growths of cacao, coffee, and Hevea, also canker and a root fungus (*Hymenochæte noxia*) of the last named.

Life history studies in Sclerotinia, F. J. Seaver and W. T. Horne (*Mem. Torrey Bot. Club, 17 (1918), pp. 202–206, pl. 1*).—The author reports finding in Van Cortlandt Park, New York City, on rootstalks of *Geranium maculatum* a fungus (conidial form of *Botrytis* sp.) described as new and named *Sclerotinia* (*Stromatinia*) *geranii*.

A new Plasmodiophoraceæ, Ligniera isoetis, B. Palm (*Svensk Bot. Tidskr., 12 (1918), No. 2, pp. 228–232, figs. 3*).—An account is given of the parasitization of *Isoetes lacustris* by an organism which is technically described as a new species under the name *L. isoetis*.

Plasticity of biologic forms of Puccinia graminis, E. C. Stakman, F. J. Piemeisel, and M. N. Levine (*Jour. Agr. Research [U. S.], 15 (1918), No. 4, pp. 221–250, pls. 3, figs. 9*).—In an account of cooperative investigations made by the Minnesota Experiment Station and the U. S. Department of Agriculture, the authors give the results of extensive experiments with a number of forms of rust from different hosts from different regions to determine the theoretical and practical importance of the plasticity of biologic forms of *P. graminis*. The authors have also investigated the possible rôle of the barberry as a bridging host and its effect as a reinvigorator of the rust. Material was obtained from many different sources, most of the work being done with the *tritici* and *secalis* forms, although a number of others were included in the investigation.

The barberry was found not to increase the host range of biologic forms and not to act as a reinvigorator of the rust. Many hosts equally susceptible to the rust were used in an attempt to change the parasitism of the two forms, but without evident results. The authors consider that the data presented in the present paper do not support the conclusions of previous workers that the pathogenicity of biologic forms is easily changed by host influence. From the practical standpoint the constancy of biologic forms is considered of great importance, and it is believed that breeding for rust resistance can proceed with considerable assurance that the same rust will not adapt itself quickly to new varieties. Biologic forms are believed to have arisen either by mutation or by gradual process of evolution. These processes may be still operative, but the authors have been unable to detect any mutation or to produce any perceptible evolutionary changes experimentally. The possible rôle of hybridization is to be investigated.

Angular leaf spot of cucumber: Dissemination, overwintering, and control, E. CARSNER (*Jour. Agr. Research [U. S.], 15 (1918), No. 3, pp. 201–220, pls. 4, figs. 3*).—A report is given of cooperative investigations, carried on by the Wisconsin Experiment Station and the U. S. Department of Agriculture, on the dissemination, overwintering, control, and other data regarding the angular leaf spot of cucumber. This disease, which is said to be due to *Bacterium lachrymans*, is believed to be world-wide in its distribution and is regarded as of considerable economic importance.

Infection occurs in both leaves and fruit, the organisms entering the plant through the stomata. Evidence has been obtained indicating that the causal bacteria overwinter in the seed, and seed treatment is believed to offer the greatest hope of satisfactory control. The causal organism is sensitive to desiccation, is readily killed in artificial media by freezing, and is also readily killed by dilute solutions of formaldehyde, copper sulphate, or mercuric chlorid. No marked difference in varietal resistance or susceptibility has been found among horticultural varieties of cucumbers. Infection by this organism seems to be limited to cucurbits, a few ornamental gourds being attacked by the disease, but the cucumber appearing to be the only one seriously affected.

Sanitary measures, such as precautions in picking and in insect control, may be helpful, and spraying with Bordeaux mixture checks the disease, but is not thought by the authors to be practicable on a commercial scale.

Anthracnose of cucurbits, M. W. GARDNER (*U. S. Dept. Agr. Bul. 727 (1918), pp. 68, pls. 8, figs. 15*).—The results are given of studies carried on under cooperative arrangement between the Bureau of Plant Industry, U. S. Department of Agriculture, the Wisconsin Experiment Station, and certain cucumber growers during the seasons of 1915, 1916, and 1917.

The fungus *Colletotrichum lagenarium*, the cause of anthracnose of cucurbits, is said to be limited to hosts of the family Cucurbitaceæ, being of greatest economic importance on cucumber, muskmelon, and watermelon. In addition other species of cucurbits are reported to be subject to attack, but anthracnose has not been found as a vine disease on species of the genus Cucurbita, which includes squash, pumpkin, and certain gourds. Serious losses are reported to be caused to the watermelon-growing industry and among cucumbers grown for slicing purposes, the loss in the pickle crop not being very great. Leaves, stems, and fruits are attacked, and the plants may be killed or the fruit blemished so as to be practically worthless.

Studies are reported on the life history of the causal organism in relation to the disease. It is claimed that it spreads in the field from centers of one or two infected plants, the spread being rapid following rainy periods when the temperatures are not far from 75° F. The principal agencies of dissemination in the field are rain and surface drainage water. The disease has been noted as especially destructive in fields where artificial overhead watering is practiced, and evidence has been obtained that it has been spread by the hands of workmen during the process of culling watermelon fields. Evidence presented seems to indicate that the disease is borne by the seed, and also that the fungus overwinters in diseased vine débris buried in the soil.

Experiments with sprays have shown that Bordeaux mixture checks but does not prevent the spread of the fungus, as the lower epidermis of the sprayed leaves is usually unprotected. It is believed that disinfection of the seed by means of immersion for 5 minutes in mercuric chlorid solution (1:1,000) will destroy all surface infection. The use of disease-free seed and a proper crop rotation to insure clean soil are recommended as control measures.

The effects of potato leaf roll on product, C. S. Wennink (*Tijdschr. Plantenziekten, 24 (1918), No. 1, Bijbl., pp. 1–4, figs. 5*).—Four potatoes affected with leaf roll which were used for seed gave an output about equal in weight to the original seed tubers, control plants on the same healthy ground producing normally.

A carrier of the mosaic disease, M. Nishimura (*Bul. Torrey Bot. Club, 45 (1918), No. 6, pp. 219–233, pl. 1*).—In experimentation here described, the author found that *Physalis alkekengi* may act as a carrier of the mosaic disease attacking tobacco, tomato, and other plants without itself showing any symptoms of the disease.

Latest information on fruit diseases and their control, H. H. Whetzel (*West. N. Y. Hort. Soc. Proc., 63 (1918), pp. 63–71*).—This report relates chiefly to diseases of fruit as affecting interests of New York growers.

Apple scab, which was favored by conditions during the season of 1917, was found to be as effectively controlled by dusting as by spraying. Prevention of the first infection still appears to be a measure of primary importance. Black root (collar) rot of apple has been found in practically constant association with *Xylaria* spp. The infection persists in the soil for a number of years, and is also said to attack pears.

Cherry leaf blight, one of the most serious cherry diseases, is not controlled by the dormant spray. Lime-sulphur or dust sulphur applied just before blooming may prove to be an important measure in a rainy season. An application just before the petals fall, another 10 to 14 days later, and a third just after the fruit is picked give practically clean foliage throughout the average season. Bordeaux mixture is apt to injure the foliage of sweet cherries. Sour cherries may be protected by use of Bordeaux mixture at 5:5:50, lime-sulphur 1:50, or ground sulphur with lead arsenate 9:1.

Peach brown rot, while seldom serious in New York, is controlled by the treatment for scab—that is, the sulphur-lead arsenate dust, which also deepens the red color of the fruit. Leaf curl is effectively controlled with copper sulphate 2:50 or lime-sulphur 1:15 or 1:20.

Plum fruit gumming has been reported from several parts of the State as causing a loss amounting to 50 per cent in one instance.

Tests of lime-sulphur for the control of apple mildew, A. Osterwalder (*Landw. Jahrb. Schweiz, 31 (1917), No. 5, pp. 442–444*).—Tests of lime-sulphur during 1915 to 1917 at a strength of 1:30 after a dormant treatment at a strength of 1:2, showed no effective control of apple mildew in case of susceptible varieties. The fungus (*Podosphæra leucotricha*) appears to winter in the buds, attacking the inclosed parts before they begin to open in the spring and spreading the infection by means of spores soon after the blooms open.

Bacterial and fungus diseases of the pear, G. P. Weldon (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 5, pp. 343–370, figs. 21*).—In this paper, the author gives a condensed account of information at present available regarding pear blight (*Bacillus amylovorus*), canker (*Sphæropsis malorum* and *Nectria* spp.), crown gall (*Pseudomonas tumefaciens*), oak root fungus (*Armillaria mellea*), and scab (*Venturia pyrina*), as regards distribution, progress, and control.

Pear blight epidemic in mountain counties, G. P. Weldon (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, p. 459*).—It is stated that pear blight was very severe during this season in some places where it was scarcely known previously. It was reported as spreading through orchards generally in Nevada, Placer, Eldorado, and Butte Counties.

Studies on grape downy mildew, L. Ravaz (*Ann. Ecole Nat. Agr. Montpellier, n. ser., 15 (1917), No. 4, pp. 290–323, figs. 5*).—The author gives an account of studies and observations conducted since 1914 on the treatment of grape downy mildew.

The various methods proposed for the preparation of Burgundy mixture do not appear to possess any advantages over the standard procedure. The presence of carbon dioxid favors the production of changes in the precipitate which are advantageous. Neutral and alkaline Bordeaux mixture are about equally efficacious, the acid preparation being inferior to both. Inadequately prepared lime may burn the foliage.

Other sprays, singly or combined, gave insufficient or inconclusive results. Copper powders were almost completely protective against both mildew and Oidium. Recent studies show the importance of temperature and of precipitation in relation to mildew development and treatment for that disease.

Spoilage of cranberries after picking, C. L. Shear (*Proc. Amer. Cranberry Growers' Assoc., 48 (1917), pp. 6–9*).—Experimentation extending over several years is said to show that about one-half the loss of berries after picking is due to fungi which develop in the fruit, causing one or more destructive storage rots, the most frequent and important of these during recent years being early rot (scald), bitter rot, and end rot. Other causes are freezing and premature death of the fruit caused by rapid ripening or suffocation, the latter of which is discussed in connection with preventive measures. See also a previous abstract (E. S. R., 39, p. 749).

Cacao diseases, G. d'Utra (*Bol. Agr. [Sao Paulo], 18. ser., No. 9 (1917), pp. 693–711*).—The diseases here discussed include brown rot (*Phytophthora faberi*); a root, fruit, and shoot disease due to *Lasiodiplodia theobromæ*; a canker possibly different from that caused by *Nectria theobromæ* in Central America; and a root rot which is associated with the presence of several fungi.

[Diseases of coffee], T. Wurth (*Meded. Proefstat. Malang, No. 22 (1918), pp. 18–20*).—In connection with brief statements regarding animal parasites, including nematodes, the author notes the occurrence of brown rot fungus of coffee and white threads on the roots of the plantlets.

Sclerotium disease of Liberia coffee in Surinam, G. Stahel (*Meded. Dept. Landb. Suriname, No. 13 [1918], pp. 2*).—This coffee disease, which has been discussed in connection with *Coremium* sp. by Kuyper (E. S. R., 30, p. 750) and which has become serious since 1917, is briefly described herein as regards its developmental phases in relation to weather conditions.

Disease control and forest management, F. H. Miller (*Jour. Forestry, 15 (1917), No. 8, pp. 974–977*).—Concluding a brief discussion, the author states that combining disease control with intensive forest management calls for an adjustment of the rotation, cutting cycle, and marking rules in such ways as, in the case of enphytotics, to control disease by sanitation measures and by limiting the felling age so as to minimize loss, and in the case of epiphytotics, to institute sanitation cuttings or damage cuttings, or both, employing also such silvicultural measures as the substitution of immune or more resistant species.

Experimental investigations on the genus Razoumofskya, J. R. WEIR (*Bot. Gaz., 66 (1918), No. 1, pp. 1–31, figs. 19*).—In this article, the first of a proposed series, it is claimed that *R. campylopoda* and *R. cryptopoda* are not identical, each form exhibiting considerable variation with host and with geographic location. *R. campylopoda* can infect *Pinus resinosa*, and its invasion of eastern United States is feared. It can also infect *P. sylvestris* and *P. montana*, and may be a source of danger to interests in Europe. Apparently *R. occidentalis abietina* is a biological form of *R. campylopoda*.

R. laricis will infect *Larix europea*, *L. leptolepis*, *Abies grandis*, *P. ponderosa*, and *P. contorta*, all except the last named being new hosts for this species. Apparently this parasite infects Japanese and European larch. It is, so far as known at present, of economic importance only on *L. occidentalis*.

R. douglasii abietina is identical with *R. douglasii*, which is of importance only in connection with *Pseudotsuga taxifolia*. *R. americana* can infect both hard and soft pines, being of importance on *Pinus contorta* and *P. banksiana*. *R. tsugensis* can infect *A. lasiocarpa* and *Tsuga canadensis*.

Many characters of false mistletoes vary with change of host, geographic location, and various environmental factors, this circumstance suggesting that only the broader and more plainly evident lines should be observed in classification.

Injury to evergreens, G. V. NASH (*Jour. N. Y. Bot. Gard., 19 (1918), Nos. 219, pp. 48–50; 223, pp. 159–164*).—The author shows that after withstanding from February 5 to 15, 1918, temperatures ranging between −6 and +54° F. with somewhat sudden changes, the soil remaining frozen during the whole period, severe injury was inflicted on evergreens in the New York Botanical Garden on February 15, when the temperature rose to 56°. Wind is considered as a most important factor. Reference is made to the degree of injury noted in March to certain evergreens which were affected during this period.

In the second note, written late in June, an account is given of developments subsequent to the time reported upon previously. A list is given of evergreens which proved unsatisfactory under the severe conditions of the 1918 winter.

Resistance of oaks to Oïdium, L. MONTEMARTINI (*Riv. Patol. Veg., 9 (1918), No. 5–6, pp. 77–79*).—The author has given to American oaks a study along the lines followed by Pantanelli (E. S. R., 34, p. 650) on European species. He announces as a result of analytical determinations that in American oaks the conditions of receptivity are stability and coincidentally a ratio of more than 1:2 between soluble and insoluble nitrogen, the latter form greatly predominating in the American oaks examined.

[Diseases affecting rubber production], T. WURTH (*Meded. Proefstat. Malang, No. 22 (1918), pp. 7–15*).—This report deals in a somewhat general way with injury to rubber interests through such agencies as canker, scab, leaf diseases, sheet mold, rustiness, and greasy and other abnormal appearances of sheet rubber, with a discussion of some preventive or remedial measures.

A method for determining the fungicidal coefficient of lime-sulphur and other common fungicides, H. C. YOUNG and E. H. COOPER (*Ann. Rpt. Mich. Acad. Sci., 19 (1917), pp. 221–236*).—The authors have devised a method for the laboratory determination of the copper sulphate coefficient of fungicides, depending upon comparison with a phenol solution of standard strength. Several commercial preparations of lime sulphur, ammoniacal copper carbonate, and neutral copper acetate have been tested, the organisms employed for this purpose being *Glomerella rufomaculans* and *Endothia parasitica*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The criterion of subspecific intergradation in vertebrate zoology, H. C. OBERHOLSER (*Science, n. ser., 48 (1918), No. 1233, pp. 165–167*).

Helping to stabilize nomenclature, S. A. ROHWER (*Science, n. ser.,* 48 (*1918*), *No. 1227, pp. 13, 14*).

The control of destructive animals, E. E. SCHOLL and J. W. NEILL (*Tex. Dept. Agr. Bul. 60 (1918), pp. 5–19*).—The more destructive birds and mammals are briefly considered and directions given for their control.

A revision of the Microtus californicus group of meadow mice, R. KELLOGG (*Univ. Cal. Pubs. Zool., 21 (1918), No. 1, pp. 42, fig. 1*).—This revision is based upon a study of approximately 790 specimens in 114 localities, all but one being within the State of California. Eleven forms are recognized, of which six are described as new subspecies.

A bibliography of 15 titles is appended.

Our winter birds.—How to know and how to attract them, F. M. CHAPMAN (*New York and London: D. Appleton & Co., 1918, pp. IX+180, pls. 2, figs. 19*).—A popular handbook.

The migration of North American birds, IV–VI, H. C. OBERHOLSER (*Bird Lore, 20 (1918), Nos. 3, pp. 219–222, pl. 1; 4, pp. 286–290, pl. 1; 5, pp. 345–3*[illegible] *pl. 1, fig. 1*).

Some useful birds found in Minnesota: Their economic relations to the agriculturist, F. L. WASHBURN (*Minn. State Ent. Circ. 43 (1917), pp. 47, pls. 3, figs. 25*).—This is a popular account illustrated by color plates of some of the species considered.

Pheasants and agriculture, MISS A. F. C.-H. EVERSHED (*Jour. Agr. Sci. [England], 9 (1918), No. 1, pp. 63–91*).—The results of an investigation of the contents of the crops of 311 pheasants are reported, largely in tabular form. In an introduction by C. Warburton the nature of the food of the pheasant is briefly analyzed month by month, as far as it is revealed by the crops sent for examination.

Woodpeckers and cacao, A. H. RITCHIE ET AL. (*Jour. Jamaica Agr. Soc.,* 22 (*1918*), *Nos. 2, pp. 65–69; 3, pp. 102–107*).—This is a report of an investigation of the economic status of the Jamaica woodpecker (*Centurus radiolatus*).

Diagnosis of a new genus of Anatidæ from South America, H. C. OBERHOLSER (*Jour. Wash. Acad. Sci., 8 (1918), No. 17, pp. 571, 572*).

The subspecies of Larus hyperboreus, H. C. OBERHOLSER (*Auk, 35 (1918), No. 4, pp. 467–474*).

Food habits of the mallard ducks of the United States, W. L. McATEE (*U. S. Dept. Agr. Bul. 720 (1918), pp. 35, pl. 1*).—This is a report of technical studies of the food habits of three mallard ducks, namely, the common mallard (*Anas platyrhyncha*), the dusky or black duck (*A. rubripes*), and the southern black duck (*A. fulvigula*). These river ducks rarely dive so as to disappear entirely beneath the water, but obtain their food in shallows by dipping the head and neck or by submerging all of the body but the tipped-up tail. Thus the food is usually obtained within 12 to 16 in. of the surface.

In the study of the common mallard, analyses of the contents of 1,578 stomachs collected in 22 States and 2 Canadian Provinces showed 9.47 per cent of the food to be derived from the animal kingdom.

In the study made of the black duck, analyses of the contents of 390 stomachs collected from September to February in 19 States and 2 Canadian Provinces showed the total percentage of vegetable food to be 75.91, or about three times as much animal food as that of the mallard. In the study of the southern black duck, analyses were made of the contents of 48 stomachs collected from November to April and representing all the usual haunts of the species. The amount of animal matter in its diet amounted to 40.5 per cent, thus exceeding the proportion taken by the black duck by approximately 15 per cent.

Identifications made of the animal and vegetable food in the stomachs of the three species are reported upon in tabular form.

The hawks of the Canadian Prairie Provinces in their relation to agriculture, P. A. TAVERNER (*Canada Dept. Mines, Geol. Survey, Mus. Bul. 28 (1918), pp. 14, pls. 4, figs. 7*).—A popular account.

Cause of the "fishy" flavor of the flesh of wild ducks, W. L. MCATEE (*Auk, 35 (1918), No. 4, pp. 474–476*).

Injurious insects and useful birds, F. L. WASHBURN (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. XVIII+453, pls. 4, figs. 414*).—This work is intended to serve as a textbook and guide to the successful control of farm pests.

Report on agricultural damage by vermin and birds in the Counties of Norfolk and Oxfordshire in 1916, R. T. GUNTHER (*London: Oxford Univ. Press, 1917, pp. 92; rev. in Nature* [*London*], *101 (1918), No. 2525, p. 48*).—A report of studies made under the auspices of the Oxford School of Rural Economy.

The wonders of instinct, J. H. FABRE, trans. by A. TEIXEIRA DE MATTOS and B. MIALL (*London: T. Fisher Unwin, Ltd., 1918, pp. 320, pls. 16*).—A translation from the French of chapters on the psychology of insects.

The polyhedral virus of insects with a theoretical consideration of filterable viruses generally, R. W. GLASER (*Science, n. ser., 48 (1918), No. 1238, pp. 301, 302*).—These data supplement the account previously noted (E. S. R., 37, p. 253).

A summary is given of the chief characteristics of the wilt virus based upon material obtained from diseased gipsy moth, army worm, and tent caterpillars. The virus, which has not been cultivated, passes through Berkefeld N but not through Pasteur-Chamberland filters. On examination with the ultramicroscope there was nothing visible that could be interpreted as being different from minute protein or pigment particles. The virus is destroyed at 60° C. in 20 minutes when suspended in water, and by dry heat at 70 to 80° in 20 minutes. It resists drying at room temperature for a period of 2 years; 98 per cent glycerin for 6 months; when dry, direct sunlight for 12 hours; and putrefaction for an indefinite time. It is destroyed by 80 per cent alcohol in 15 minutes and by 5 per cent carbolic acid in 3 weeks. There is no growth or fermentation of the virus on 1 per cent sugar solutions; no growth or reduction on methylene blue and sodium nitrate solutions; and no growth or liquefaction on gelatin and casein.

Experiments on the extrusion of polar filaments of cnidesporidian spores, R. KUDO (*Jour. Parasitology, 4 (1918), No. 4, pp. 141–147*).—"A concentrated solution of hydrogen peroxid is the most perfect and convenient reagent for producing extrusion of the polar filament from spores of *Nosema bombycis* and of some Myxosporidia in the fresh state. The action of hydrogen peroxid is accelerated by the presence of weak alkalis. Ringer's solution emulsion is more favorable for filament extrusion than water emulsion. The action of hydrogen peroxid in extruding the polar filament is less effective upon spores which have been desiccated at room temperature than upon fresh ones. Spores dried on a slide for three days do not extrude the filament. The pressure method gives, generally speaking, the same results as the perhydrol method, except that it produces fewer examples of extruded filament. A spore emulsion centrifuged with 60 per cent methyl alcohol for 10 minutes or mixed with 84 per cent ethyl alcohol for 16 hours shows filament extrusion under the action of perhydrol."

Effect of hydrocyanic acid gas under vacuum conditions on subterranean larvæ, E. R. SASSCER and H. L. SANFORD (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 3, pp. 133–136*).—The advisability of fumigating all imported nursery stock at the port of arrival as a requirement for entry, which has been under consideration for the past five or six years, led to the investigations by the Federal Horticultural Board of the U. S. Department of Agriculture here reported.

It is pointed out that under normal conditions from five to seven million ornamental plants, such as azaleas, rhododendrons, aucubas, conifers, box bushes, bays, etc., are introduced annually with balls of earth around their roots. Since it is impossible to inspect and safeguard plants of this type without removing the soil from the roots, and since practical horticulturists have strongly advised against this procedure on account of its effect on the plants, the only safe course appears to be fumigation with hydrocyanic acid gas under vacuum conditions.

The work was carried on with larvæ of the wheat wireworm (*Agriotes mancus*), green June beetle (*Cotinus nitida*), white grub (*Lachnosterna* sp.), and Japanese beetle (*Popillia japonica*).

The results show the effectiveness of hydrocyanic acid gas under the vacuum process to be influenced by the water content of the soil. "The death of 100 per cent was not obtained with larvæ in soaked soil at dosages ranging from 0.5 oz. to 3 oz. per 100 cu. ft. of space. Eliminating the soaked-soil tests, by far the best results were secured where a preliminary 15-in. vacuum preceded an exposure of 1.5 hours under normal atmospheric conditions. Hydrocyanic acid gas in the presence of 26-in. vacuum throughout the entire exposure gave negative results with a dosage of 1 oz. of sodium cyanid per 100 cu. ft. and an exposure of one hour. An exposure of the gas for one-half hour under 10 lbs. pressure, following a half-hour exposure to a 27 in. vacuum, yielded very indifferent results. With our present knowledge of vacuum fumigation with hydrocyanic acid gas, a dosage exceeding 1 oz. of sodium cyanid per 100 cu. ft. of space with an exposure of 1.5 hours is not recommended for plants in foliage. Inasmuch as all larvæ in soaked soil were not killed with dosages varying from 0.5 oz. to 3 oz. per 100 cu. ft. of space, fumigation at the port of entry with a dosage which will not injure the plants can not prevent the introduction and establishment of all subterranean pests."

The control of insect pests of cotton, H. H. KING ([*Wellcome Trop. Research Lab.*] *Ent. Bul. 9* (*1918*), *pp. 4*).—A brief summary of methods of control of insect pests of cotton in Anglo-Egyptian Sudan, including the pink bollworm (*Pectinophora* [*Gelechia*] *gossypiella*), Egyptian bollworm (*Earias insulana*), Sudan bollworm (*Diparopsis castanea*), cotton aphis, stainer bug (*Oxycarenus hyalinipennis*), and a flea-beetle (*Nisotra uniformis*).

Garden and small fruit insects, with notes on spraying in general, A. G. RUGGLES and S. A GRAHAM (*Univ. Minn. Col. Agr. Ext. Div. Spec. Bul. 29* (*1918*), *pp. 32, figs. 50*).—The several circulars previously noted (E. S. R., 39, p. 861) have been brought together in this special bulletin.

The insect enemies of fruit trees, P. LESNE (*Rev. Hort.* [*Paris*], *89* (*1917*), *No. 24, pp. 385–388, pl. 1; Jour. Agr. Prat., n. ser., 31* (*1918*), *No. 14, pp. 269–271, pl. 1*).—A brief account is given of the woolly aphis and the more important coccid enemies of fruit trees, accompanied by a colored plate of the same.

Papers on deciduous-fruit insects (*U. S. Dept. Agr. Bul. 730* (*1918*), *pp. 40, pls. 8, fig. 1*).—This bulletin consists of three papers, information relating to the first two of which has been reported in a paper previously noted (E. S. R., 37, p. 58).

I. *The grape curculio*, F. E. Brooks (pp. 1–19).—This paper reports upon investigations of the grape curculio carried out principally in a badly infested locality in central West Virginia during the years 1916 and 1917.

The grape appears to be the only host plant of this weevil. The adults may be found upon the foliage and the larvæ within the fruit of probably all kinds of wild and cultivated grapes that grow in the localities where the insect is found, although the "frost" grape (*Vitis cordifolia*) is very rarely attacked.

In order to determine the extent of injury caused counts were made in August, 1917, of about 50 grapevines of different varieties. The results showed that from 40 to 95 per cent of all unprotected fruit had been ruined by the curculio, the average loss being about 70 per cent.

On emerging from hibernation, the beetles appear upon the grape canes about the time the Concord grape is in bloom and feed for ten days or two weeks on the upper epidermis and parenchyma of the leaf before beginning to deposit eggs within the young fruit. Oviposition records kept of 24 females showed a maximum of 386 and a minimum of 141, with an average of 261.66. Six days were required for incubation of the egg in July, from 7 to 19 days for the development of the larva, and 18 or 19 days for the pupa.

Several insects are mentioned as being predacious upon the larvæ. Parasites mentioned include *Anaphoidea conotracheli*, which was quite abundant, as high as 39.5 per cent of the eggs having been parasitized by it; *Microbracon mellitor*, which attacks the larva; *Stiboscopus brooksi*, which attacks the pupa while within the cocoon; and *Triaspis curculionis*, a single specimen of which was reared.

As regards control measures, it is pointed out that the long period during which the curculio beetles feed freely on the upper surface of the grape leaves renders them peculiarly susceptible to arsenical sprays. In several cases practically complete freedom from attack was obtained by applying two sprays of lead arsenate, 3 lbs. of paste to 50 gal. of water, the first just after the blossoms had dropped, and the second three or four weeks later. Bagging the clusters of fruit affords complete protection. Cultivation of the soil under infested grapevines destroys the curculios to some extent by breaking up the cocoons and exposing the pupæ, or by burying the cocoons deeply in the soil.

A bibliography of 34 titles is included.

II. *The grape root-borer*, F. E. Brooks (pp. 21–28).—This is a report of studies carried on at French Creek, W. Va., during the summers of 1916 and 1917.

This root-borer is frequently a source of serious injury to the grape in a few sections of West Virginia; vines of the fox grape (*V. labrusca*) growing in a vineyard and of cultivated varieties suffer about equally.

The eggs are deposited on the canes or leaves of grapevines or, more frequently, on grass, weeds, or straws under or near the vines, sometimes as many as 4 or 5 eggs being placed together. A single female has been recorded as depositing as many as 555 eggs. Oviposition is usually completed within a period of one week. The larvæ, which hatch out in from 18 to 23 days, at once burrow into the soil and attack the larger grape roots wherever found. A period of nearly two years is passed in the larval stage and about 4 weeks are passed in the cocoon.

No parasites of this species have been discovered. As regards control it is stated that this species does not lend itself readily to any of the common insecticidal methods and neither is the worming process of practical application against it. Thorough cultivation of the soil around the vines during June and July is of some benefit in destroying the larvæ and pupæ in the cocoons. By far the most valuable practice, however, is the application of such cultural methods as will induce a vigorous and rapid growth in a healthy vine.

A list of 8 references to the literature cited is appended.

III. *Experiments in the control of the root form of the woolly apple aphis*, B. R. Leach (pp. 29–40).—This is a report of a series of experiments conducted in Virginia during the seasons of 1914 and 1915, the work being based upon results obtained by French investigators in the employment of carbon disulphid and sodium cyanid in solution against the grape phylloxera. The results have been summarized by the author as follows:

"Carbon disulphid, in solution at the rate of 0.5 oz. to 4 gal. of water and applied at the rate of 0.75 gal. per square foot of soil, will control the root form of the woolly aphis under suitable soil conditions. The liquid is best applied by preparing shallow basins about the tree and should be applied only when the soil is in a moist condition. The solution is best prepared by pouring the carbon disulphid into the water and agitating vigorously. The carbon disulphid thereby breaks up into small globules, some going into solution and the remainder forming a mechanical mixture with the solution. The gas diffuses laterally and vertically only as far as the liquid penetrates and therefore every square foot of infested soil must be subjected to the action of the solution in order to insure complete control. When used at the foregoing rate the carbon disulphid produced no injury to the roots of apple. The treatment may be made at any time during the growing season except during the period of two or three weeks in the spring when the trees are budding out. In orchard practice the solution is best applied by using a power spraying outfit and two auxiliary tanks.

"The advantages of this method are, first, the even diffusion of the liquid and complete aphid mortality in the soil area treated and, second, the safety with which the disulphid can be used. The disadvantages of the method are, first, the huge amounts of water required, with consequent high cost of labor; second, the difficulty, on any but level ground, of preparing basins with level floors, thus insuring the proper distribution of the liquid over the area to be treated; and, third, the wide area of infested roots on older trees, every square foot of which must be treated with the liquid. This last condition precludes the use of carbon disulphid except on small trees with restricted root areas.

"Sodium cyanid at the rate of 0.5 oz. to 4 gal. of water did not kill the woolly aphis in the lower soil depths even when a superabundance of solution per square foot was employed. No injury to apple roots resulted when the material was employed at this strength. The only advantage this material possesses, as compared with carbon disulphid, is its ready solubility in water. On the other hand, its uncertainty in producing aphid mortality in the lower soil levels, together with the extremely poisonous nature of the material, precludes its use in practice.

"When kerosene emulsion is applied to the soil it disintegrates into its component parts; the first inch of surface soil retains the soap and some of the kerosene content; the first 4 in. of the soil retain almost all the remainder of the kerosene. Kerosene emulsion, therefore, does not kill the aphids in the lower soil levels and the cost of preparing the quantity necessary for soil treatment renders it of little value. The application of this material to apple roots, in the author's experience, results in severe injury to the tree.

"Deep planting will not prevent woolly aphis infestation and results in the death of many trees so planted, due apparently to the inability of the root systems to function properly under these conditions."

Combating insect enemies of the vine by cultural methods, J. Capus (*Rev. Vit.*, *48* (*1918*), *Nos. 1247, pp. 327–329; 1248, pp. 340–344; 1249, pp. 357–359; 1250, pp. 374–378; 1251, pp. 390–393*).—A general account of cultural control measures.

Notes on insect pests of green manures and shade trees, E. A. Andrews (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 2* (*1918*), *pp. 29–34*).—This is a continuation of the paper previously noted (E. S. R., 38, p. 357).

Some insects injuring nut trees, W. E. Britton (*North. Nut Growers Assoc. Proc.*, *8* (*1917*), *pp. 73–81*).—The insect pests here considered include the walnut caterpillar (*Datana integerrima*), fall web-worm, walnut bud moth (*Acrobasis caryæ*), walnut weevil or curculio (*Conotrachelus juglandis*), nut weevils (*Balaninus* spp.), hickory bark beetle or bark borer (*Scolytus quadrispinosus*), and hickory borer.

List of pecan insects, H. A. Gossard (*Proc. Nat. Nut Growers' Assoc., 1917, pp. 12–15*).—A list of 48 species with references to the literature relating to each.

[Insect enemies of the coconut in the Philippines], P. J. Wester (*Philippine Agr. Rev.* [*English Ed.*], *11* (*1918*), *No. 1, pp. 47–57, pls. 4, figs. 2*).—A brief summary is given of the more important insects attacking the coconut and remedial measures therefor.

Insect pests of tea in Northeast India during the season 1916 (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 3* (*1917*), *pp. 75–79*).—The more important pests of tea in 1916 are noted.

Forest insect conditions in India, C. F. C. Beeson (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 114–124*).—A general discussion.

Insects in relation to problems of storage of food in Hawaii, J. C. Bridwell (*Proc. Hawaii. Ent. Soc.*, *3* (*1917*), *No. 5, pp. 506–509*).—A brief discussion of the subject.

Insects and disease, C. E. A. Winslow and F. E. Lutz (*Amer. Mus. Nat. Hist. Guide Leaflet 48* (*1918*), *pp. 73, pl. 1, figs. 38*).—A popular summary of information.

Tenth annual report of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases, 1917–18 (*Ann. Rpt. Quebec Soc. Protec. Plants* [*etc.*], *10* (*1917–18*), *pp. 92, pls. 2, figs. 7*).—This, the usual annual report (E. S. R., 38, p. 459), includes the following papers which have a bearing on economic entomology: The Protection of Plants, W. Lochhead (pp. 14–18); A Few Notes on the Life of Abbé Provancher, by V. A. Huard (pp. 19–22); Notes on the White-marked Tussock Moth, by J. C. Chapais (pp. 23, 24); Warbles and Bots, by A. E. Cameron (pp. 31–39); Some Injurious Insects of Ste. Anne de Bellevue, 1917, by P. I. Bryce (pp. 46–48); Ants and Aphids, by P. Fontanel (pp. 52–57); The Control of the White-marked Tussock Moth, by J. M. Swaine (pp. 58–69); and The Most Common Plant Lice or Aphids, by W. Lochhead (pp. 79–91).

Annual report of the entomologist, A. H. Ritchie (*Ann. Rpt. Dept. Agr. Jamaica, 1918, pp. 34–40*).—This reports upon the occurrence of and work with the more important insects of the year in Jamaica. The pests particularly considered include the sweet potato weevil (*Cylas formicarius*); *Euscepes porcellus*, previously unrecorded from Jamaica; a minute scolytid beetle, the larva and adult of which bore into sweet potato chips; the sweet potato leaf-folder (*Pilocrocis tripunctata*), noted by Jones (E. S. R., 38, p. 465), which occasionally becomes destructive in Jamaica; the yam scale (*Aspidiotus hartii*); the pineapple weevil (*Metamasius ritchiei*), which injured a large percentage of the crop in Above Rocks; etc. The results of extensive rearings during the year indicate that the Mediterranean fruit fly does not at present exist in Jamaica.

[Report on the prevalence of insect pests in the West Indies d 1917], J. C. HUTSON (*West Indian Bul., 17 (1918), No. 2, pp. 86–96; Agr.* [*Barbados*], *17* (*1918*), *No. 433, pp. 378, 379*).—This paper deals with the s under the headings of the crops affected.

Injurious insects and other animals observed in Ireland during the 1914 and 1915, G. H. CARPENTER (*Econ. Proc. Roy. Dublin Soc., 2* (*191 12, pp. 221–237, pls. 4, figs. 8*).—Brief accounts are given of the occurre the more important insect pests of these years, in continuation of the previously noted (E. S. R., 33, p. 554).

Economic zoology (*Ann. Rpt. Bd. Sci. Adv. India, 1916–17, pp. 78–98*). occurrence of and injury caused during the year by the more important attacking agricultural crops is discussed by T. B. Fletcher, imperial mologist (pp. 78–95), and of those attacking forest trees by C. F. C. B forest zoologist (pp. 96–98).

Notes on entomology in the Federated Malay States during 1917, RICHARDS (*Agr. Bul. Fed. Malay States, 6* (*1918*), *No. 10, pp. 409–420*). reports upon the occurrence of and work with economic insects duri year, dealing particularly with the insect enemies of rubber and coconuts.

[**Economic insects in the Straits Settlements**] (*Gardens' Bul. Straits ments, 2* (*1918*), *No. 1, pp. 1–6, pl. 1, fig. 1*).—Brief accounts are given b Burkill of *Catochrysops pandava*, the caterpillar of which attacks (*Cycas rumphii* and *C. siamensis*) and strips them of leaves, and of *cotheca cumingii*, an account of which in the Philippines by Jones ha previously noted (E. S. R., 30, p. 56), which was found to injure serio conut palms in Malacca. Brief reference is also made to a beetle of the Lema or Criocera which attacks yams in the vicinity of Singapore. In C. F. Baker states that the coconut hispid known to peninsular entom as *Bronthispa froggattii* has been determined to be *Plesispa reichei*.

A note on the hibernation of Kinosternon pennsylvanicum, A. W and F. HARPER (*Copeia, No. 45* (*1917*), *pp. 56–59*).

Termite injury to sweet potatoes, E. W. BERGER (*Quart. Bul. Plant B 2* (*1918*), *No. 4, pp. 190, 191, fig. 1*).—An illustrated description is given injury caused by termites in order that it may not be confused with th of the more important sweet potato weevil (*Cylas formicarius*).

Zorotypus hubbardi, a new species of the order Zoraptera from the States, A. N. CAUDELL (*Canad. Ent., 50* (*1918*), *No. 11, pp. 375–381*).

Fauna of New England.—XIV, List of the Hemiptera-Heteroptera, PARSHLEY (*Occas. Papers Boston Soc. Nat. Hist., 7* (*1917*), *pt. 14, pp. 1*).—The author here lists 419 species representing 215 genera of 32 f occurring in New England, and records the occurrence of each species b and collectors for each State.

The rape bug (Meligethes aeneus [brassicæ]), N. A. KEMNER (*Cent Jördbruksförsök Flygbl. 64* (*1917*), *pp. 4, figs. 3; K. Landtbr. Akad. Hand Tidskr., 56* (*1917*), *No. 5, pp. 454–457, figs. 3*).—A brief account of this pe means for its control.

The meadow plant bug, Miris dolabratus, H. OSBORN (*Jour. Agr. Re* [*U. S.*], *15* (*1918*), *No. 3, pp. 175–200, pl. 1, figs. 5*).—This is a report of i gations carried on, particularly at Orono, Me., during the summer of 1 the consulting entomologist of the Maine Experiment Station.

"*M. dolabratus* has been a conspicuous insect in timothy meadows in po of the eastern United States during the past 40 years and now has a dis tion as far west as Illinois and Minnesota and south in the Mississippi V into Kentucky. It is believed to be an introduced species, coming from Eur with timothy hay or other large-stemmed grass shipped for forage or pack some time between 1800 and 1825. It feeds upon cultivated grasses, especially timothy, orchard grass, and meadow fescue, and when abundant must seriously affect the value of the crop. It is a dimorphic species, there being two forms of females, a long-winged and short-winged form, the latter being far more plentiful, about 90 per cent.

"The species hibernates in the egg form; hatching occurs about May 25 to June 10 in Maine; and the nymphs pass through five instars of about six or seven days each, adults occurring from early July, mating and laying eggs from July 10 to August 1 for the short-winged forms necessarily in the fields where the females have developed. The eggs are laid in stems of grass or clover in fields where females have grown, being thrust through the wall of the stem and held by an expanded cap which is firmly held by the walls of the stem, the egg being protected in the hollow of the stem, and in this position remain for at least eight or nine months before hatching.

"Measures for control so far evident and based on habits determined will consist especially of rotation, with probably some advantage from burning, early cutting, pasturing heavily in fall, and possibly by mechanical devices for capturing the nymphs or adults. The spread of the insect should be prevented by care in the disposition of timothy hay moved to a distance. No hay from an infested district should be allowed to be scattered in or near meadows in localities where the insect is not already present.

"Natural enemies consist so far as at present known of spiders, the predacious damsel bug, *Reduviolus ferus*, a tachinid fly, *Phorantha occidentis*, and an undetermined species, and a species of fungus, *Entomophthora* sp."

A list of 21 titles to the literature cited is appended.

Cotton stainer control in St. Vincent, H. A. Ballou (*Agr. News [Barbados], 17 (1918), No. 426, pp. 266, 267*).—Control work with the cotton stainer is said to have resulted in the production of a better cotton crop in 1917 than in any recent year.

[Leptocorisa varicornis, a coreid injurious to rice in Assam], J. McSwiney (*Rpt. Agr. Dept. Assam, 1917, p. 5; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 5, p. 639*).—As determined by experimental harvestings, injury by the rice bug (*L. varicornis*) has resulted in a loss as high as 90 per cent of the normal yield, the early varieties suffering most.

The apple leaf jassid (Empoasca australis), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 29 (1918), No. 8, pp. 568–570, figs. 6*).—A species, which has been known for some years to occur in the apple orchards in the southern districts about Yass and Binalong in a minor degree, but which during the past year appeared in large numbers and caused severe injury, is described as *E. australis* n. sp. It is said to resemble closely the apple leaf-hopper.

Notes on Nova Scotian eupteryid leaf hoppers, including descriptions of two new species, W. L. McAtee (*Canad. Ent., 50 (1918), No. 11, pp. 360, 361*).—*Typhlocyba cymba* and *Erythroneura ador* are described as new to science.

A note on the recent froghopper outbreak, G. E. Bodkin (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), No. 3, pp. 96, 97*).—The author records outbreaks of the Demerara sugar-cane froghopper (*Tomaspis flavilatera*) in three widely-separated districts, due mainly to abnormal climatic conditions.

Notes on the entomology of Hawaiian Euphorbia with the description of a new Dictyophorodelphax, J. C. Bridwell (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, pp. 385–387*).—A brief account with a description of *Dictyophorodelphax swezeyi* n. sp.

The pear psylla, W. A. Ross (*Agr. Gaz. Canada, 5 (1918), No. 12, pp. 1134–1136, figs. 10*).—A brief account of the pear psylla, which is frequently very destructive to pear orchards in Ontario, notably in the fruit-growing sections bordering Lake Ontario from Burlington to the Niagara River. Many pear growers have found it to be the most troublesome insect with which they have to contend.

The jumping plant lice (family Psyllidæ) of the Hawaiian Islands, D. L. Crawford (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, pp. 430–457, figs. 23*).—The author describes 11 species representing 5 genera as new to science and gives tables for their separation. The genus Cerotrioza is erected.

The California species of mealy bugs, G. F. Ferris (*Leland Stanford, Jr., Univ. Pubs., Univ. Ser., 1918, pp. 78, pls. 3, figs. 16*).—The author first describes the methods of study and the taxonomic value of morphological characters, secretions, and biology of California species of mealy bugs. A systematic treatment is then presented, including a synonymical list of names applied to California species, keys to the nine genera represented and to the species, and descriptions of the genera and species. Nine species, representing the genera Pseudococcus, Phenacoccus, Trionymus, and Heterococcus n. g., are described as new to science.

Contributions to the knowledge of the family Chermesidæ.—I, The biology of the Chermes of spruce and larch and their relation to forestry, H. M. Steven (*Proc. Roy. Soc. Edinb., 37 (1916–17), No. 4, pp. 356–381, figs. 6; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 4, pp. 154–158*).—This is an introductory report of studies of the genus Chermes and its allies in Great Britain.

"The nonmigrating species of the genera Chermes s. str. and Cnaphalodes are more serious enemies to spruce than are the migrating species. The species of Chermesidæ, however, are only serious enemies of spruce when allied with unsuitable soil or atmospheric conditions. The collective damage to larch by the colonici of the species of Chermes s. str. and Cnaphalodes and the progredientes of Cnaphalodes is serious in Britain.

"The fumigation of coniferous nursery stock before dispatch to the planting area has proved a practical method of limiting the further distribution of these pests, and of insuring that the plants get a reasonable chance of establishing themselves in their new environment."

A bibliography of 51 titles is included.

Phylloxera (*Dept. Agr., Indus., et Com. [Vaud], Rap. Sta. Vit. et Serv. Phylloxérique, 1915, pp. 60; 1916, pp. 62*).—These are annual reports of the Viticultural Station and Phylloxera Service on the work conducted during 1915 and 1916.

Some Japanese Aphididæ, E. O. Essig and S. I. Kuwana (*Proc. Cal. Acad. Sci., 4. ser., [Zool.], 8 (1918), No. 3, pp. 35–112, figs. 40*).—In this paper the authors report upon Japanese Aphididæ collected at or in the vicinity of Tokyo during 1913. A host index to the species listed is first presented, followed by notes and descriptions of the species, including 24 new to science. Studies of Japanese Aphididæ by Matsumura have been previously noted (E. S. R., 40, p. 60).

Our birch Symydobius distinct from the European, A. C. Baker (*Canad. Ent., 50 (1918), No. 9, pp. 318–320*).—The author finds the American form to be distinct from *Symydobius oblongus* of Europe, and describes it as representing a new species under the name *S. americanus*.

On the transmission of the subtertian malaria parasite (Plasmodium falciparum) by Egyptian Anopheles, P. H. Bahr (*Jour. Roy. Army Med. Corps, 30 (1918), No. 6, pp. 606–608*).—The author found that *Anopheles (Myzomyia) turkhudi* is an efficient definitive host of the subtertian malaria parasite in Egypt. "*A. (Cellia) pharoensis* can act as an inefficient and occasional definitive host for the subtertian parasite. This fact is of interest in view of the prevalence of its congener *A.* (*Cellia*) *pulcherrima* in Mesopotamia, where it is regarded as a probable carrier."

A peculiar habit of a horsefly (Tabanus americanus) in the Florida Everglades, T. E. Snyder (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 141–146, pls. 2*).

A study of the nuche, E. G. Corradine (*Rev. Nac. Agr.* [*Bogota*], *13. ser., 12 (1917), No. 160, pp. 1343–1354, figs. 7; abs. in Jour. Amer. Vet. Med. Assoc., 52 (1918), No. 4, pp. 470, 471*).—A summary of information on Dermatobia.

The Australian sheep fly in Hawaii, J. F. Illingworth (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, p. 429*).—The author records the occurrence of the screw worm fly *Chrysomyia rufifacies* in Hawaii.

Key to separate Hawaiian Sarcophaga, P. H. Timberlake (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, pp. 371, 372*).—A table is given for the separation of males and females of six species.

Two new Hydrotæas, J. M. Aldrich (*Canad. Ent., 50 (1918), No. 9, pp. 311–314*).

The kelp flies of North America (genus Fucellia, family Anthomyidæ), J. M. Aldrich (*Proc. Cal. Acad. Sci., 4. ser.,* [*Zool.*], *8 (1918), No. 5, pp. 157–179, figs. 10*).—Thirteen species are recognized, of which 4 are described as new to science.

New and little-known Canadian Oscinidæ, J. M. Aldrich (*Canad. Ent., 50 (1918), No. 10, pp. 336–343, figs. 5*).—Four species representing the genera Lasiosina, Dicræus, and Oscinis are described as new.

Key to the North American species of Agromyza related to Simplex, J. R. Malloch (*Canad. Ent., 50 (1918), No. 5, pp. 178, 179*).—In this third paper (E. S. R., 39, p. 661) a key is presented for the separation of five species which are recognized by the author, one of which is described as new to science.

Partial key to the genus Agromyza, IV, J. R. Malloch (*Canad. Ent., 50 (1918), No. 9, pp. 315–318*).—This is the fourth part of the paper noted above.

Color variation in pupæ of Terias nicippe, G. G. Ainslie (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, p. 78*).

The fall army worm, F. Sherman and R. W. Leiby (*N. C. Agr. Ext. Serv. Circ. 79 (1918), pp. 7, fig. 1*).—A popular summary of information.

The pink bollworm, Pectinophora (Gelechia) gossypiella, at Tokar, Anglo-Egyptian Sudan, during the season of 1917–18, H. H. King ([*Wellcome Trop. Research Lab.*] *Ent. Bul. 10 (1918), pp. 3*).—A brief account of the occurrence and work with the pink bollworm during the year.

Physiological and parasitological studies of economic Lepidoptera, C. Gautier (*Compt. Rend. Soc. Biol.* [*Paris*], *81 (1918), Nos. 4, pp. 196–199; 15, pp. 801–803*).—Three papers are presented, the first (pp. 196, 197) dealing with observations of the larvæ of *Pieris brassicæ* and *P. rapæ;* the second (pp. 197–199) with the parasitism of *P. brassicæ* by *Apanteles glomeratus*, etc.; and the third (pp. 801–803) with the oviposition of this Apanteles parasite of *P. brassicæ*.

The fruit-tree leaf roller (Tortrix argyrospila), L. Caesar (*Canad. Ent., 50 (1918), No. 10, pp. 321–323*).—A brief account of this insect, which has become a dangerous pest of apple, pear, and plum orchards in Ontario during the last five or six years.

Ecological notes on the spring cankerworm (Paleacrita vernata), B. P. Young (*Canad. Ent., 50 (1918), No. 8, pp. 267–277, figs. 2*).—This is a report of studies made at Lawrence, Kans., in the eastern part of which State this pest has been a source of considerable injury to elm, as previously noted by Hunter (E. S. R., 39, p. 258).

Oviposition began during the second night after emergence from the gro The average number of eggs deposited by 2,500 females was 82.7. It was fo that there were 11.7 eggs per milligram; dissections showed the presence of many as 400 eggs. The percentage of sterility of eggs varied from 10.8 per c for those deposited the first night in captivity up to 46.7 per cent for th deposited on the fourth night, and thereafter 82.8 per cent, with a gen average of 19.15 per cent sterility. The incubation period of the egg m varied from 23 to 32, with an average of 26 days.

The average longevity of females after capture was about 9 days. It w found that in case a moth is able to drag herself through the sticky band go on up the tree she is not likely to deposit more than 16 per cent as m eggs as she would otherwise have done under normal conditions. It was found by isolating individuals that eggs are not all deposited at one time, may be laid in at least four different masses. The details are given in tab form.

A note on the tortricid genitalia, C. HEINRICH (*Proc. Ent. Soc. Wash.,* *(1917), No. 1–4, pp. 137, 138*).

Bee culture in Maine, O. B. GRIFFIN (*Bul. [Maine] Dept. Agr., 17* (*No. 4, pp. 58, figs. 28*).—This guide to beekeeping treats of the subject from standpoint of Maine conditions. It is based upon the author's personal ex ence during a period of 25 years, during which time he handled as ma 150 colonies per season. A paper on The Honey Flora of Maine, by J. H. L (pp. 54–58), is included.

Thirty-eighth annual report of the Bee-Keepers' Association of the Prov of Ontario, 1917 (*Ann. Rpt. Bee-Keepers' Assoc. Ontario, 1917, pp. 56*).—A port of the proceedings of the annual meeting of this association held at Tor December 11–13, 1917.

The Nicolson observatory beehive and how to use it, J. ANDERSON (*[E burgh]: No. Scot. Col. Agr., 1916, pp. 15, pls. 4, fig. 1*).—A description of Nicolson observatory beehive, designed in Scotland in 1910, and the manner which it is used.

Selection and management of hives, P. LEMAIRE (*Les Ruches: Chois Aménagement. Paris: J. B. Baillière & Sons, 1918, pp. 84, figs. 52*).—This small guide to beekeeping.

The management of the apiary, P. LEMAIRE (*La Conduite du Ruc Paris: J. B. Baillière & Sons, 1918, pp. 132, figs. 76*).—A small handbook.

Practical queen rearing, F. C. PELLETT (*Hamilton, Ill.: Amer. Bee Jo 1918, pp. 103, figs. 41*).—A practical work dealing particularly with method

Pollination of alfalfa by bees of the genus Megachile.—Table of Canad species of the Latimanus group, F. W. L. SLADEN (*Canad. Ent., 50 (1918), 9, pp. 301–304*).—This is a report of studies of the bees that trip, and presumably pollinate, flowers of alfalfa in parts of Canada where it ca grown for seed. See also a previous note (E. S. R., 39, p. 661).

A revision of the bembicine wasps of America, north of Mexico, J. PARKER (*Proc. U. S. Nat. Mus., 52 (1917), pp. 1–155, figs. 231*).—In this revi of the tribe Bembicini, which includes species of economic importance, author deals with six genera. One of these (Stictiella) and 21 species described as new.

Early establishment of Blastophaga in California, G. P. RIXFORD (*Cal. C 51 (1918), No. 7, p. 147*).—A discussion of the history of the establishment the fig Blastophaga in California.

Perezia legeri n. sp., a new microsporidian parasite of the larvæ of Pie brassicæ, A. PAILLOT (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 4, 187–189, figs. 26*).—The organism here described as new is found particular in the adipose tissue and in certain giant cells of the blood of caterpillars. The schizogone stages of *P. legeri* are said to differ but little from those of *P. mesnili* (E. S. R., 40, p. 65).

The parasites of leaf-hoppers, with special reference to Anteoninæ, II, III, F. A. FENTON (*Ohio Jour. Sci., 18 (1918), Nos. 7, pp. 243–278, figs. 11; 8, pp. 285–296, figs. 15*).—Part II of this series (E. S. R., 39, p. 870) deals first with the phylogeny, taxonomy, and life histories of *Gonatopus erythrodes*, *G. contortulus*, *Haplogonatopus americanus*, *Chalogynus osborni* n. sp., *Phorbas mirabilis*, and *Aphelopus dikraneuri* n. sp. This is followed by a systematic account (pp. 258–278) which includes descriptions of six new species.

Part III deals with the effect of parasitism on the host. A bibliography of 28 titles is included.

Notes on some of the immigrant parasitic Hymenoptera of the Hawaiian Islands, P. H. TIMBERLAKE (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, pp. 399–404*).—A brief discussion of introduced parasites.

A new genus of pteroptricine Aphelininæ, D. T. FULLAWAY (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, pp. 463, 464*).—*Pseudopteroptrix imitatrix*, reared from *Howardia biclavis* and the greedy scale, is here described as representing a new genus and species.

Idiogastra, a new suborder of Hymenoptera with notes on the immature stages of Oryssus, S. A. ROHWER and R. A. CUSHMAN (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 89–98, figs. 11*).

Feeding habits of the parasites of hardback grubs, H. A. BALLOU (*Agr. News [Barbados], 17 (1918), No. 425, pp. 250, 251*).—In discussing the introduction into Mauritius of *Tiphia parallela*, a scoliid wasp parasitic on *Phytalus smithi*, it is pointed out that success in establishing this parasite depends entirely on the ability of the adult to find suitable food during the period of mating and egg laying. This food appears to consist in large part of the honeydew from plant lice. In Mauritius, where plant lice appear only at a certain time of the year and are then rapidly destroyed by their natural enemies, this parasite has recourse to the sweetish content of the vesicular hairs of *Cordia interrupta*, a plant native to British Guiana, which was introduced some 15 years ago and is now a regular pest infesting all uncultivated fields.

The segregation of the germ cells in Trichogramma evanescens, J. B. GATENBY (*Quart. Jour. Micros. Sci. [London], n. ser., 63 (1918), No. 250, pp. 161–174, pl. 1, fig. 1*).—A report of embryological studies carried on in continuation of the work previously noted (E. S. R., 37, p. 856).

Polyembryony in parasitic Hymenoptera.—A review, J. B. GATENBY (*Quart. Jour. Micros. Sci. [London], n. ser., 63 (1918), No. 250, pp. 175–196, pls. 2*).—A review of the subject in connection with a bibliography of 18 titles.

The raspberry and loganberry beetle (Byturus tomentosus), A. H. LEES (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 35, 36; Jour. Bath and West and South. Counties Soc., 5. ser., 12 (1917–18), pp. 136, 137*).—This beetle is said to have a wide distribution in England and fruit is said to be quite commonly infested by it. The market value of infested fruit is greatly reduced, and such fruit can not be used for canning. In experiments in 1917 with a paraffin emulsion containing nicotin, the infestation was 100 per cent on control rows and only 33 per cent on sprayed rows.

The New Zealand flax grub.—Progress of the investigation, D. MILLER (*Jour. Agr. [New Zeal.], 17 (1918) No. 4, pp. 209–215, fig. 1*).—This is a report of studies of the biology of *Xanthorhoe præfectata* and of control measures.

Two new hydrophilid beetles, E. A. SCHWARZ and H. S. BARBER (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 129–135, figs. 2*).

A review of the genus Buprestis in North America, A. S. NICOLAY an[d] WEISS (*Jour. N. Y. Ent. Soc., 26 (1918), No. 2, pp. 75–109, pls. 2, fig. 1*) authors recognize 25 forms of this genus occurring in North America, one species and one variety are described as new. A bibliography of is included.

The leather beetle (Dermestes vulpinus), a troublesome pest of d[ried fish] in Hawaii, J. F. ILLINGWORTH (*Proc. Hawaii. Ent. Soc., 3 (1917), [No. 4, pp.] 375–378*).—In Honolulu bales of dried cod found in the fish marke[t] badly infested by *D. vulpinus* that the whole consignment had to be d[estroyed]. Under tropical conditions 50 days were required for completion of larval instars and 64 days for the life cycle from egg to adult. An list of six references to the literature is included.

Notes on the Bruchidæ and their parasites in the Hawaiian Isla[nds], BRIDWELL (*Proc. Hawaii. Ent. Soc., 3 (1917), No. 5, pp. 465–505; ab[s. in Rev.] Appl. Ent., Ser. A, 6 (1918), No. 8, pp. 352–356*).—It is stated that bruchid is endemic in the Hawaiian Islands various species have bee[n estab]lished there. A key is given for the separation of the Hawaiian spec[ies, includ]ing the bean weevil, cowpea weevil, the four-spotted bean weevil *quadrimaculatus*), the mesquite or algaroba weevil (*B. prosopis*), rind weevil (*Pachymerus* [*Caryoborus*] *gonagra*), *B. pruininus*, mined species closely related to *B. ornatus* referred to as the Doli[chos] and a small species perhaps identical with *Spermophagus* (*Zabrotes* In addition the pea weevil and *B. rufimanus* occur frequently in im[ported peas] (*Pisum sativum*) and broad or horse beans (*Vicia faba*).

In a detailed discussion of parasites of bruchids in Hawaii, th Charitopodinus is erected and *Scleroderma immigrans* described account of the habits of the Bruchidæ follows.

The distribution of Xyleborus fornicatus (shot-hole borer o SPEYER (*Dept. Agr. Ceylon Bul. 39 (1918), pp. 34*).—This discuss list of the estates infested up to June 7, 1918.

The banana borer (*Ann. Rpt. Dept. Agr. Jamaica, 1918, pp.* is a summary of work with *Cosmopolites sordida* in Jamaica ext period of two years, a preliminary account of which has been pr (E. S. R., 38, p. 164). It has been found in the Above Rocks Catherine, and to be generally distributed in the parish of St. A out all the patches of bananas growing in the lowlands and foot the hills above an elevation of 3,000 ft. It is thought to have from Martinique about 70 years ago.

Notes on insects of the order Strepsiptera, with descriptions W. D. PIERCE (*Proc. U. S. Nat. Mus., 40 (1911), pp. 487–511*).- ment to the author's monographic revision of the Strepsiptera 465), which includes descriptions of 3 genera and 26 species ne

The comparative morphology of the order Strepsiptera, records and descriptions of insects, W. D. PIERCE (*Proc. U.* (*1918*), *pp. 391–501, pls. 16, figs. 5*).—A second supplement monographic revision of the Strepsiptera, the first of which is the first part on biology the author discusses the relations morphology, and anatomy. Their classification is then take tions given, including 1 new family, 9 new genera, 2 subgener A table which shows the distribution of the described speci according to the geographical regions of Wallace, a host list the previous list, and a 5-page bibliography are given.

Further experiments on big bud mite, A. H. LEES (*Univ. Agr. and Hort. Research Sta., 1917, pp. 37, 38; Jour. Bath an*

Counties Soc., 5. ser., 12 (1917–18), pp. 137–139).—From experiments conducted during the winter of 1916–17 in continuation of those previously noted (E. S. R., 38, p. 468), it appears that an early application of the mixture of soap (10 per cent) and crude carbolic acid (5 per cent) is important when a double spraying is done, and that three sprayings will give better results than two.

The chicken tick, H. F. Reils (*Fla. Grower, 18 (1918), No. 13, p. 5, fig. 1*).—The occurrence of *Argas miniatus* at Tampa and Lutz, Fla., where it was causing considerable loss, is reported.

North American earthworms of the family Lumbricidæ in the collections of the United States National Museum, F. Smith (*Proc. U. S. Nat. Mus., 52 (1917), pp. 157–182*).—In this paper the author recognizes 29 species, representing 3 genera occurring in North America, of which one (*Helodrilus welchi*) is described as new. A bibliography of 35 titles is included.

Observations on reproduction in certain parthenogenetic and bisexual nematodes reared in artificial media, P. S. Welch and L. P. Wehrle (*Trans. Amer. Micros. Soc., 37 (1918), No. 3, pp. 141–176*).—The authors have found that some of the free-living and semiparasitic nematodes can be reared generation after generation in artificial media and their study thus facilitated. Studies made of *Cephalobus dubius* and *Diplogaster aerivora*, which were cultured continuously for over three years, are reported upon.

FOODS—HUMAN NUTRITION.

Digestion of the aleurone cells incorporated in bread, L. Lapicque and A. Liacre (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 5, pp. 217–220*).—A microscopic examination of bread and of feces recovered after the ingestion of bread by the mouse, dog, and man would seem to show that the cell walls of the aleurone granules are broken in the bread, and that the contents undergo digestion in the alimentary tract. The explanation advanced is that the tension exerted on the dough during kneading and fermentation causes the breaking open of the aleurone cell wall at points weakened by the milling process. The contents of the cell are thus exposed to the action of the digestive juices. These aleurone cells consist of about one-third of the material hitherto considered nondigestible.

Improvement of war bread by neutralization of the ferments of bran, Lapicque and Legendre (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 9, pp. 316–319*).—The authors suggest the use of limewater in making bread from flour containing bran in order to prevent the acid fermentation caused by the soluble ferments in the aleurone cells.

How to make sweet potato flour, starch, sugar, bread, and mock cocoanut, G. W. Carver (*Alabama Tuskegee Sta. Bul. 37 (1918), pp. 6*).—Directions are given for making sweet potato flour from the raw potatoes, from the cooked potatoes, and from the potatoes after the starch has been removed, as well as for sweet potato starch and sugar. The uses of these various products are mentioned, and recipes are given for sweet potato bread and biscuits.

Feeding experiments with raw and boiled carrots, Minna C. Denton and Emma Kohman (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 249–263, figs. 2; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 1, p. 70*).—Feeding experiments with albino rats are reported which show that the ordinary methods of cooking do not perceptibly injure the nutritive value of carrots, although a considerable portion of the caloric value is lost when the water used in cooking is rejected. Normal growth and reproduction took place on a diet of carrots properly supplemented with starch, purified commercial casein, butter or lard, and salts to such an extent that 50 per cent of the caloric value of the diet was derived from the carrots. When used as an exclusive diet, and supplemented by calcium, phosphorus, sodium, and chlorin, carrots were able to support animals in apparent good health for as long as 16 weeks, although no growth took place. On reduction of the proportion of nitrogen by the addition of some nonnitrogenous foodstuff, such as fat or starch, dropsy occurred among many of the rats. The growth curves indicated the presence in carrots of a considerable amount of both water-soluble and fat-soluble vitamins.

Experimental researches on the food value of raw, sterilized, and decorticated corn, E. WEILL and G. MOURIQUAND (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 8, pp. 372–375*).—Feeding experiments with pigeons are reported which show the high food value of raw whole corn, the destructive action produced by sterilization and decortication of the corn, and the dystrophic action in certain cases of decorticated corn on cutaneous nutrition. These results are in agreement with those previously obtained with other grains (E. S. R., 35, p. 861).

Report upon the food value of the groundnut, R. L. M. WALLIS (*Indian Jour. Med. Research, 6 (1918), No. 1, pp. 46–55*).—This article discusses the manufacture and composition of a preparation, "nutramine," obtained from the groundnut or peanut, the utilization of the substance in the preparation of food products, and economic considerations in regard to the peanut industry. Nutramine is the flour prepared by warming the press cake obtained after the usual extraction of arachis oil from the peanut and subjecting it to another extraction in the hydraulic press. By this means only about 5 per cent of the oil remains in the press cake, and the resulting flour is said to have lost the peculiar peanut taste. It is of high protein content, the protein being rich in lysin but deficient in tryptophan. This deficiency may be made up by mixing the flour with casein or dried milk.

Relative digestibility of maize oil (corn oil), cottonseed oil, and lard, E. W. ROCKWOOD and P. B. SIVICKES (*Jour. Amer. Med. Assoc., 71 (1918), No. 20, pp. 1649, 1650*).—As a result of metabolism experiments on three dogs the following percentages of fats metabolized were obtained. Corn oil 98.9, cottonseed oil 98.8, and lard 97.8.

The authors state that other experiments show that corn oil can be well substituted for other animal and vegetable oils in salads and for "shortening" in cooking wheat foods.

Utilization of blackberries, A. TRUELLE (*Vie Agr. et Rurale, 8 (1918), No. 39, pp. 222–224*).—The chemical composition, food value, and use of blackberries are discussed, and methods are described for the preparation of blackberry conserves, sirups, jellies, and marmalade.

Some preparations of coffee proposed for the Army, BALLAND (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 12, pp. 423–425; abs. in Chem. Abs., 12 (1918), No. 23, p. 2633*).—Descriptions and analyses are reported of certain coffee preparations proposed for army use, including coffee extracts, tablets, and the silver skin obtained in roasting the coffee.

Investigations in regard to the reaction of human milk, A. SZILI (*Biochem. Ztschr., 84 (1917), No. 3–4, pp. 194–200; abs. in Chem. Abs., 12 (1918), No. 14, p. 1482*).—Tables are given of the hydrogen-ion concentration of various samples of human milk and of the acidity as determined by neutralization with 0.50 N sodium hydroxid, using phenolphthalein as an indicator.

The hydrogen-ion concentration was found to be almost exactly that of water, and did not change appreciably during the course of lactation. The milk in the latter stages of lactation required somewhat less alkali than in the earlier stages for neutralization to phenolphthalein.

The utilization of horse serum in human nutrition, L. LINDET (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 29, pp. 807–810*).—The use of serum albumin of the horse as an inexpensive and satisfactory substitute for the white of eggs in cooking is suggested.

The energy content of extra foods, CORNELIA G. and F. G. BENEDICT (*Boston Med. and Surg. Jour., 179 (1918), No. 5, pp. 153–162; abs. in Chem. Abs., 12 (1918), No. 22, p. 2387*).—The energy values of several extra foods which may be taken at other times than at the three regular meals are reported. These include well-known brands of plain, milk, and nut chocolate, crackers and wafers, plain and ice cream sodas, sundæs, ice cream cones, and temperance or soft drinks.

The data show that the caloric content of an ordinary serving or portion of these so-called extra foods and beverages is of real significance, and should be taken into account in considering the total energy intake in the course of the day. It is stated that these extra foods may in many cases form at least 10 per cent of the total daily intake.

General index numbers of food prices on a nutritive value base, R. PEARL (*Washington: U. S. Food Admin., 1918, pp. 13, fig. 1*).—Two general price indexes have been devised, one indicating the trend of prices received by the producer of the basic food staples for his products and the other indicating the trend of wholesale prices. The general plan followed in calculating these indexes is to weight the quoted prices of each commodity by a factor proportional to the nutritive value of the normal production or crop of that commodity, the total energy content in calories being taken as the measure of nutritive value. Detailed data are given as to the number of commodities, computation of prices, and weighting factors.

Commercial stocks of grain, flour, and miscellaneous food products in the United States on November 1, 1918 (*U. S. Dept. Agr., Food Surveys, 2 (1918), No. 14, pp. 8*).—Data as to stocks on this date are reported.

Physiological effects of a prolonged reduction in diet on 25 men, F. G. BENEDICT (*Proc. Amer. Phil. Soc., 57 (1918), No. 5, pp. 479–490; abs. in Chem. Abs., 12 (1918), No. 23, pp. 2600, 2601*).—The essential points of this investigation have been previously noted (E. S. R., 39, p. 567).

Some aspects of infant feeding, J. C. DRUMMOND (*Lancet [London], 1918, II, No. 15, pp. 482–484*).—This is a discussion of the influence of the accessory factors of the diet on nutrition based upon experimental research upon the nutrition of young growing animals. The accessory factors are classified as fat-soluble A, water-soluble B or antiberi-beri factor, and water-soluble C or antiscorbutic factor. Tables are given which indicate the chief properties of the three substances and their relative distribution in natural foodstuffs.

The author points out that much of the low resistance to disease shown by the breast-fed young of the poorer classes or by those fed on various substitutes for human milk is indirectly due to their having received during a most critical period of their development an inadequate supply of one or more of the indispensable accessory factors.

Gastric response to foods.—The determination and significance of intragastric conductance, O. BERGEIM (*Amer. Jour. Physiol., 45 (1917), No. 1, pp. 1–11, figs. 13*).—A retention stomach tube in the form of an electrolytic cell is described, which is said to make possible the determination of intragastric conductances at any desired interval of time without disturbance or removal of gastric contents. The tip contains a thermocouple, which makes possible intragastric temperature determinations and corrections, and an aspiration tube by means of which samples of gastric contents may, if desired, be collected for analysis.

It is considered that determinations of this character will possess the advantage over titration methods of obtaining the desired data at frequent intervals without any disturbance or removal of gastric contents, and that the difficulties due to dissociation of the protein salt during the usual analysis, to the phosphates from the saliva, and to the coloring matter will also be avoided. A few preliminary observations with the new method are reported.

Contributions to the physiology of the stomach.—XLV, Hunger, appetite, and gastric juice secretion in man during prolonged fasting (15 days), A. J. Carlson (*Amer. Jour. Physiol., 45 (1918), No. 2, pp. 120–146, figs. 14*).—Detailed observations are reported of 15 days' complete fast followed by 8 days' abstinence from food with daily ingestion of cotton fiber. Reports are given of gastric hunger contractions during the control and fasting periods, the subjective feelings of hunger and appetite during the fast, and the secretion of gastric juice.

The results show that during fasting the gastric hunger contractions continued with practically normal rhythm and intensity, although the subjective sensations induced by the gastric contractions appeared to be somewhat weakened. The contents of the empty stomach and the continuous gastric juice secretion during the fast showed a tendency to slight increase in acidity, but no significant increase in secretion rate over that of the control period.

Contributions to the physiology of the stomach.—L, Studies on the control of hunger by drugs, H. Ginsburg and I. Tumpowsky (*Arch. Int. Med., 22 (1918), No. 5, pp. 553–570, figs. 8*).—The effects are reported of various common drugs on the hunger contractions in the stomach of dogs by the use of the balloon method.

Food ingestion and energy transformations with special reference to the stimulating effect of nutrients, F. G. Benedict and T. M. Carpenter (*Carnegie Inst. Washington Pub. 261 (1918), pp. 355; abs. in Chem. Abs., 12 (1918), No. 21, pp. 2210, 2211*).—This publication includes an historical summary of the evidence with human subjects which has thus far accumulated to show that there is an increased heat production following food, and the results of an extensive series of observations made under the auspices of the Carnegie Institution of Washington during a period of 10 years on the quantitative relations between the energy intake and character of the ingesta and the quantitative increase in the metabolism of man following the ingestion of various diets. Determinations were made in respiration calorimeters and with the universal and the Tissot respiration apparatus. The investigations include determinations of basal metabolism during 24-hour, 8-hour, and short periods, metabolism during chewing, and metabolism following ingestion of water, coffee, beef tea, carbohydrates, fats, diets predominating in protein, and mixed diets. From the analytical data presented the following general conclusions are drawn:

The mechanical work of chewing produces a definite increase in metabolism. The drinking of liquids, especially in large amounts, increases to a slight extent the metabolism. Ingestion of all kinds of food in any amount results in an increment in the metabolism. Protein produces a more marked and extended effect on metabolism than does any other nutrient. All carbohydrates differ but little in their effect on total metabolism, although levulose and sucrose appear to exert a somewhat more powerful influence than the other sugars. Experiments with mixed diets showed that it is possible by the ingestion of a large meal to stimulate the metabolism to 40 per cent above the basal value for a number of hours and to 20 per cent for at least eight hours.

A comparison of the fuel value of the diet with the subsequent increase in heat production showed the average "cost of digestion" for the ingestion of pure carbohydrates or a predominatingly carbohydrate meal to be about 6 per cent of the fuel value of the food ingested, of fat approximately 2 per cent, of a protein-rich diet about 12 per cent, and of a mixed diet about 6 per cent. The authors assert, however, that "the excess heat produced from the ingestion of protein or carbohydrates like sugars may not properly be considered as purely a waste process, but that it is far more logical to consider it as a general stimulation of all of the cells in preparation for the drafts of muscular activity."

The results are considered to give no basis for recommending an exclusively protein diet or an exclusively sugar diet prior to muscular work, but to show the value of large diets of either protein, carbohydrate, or mixed nutrients in replenishing the glycogen depots and stimulating the whole body to cellular activity.

Practical suggestions as to the methods to be employed for an ideal study of the effect upon basal metabolism of ingestion of food and drugs are appended.

The presence of food accesories in urine, bile, and saliva, A. M. Muckenfuss (*Jour. Amer. Chem. Soc., 40 (1918), No. 10, pp. 1606–1611; abs. in Chem. Abs., 12 (1918), No. 23, p. 2611*).—Experiments are reported in which urine, bile, and saliva were tested for antineuritic properties by attempting to cure pigeons of acute polyneuritis by treatment per os with fuller's earth activated by the substance under investigation. From the results obtained the author concludes that the antineuritic vitamin is probably present in comparatively small quantity in clean, fresh, filtered bile from the bladder of the ox, and is also present in traces in fresh filtered human urine and in saliva.

A study of the water-soluble accessory growth-promoting substance.—II, Its influence upon the nutrition and nitrogen metabolism of the rat, J. C. Drummond (*Biochem. Jour., 12 (1918), No. 1–2, pp. 25–41; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 670, I, pp. 358, 359; Chem. Abs., 12 (1918), No. 23, p. 2609*).—In continuation of work previously noted (E. S. R., 38, p. 503), observations upon the effect of the water-soluble accessory factor upon the general nutrition of the rat are reported, the results of which may be summarized as follows:

The food consumption of rats fed upon a diet deficient in water-soluble B is low, probably being reduced to that sufficient to supply the calorific requirements of maintenance. Increased food consumption may be brought about by the addition to the diet of flavoring agents or by extracts containing the water-soluble B. Growth takes place only when the extract contains the water-soluble accessory, and the amount of growth is within certain limits proportional to the amount of accessory substance added. The length of time that an animal is able to maintain itself upon a diet deficient in water-soluble B without suffering serious loss of body weight seems to be directly proportional to the age at which the restriction is imposed. There is no apparent deviation in the nitrogen metabolism except in the appearance of creatinuria. Actively growing animal tissues and the glands of internal secretion are deficient in water-soluble B.

The author was unable to determine the cause of the fatal decline which invariably follows a deficiency of water-soluble B. Symptoms of nerve disorder were found in only three of the many cases studied.

The alleged antineuritic properties of α-hydroxypyridin and adenin, A. Harden and S. S. Zilva (*Biochem. Jour., 11 (1917), No. 2, pp. 172–179*).—The authors have confirmed most of the facts observed by Williams (E. S. R., 35, p. 711) in regard to the chemical nature of α-hydroxypyridin, but were unable by its use to effect a cure or an improvement in the condition of polyneuritic pigeons. Pure adenin, as well as adenin treated with sodium ethylate, yielded negative results in disagreement with those obtained by Williams and Seidell (E. S. R., 36, p. 314).

The differential behavior of the antineuritic and antiscorbutic factors toward adsorbents, A. Harden and S. S. Zilva (*Biochem. Jour., 12 (1918), No. 1–2, pp. 93–105, figs. 8; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 670, I, p. 365*).—The possibility of separating the antineuritic and antiscorbutic factors when present in the same solution was tested with a mixture of equal quantities of autolyzed yeast and orange juice. Various absorbent reagents were used and the filtrates tested on polyneuritic pigeons and scorbutic guinea pigs.

It was found that the antineuritic factor is absorbed by fuller's earth and dialyzed iron, while the antiscorbutic factor is not affected. Orange juice did not lose its antiscorbutic activity on filtration through a Berkefeld candle.

A note on the susceptibility of the antiscorbutic principle to alkalinity, A. Harden and S. S. Zilva (*Lancet [London], 1918, II, No. 10, p. 320; abs. in Chem. Abs., 12 (1918), No. 22, p. 2366*).—Experiments with guinea pigs are reported which show that alkalinity has a very deleterious effect on the antiscorbutic potency of orange juice. The authors point out that, as most antiscorbutic vegetables are either neutral or very slightly acid, any culinary manipulation which entails alkaline treatment will be instrumental in the destruction of at least a significant part of the antiscorbutic potency of such vegetables.

The antiscorbutic value of cow's milk, Harriette Chick, Eleanor M. Hume, and Ruth F. Skelton (*Biochem. Jour., 12 (1918), No. 1–2, pp. 131–153, figs. 5; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 670, I, p. 360; Chem. Abs., 12 (1918), No. 23, p. 2609*).—The antiscorbutic value of cow's milk was tested by feeding experiments with young guinea pigs in which the diet consisted of oats, wheat bran, and fresh milk, a special feature of the work consisting of the measurement of the amounts actually consumed.

When less than 50 cc. of milk was taken daily, the animals showed no protection from scurvy. If the daily ration varied from 50 to 100 cc., a greater or less protection was observed, varying proportionately with the amount consumed. If from 100 to 150 cc. was taken daily, satisfactory growth and development occurred with no symptoms of scurvy. These results are considered to agree with the vitamin deficiency hypothesis of the etiology of guinea-pig scurvy, and to show that milk is a food poor in the antiscorbutic accessory factor, since a ration large in comparison with that of other antiscorbutic materials is necessary to afford sufficient protection from scurvy.

The authors are of the opinion that the experiments reported offer a reasonable explanation of the anomalous results of other observers when guinea pigs were fed on diets consisting of grain and fresh milk and no measurements were made of the amount of milk actually consumed. The conclusions of McCollum and Pitz (E. S. R., 38, p. 568) are challenged on this ground, and experiments are reported which tend to refute their constipation hypothesis as to the cause of scurvy.

Applications of the results of these investigations are made to infant feeding with cow's milk. It is urged that whenever milk is heated in any way or dried an additional source of antiscorbutic vitamin should be provided, either in the form of orange juice or, if this is unavailable, of raw ruta-baga juice.

Studies of experimental scurvy.—III, The influence of meat and various salts upon the development of scurvy, W. Pitz (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 439–466, figs. 15; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 1, p. 70*).—In continuation of studies previously noted (E. S. R., 39, p. 365), the author has investigated the effect of meat and of tricalcium phosphate and other salts upon the development of scurvy in the guinea pig.

An improvement of the protein of the diet was found to protect guinea pigs from scurvy for a number of weeks and to greatly prolong the life of the animals, even though the physical character of the diet was not improved. A study of the effect of tricalcium phosphate, sodium chlorid, and calcium chlorid showed that the calcium and chlorin ions are of greater importance in the development of the disease than is phosphorus. The evidence given in the three papers upon scurvy is summarized as follows:

"The physical character of the diet and the character of the flora of the digestive tract are clearly of prime importance in the production of this disease, but other factors, such as those which make the diet more nearly chemically complete, which stimulate appetite and increase the flow of digestive juices and increase the resistance of the animals, which decrease the permeability of the intestinal wall, and which aid in correcting a deranged chlorin metabolism, are of great importance and will protect the animals from scurvy for a considerable time. These experiments point to the little emphasized rôle of calcium salts in nutrition, namely, that of controlling the permeability of various animal tissues and thereby affording protection against invading agents."

Observations on three cases of scurvy, V. STEFÁNSSON (*Jour. Amer. Med. Assoc., 71 (1918), No. 21, pp. 1715–1718*).—The author has described three cases of scurvy occurring among members of the Canadian Arctic Expedition in the winter of 1916–17. The conclusions drawn from observations of these and other cases not reported are as follows:

The strongest antiscorbutic qualities reside in certain fresh foods, and diminish or disappear with storage by any of the common methods of preservation, such as canning, pickling, drying, etc. Cooking lessens or destroys the antiscorbutic value of most or all foods. Meat and fish slightly or well advanced in the process of ordinary putrefaction seem to be as good an antiscorbutic as fresh flesh. Bodily cleanliness and ventilation have not been shown to have any bearing on the incidence or severity of scurvy. Exercise does not prevent scurvy. Salt probably has some direct bearing on the history of the disease, as shown by the fact that salt meats have long been recognized as predisposing to scurvy and that most scurvy patients have a craving for salt which disappears as the cure proceeds.

Experimental chronic beri-beri syndrome, E. WEILL and G. MOURIQUAND (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 8, pp. 432–436*).—Chronic beriberi was produced in pigeons by the use of a partially deficient diet consisting of a mixture of one-third uncooked whole grain with two-thirds sterilized grain. The disease was characterized by an initial paralysis of the wings, sometimes followed by paralysis of the feet, also in one case by severe lesions of the bones. These chronic beri-beri symptoms, contrary to the acute form, showed a complete resistance to treatment with grain polishings. The authors consider the paralysis functional in the case of acute and lesional in the case of chronic beri-beri.

The phenol excretion of guinea pigs maintained on an exclusive oat diet, W. G. KARR and H. B. LEWIS (*Amer. Jour. Physiol., 44 (1917), No. 4, pp. 586–590*).—In guinea pigs on an oat diet no changes in the urinary elimination of phenols nor in the degree of conjugation of the phenols were observed, provided the factor of partial starvation was ruled out. This is considered by the authors to substantiate the theory advanced by McCollum and Pitz (E. S. R., 38, p. 568) that the injury to the intestine is mechanical, permitting bacterial invasion of the tissues, rather than the alternate theory that the injury may be due primarily to the absorption of toxic products of bacterial metabolism from the intestines.

The occurrence of creatin and creatinin in the blood in normal and pathological conditions.—II, Observations in the young. Further discussion in regard to the development of methods, J. Feigl (*Biochem. Ztschr., 84 (1917), No. 3–4, pp. 264–280; abs. in Chem. Abs., 12 (1918), No. 22, p. 2360*).—Tables are given of the creatin and creatinin content of the blood of children under 10 years and from 10 to 15 years of age. The creatinin content was found to be lower in children up to 15 years than in adult men.

Methods for determining creatinin are discussed, and attention is called to the necessity of employing pure reagents.

The influence of iodin and sodium iodid on the circulation, W. Salant and A. E. Livingston (*Amer. Jour. Physiol., 41 (1916), No. 2, pp. 234–249, figs. 12*).—The authors, at the Bureau of Chemistry, U. S. Department of Agriculture, have studied the influence of iodin and sodium iodid on the circulation in frogs, cats, and dogs.

It was found that dilute solutions of molecular iodin perfused through the isolated frog heart produced cardiac irregularity and depressing aftereffects. These were much more marked after the use of more concentrated solutions, but were decreased by the presence of olive oil in the perfusion fluid. Intravenous injection of iodin caused marked depression of the circulation in cats, but was without effect on dogs. Sodium iodid was in all cases much less toxic than iodin, although a solution of 0.5 per cent in Ringer's solution perfused through the frog heart produced slight depression.

It is suggested that "the action of molecular iodin is due to formation of additive compounds with the unsaturated fatty acids present in the frog heart. The action of iodin on the circulation of the cat might be due to the presence in the heart of large amounts of unsaturated fatty acids or perhaps to acids that are more unsaturated than those in the heart of the dog and also to the presence of smaller amounts of some of the lipoids in the blood serum of the cat than in that of the dog. The action of sodium iodid on the frog heart is probably due to physical action with the lipoids of the heart. Rapid elimination is suggested as a possible cause of the negative results obtained after the intravenous administration of sodium iodid to cats and dogs."

Changes in the hydrogen-ion concentration of muscle during work, J. Goldberger (*Biochem. Ztschr., 84 (1917), No. 3–4, pp. 201–209; abs. in Chem. Abs., 12 (1918) No. 14, p. 1482*).—The reaction of extract of frogs' muscle was found to be slightly acid. The hydrogen-ion concentration of the muscle increased during work. The acidity as determined by titration to phenolphthalein was found to be from 7 to 10,000 times higher than as electrometrically determined. The increased acidity due to work is considered to be caused by volatile acids, principally carbon dioxid.

ANIMAL PRODUCTION.

Genetics and eugenics, W. E. Castle (*Cambridge: Harvard Univ. Press, 1916, pp. VI+353, pls. 37, figs. 29*).—The subtitle calls this volume a textbook for students of biology and a reference book for animal and plant breeders. The main emphasis, however, is on animal genetics, plants being dealt with only incidentally and eugenics being confined to a separate section of less than 50 pages. The first seven chapters trace the history of evolutionary thought from Lamarck to DeVries, and then follows a four-chapter exposition of elementary mendelism. Succeeding chapters bring together much hitherto scattered material on the unit characters of rodents, cattle, and other domestic mammals, poultry, plants, and insects. There are two chapters on linkage, with special references to Drosophila, and one on sex determination, as well as short discussions on unit character constancy, multiple factors, gametic purity, pure lines, the efficacy of selection, and similar topics. The Royal Horticultural Society's translation of Mendel's paper of 1865 is printed as an appendix. There is an extended bibliography.

Inheritance of stature, C. B. Davenport (*Genetics, 2 (1917), No. 4, pp. 313–389, figs. 19*).—Material for this investigation consisted of two groups of family data, one in which total height alone had been determined, and another less numerous group, secured personally by the author and his assistants, in which measurements were made on the seated subject of the distance from the surface of the seat to the top of the head, from the seat to the upper border of the breastbone, and from the ground to the head of the fibula at the side of the knee. The full height being known, it was thus possible to divide the stature of the members of this group into four segments which roughly coincide with the head and neck combined, torso, thigh, and lower leg. In discussing the results the absolute measurements of an individual are not used, but only the deviation of each measurement from the mean of that individual's sex.

Examination of these data convinced the author that shortness of stature tends to be dominant to tallness, and that this condition results from the dominance of smallness of body segment over elongation of segment. The segments being more or less independent of each other, there is a considerable irregularity in the results when total stature is used. A lesser irregularity seen in the inheritance of segment length indicates that the segments selected are not the ultimate units of stature. There is also evidence of the inheritance of proportional length of segments, and probably there exist factors which influence growth as a whole.

The relation of yellow coat color and black-eyed white spotting of mice in inheritance, C. C. Little (*Genetics, 2 (1917), No. 5, pp. 433–444; abs. in Anat. Rec., 11 (1917), No. 6, p. 501*).—It is well known that yellow color in mice has never been found in a homozygous condition. A black-eyed white spotted character, the inheritance of which has already been studied by the author (E. S. R., 34, p. 466), has the same peculiarity. As two doses of yellow or two doses of black-eyed white seem to produce death, it is important to knew whether animals with a single dose of each are viable. The author reports that they are. The lethal effects of yellow and of black-eyed white are, therefore, not additive. The two factors are found not to be linked.

Inheritance of number of feathers of the fantail pigeon, T. H. Morgan (*Amer. Nat., 52 (1918), No. 613, pp. 5–27, figs. 16*).—The feathers in question are the tail feathers, which in fantails may be three or more times as numerous as the usual 12 of other breeds. Three white fantails were crossed with ordinary pigeons (color not mentioned) and the F_1's allowed to breed together at random, separate records not being kept of the offspring of particular pairs. A few back crosses were, however, made. The frequency distributions, which are given only as diagrams, present so many peculiarities that the author has some difficulty in interpreting them on the customary basis of the multiple factor hypothesis. The distribution of blue and white color among the tails of different feather number suggests "that the principal factor for white is linked to one or more of the factors for increased number of feathers." There seems also to be a linkage between a gene for more than 12 tail feathers and the gene for absence of oil gland.

Some notes on split feathers are added.

A note on the inheritance of color in one breed of pigeons—an attempt to demonstrate a Mendelian type of transmission, J. S. W. Nuttall (*Jour.*

Genetics, 7 (1918), No. 2, pp. 119–124).—The red coloration of the type seen in racing homers was found to be dominant to the blue color, and the checked wing-pattern dominant to the barred. This conclusion is based on over 400 offspring. For tabulating purposes the matings are grouped according to the external appearance of the parents only, there being 8 out of a possible 10 groups. The expected ratios are computed by assuming that individuals heterozygous for one of the characters dealt with are as numerous as complete homozygotes, but that double heterozygotes are twice as likely to occur.

Observations on the skulls of Japanese cattle, K. Iguchi (*Jour. Col. Agr. Tohoku Imp. Univ., 5 (1913), No. 1, pp. 1–30, pls. 5; 7 (1917), No. 5, pp. 321–349, pls. 5*).—These papers continue the author's reports (E. S. R., 28, p. 472) on the craniometry of Japanese cattle. Measurements of 51 dimensions of each skull are given. The 57 specimens dealt with were collected from six localities in the Empire, including Chosen and small islands near Formosa.

Studies on the chromosomes of the common fowl as seen in testes and in embryos, M. F. Guyer (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 31 (1916), No. 4, pp. 221–268, pls. 7, figs. 2*).—Continued studies confirm, in general, the author's earlier observations on spermatogenesis in the fowl (E. S. R., 21, p. 670). The large curved element, interpreted as a sex chromosome, is clearly shown in nearly 1,000 primary spermatocytes, is surprisingly constant in size and shape, and has been found in Langshan, Plymouth Rock, and Rhode Island Red breeds. It is apparently a bivalent chromosome, as there are two visible in earlier stages. It passes undivided into only one of the two secondary spermatocytes resulting from each primary spermatocyte division, and in this way there are produced two types of spermatids, one with and one without the element. The author now believes that this latter class degenerates, and that all the functional spermatozoa arise from the first class. He bases this belief on microscopic evidence of a riot of irregular cell division among spermatids lacking this element with resultant decrease in size, on measurements which indicate a general uniformity in size of mature sperm, and on a certain logical necessity, if the facts of spermatogenesis are to be consistent with the chromosome counts of the embryo.

Microscopic examination by the author of embryos in the tenth to fourteenth day of incubation showed two of these curved chromosomes in dividing cells of male chicks and only one in those of females. This indicates that in poultry the female, and not the male, produces two kinds of germ cells with respect to the sex chromosomes and harmonizes with the breeding evidence that a hen is never homozygous for a dominant sex-linked factor.

Live stock production for 1919 (*U. S. Dept. Agr., Off. Sec. Circ. 123 (1918), pp. 14*).—This circular, issued in October, 1918, considers the food needs for 1919, and urges the increased production of live stock as part of the agricultural program for the period beginning with the autumn of 1918. The discussion is based largely on data presented relating to the exportation and production of beef, pork, and dairy products and to wool production, requirements, and supplies.

Certain desert plants as emergency stock feed, E. O. Wooton (*U. S. Dept. Agr. Bul. 728 (1918), pp. 27, pls. 8, fig. 1*).—This bulletin was prompted by the shortage of feeding stuffs in the arid Southwest. The author deals with about 12 species of plants growing in the desert regions near the Mexican border which have been or might be used as emergency feed for cattle on the range. These plants are mostly yuccas and agaves.

The essential factor in the utilization of these feeds is the production of an apparatus that will reduce them to a satisfactory mechanical condition, since hand chopping consumes much time and is otherwise unsatisfactory. Four such machines are now offered for sale, all consisting essentially of a heavy cast cylinder that revolves on a horizontal shaft and carries knives or cutting teeth passing close to a chopping block to which the material is carried by a feeding mechanism or by gravity. The bulletin includes a compilation of chemical analyses of the different species. These figures and the experience of the men who have fed the plants agree in showing that the feeds are of low nutritive value and are to be considered as roughages, but constitute valuable emergency feed for range cattle and sheep in times of extreme drought if properly prepared. Data as to the quantity to be fed, mechanical condition of the feed, and the cost of preparing it are given.

Only two of the species, the bear grass (*Yucca glauca*) and the soap weed (*Y. elata*), can be expected to reproduce themselves without special effort to insure a new crop. The plants, therefore, should be used only under emergency conditions and permitted to grow undisturbed during favorable seasons.

Range cow maintenance on Yucca and sotol, L. Foster and C. W. Humble (*New Mexico Sta. Bul. 114 (1918), pp. 27, figs. 9*).—The maintenance of range cows on Yucca and sotol is discussed. Descriptions of sotol and of species of Yucca are given, and the results of feeding tests with these plants as a source of feed are reported. The species of Yucca used in the experiments was the soapweed (*Yucca elata*). The dry leaves were burned from the plant, and the stem was then cut off at the ground and sliced or chopped up for feed. The sotol feed was prepared similarly but only the compact head of the plant was used.

The feeding tests were conducted with 25 range cows in thin condition and from two to four years old. These cows were divided into five equal lots, of which two were fed sotol heads and three on Yucca stems at the rate of 25 lbs. per head per day. Three of the lots, including one receiving the sotol feed, were given in addition, daily, 2 lbs. of cottonseed meal per head. For the two lots receiving no cottonseed meal the daily ration was later increased to 30 lbs. per day of sotol and Yucca. One lot of cows entered the experiment with their calves, while in the other four lots 10 calves were born during the period of the test, January 12 to June 25.

The results of the experiment are considered as evidence that cows may be maintained on either *Yucca elata* stems or sotol heads, without other feed, through long periods of drought. The best results were secured with the lots receiving the cottonseed meal. The five calves coming into the experiment with their dams but being allowed the run of a separate lot, where they were fed cottonseed meal up to 0.5 lb. per head per day and all the Yucca they would eat, made a total gain of 985 lbs. for the entire period of the experiment. The gain was made at a very small cost of feed and the calves were in fine condition when they went back to the range the middle of July. Until the cows became accustomed to the feed the succulence of the Yucca and sotol plants had a loosening effect, but when they were given the run of a brush pasture the dry feed they obtained tended to counteract this condition.

Analyses and preliminary coefficients of digestibility are also reported. A report by C. L. Forsling, of the Forest Service of the U. S. Department of Agriculture, on Collection, Preparation, and Feeding of Soapweed under Practical Range Conditions on the Jornada Range Reserve is included.

A chest contour caliper and its adaptability for measuring sheep, E. G. Ritzman (*New Hampshire Sta. Sci. Contrib. 11, pp. 11, figs. 7*).—The desirability of greater accuracy in body measurements taken in connection with animal husbandry studies is pointed out, and a chest contour caliper designed at the station for use in experimental breeding work with sheep is described. Detailed directions for its use are also given.

A method of feeding orphan lambs, W. E. Carroll (*Utah Sta. Circ.* (*1918*), *pp. 8, figs. 5*).—A system of feeding motherless lambs, including the description of a feeder for this purpose, is briefly outlined.

A preliminary report on feeds for fattening pigs, J. S. Malone (*Oklahoma Sta. Bul. 120* (*1918*), *pp. 7*).—The results of two tests made to determine the relative merits of tankage, peanut meal, and cottonseed meal as supplements to Kafir corn, together with data secured in a comparison of corn, Kafir corn, and darso as a fattening feed for pigs, are presented as a preliminary report.

In the tests with the different protein supplements the four lots of pigs used received the Kafir corn and the supplements through self-feeders. Three lots were given each one of the supplements and the fourth was given all three of them in addition to the Kafir corn. The results of the two tests were in favor of tankage, the tankage lots having eaten more feed and made faster and more economical gains and greater gains per pound of feed than those getting cottonseed meal or peanut meal. The lot having access to the three supplementary feeds made as rapid gains but ate more feed per pound of gain and made less profit than the tankage lot.

In the comparison of corn, Kafir corn, and darso, tankage was fed with each of these grains through self-feeders. The lot of pigs fed corn consumed 3.4 lbs., the one fed Kafir corn 3.7 lbs., and the lot fed darso 4.23 lbs. of feed per pound of gain. The results indicated also that when ground and fed in self-feeders Kafir and darso will produce as rapid gains and as good pork as corn, and that more supplement is required for darso than for Kafir corn and less for Kafir corn than for corn.

Feeding swine during fall and winter, W. L. Robison (*Mo. Bul. Ohio Sta.*, *3* (*1918*), *No. 11, pp. 328–332, figs. 3*).—The results of several feeding experiments are summarized in tables and briefly discussed.

In the first experiment reported 5 pigs each were fed for 10 weeks on corn alone and on corn and tankage. Corn alone produced 9.06 lbs. gain per bushel, while with the addition of 5.5 lbs. of tankage the production of gain was 13.29 lbs. With corn at $1.68 per bushel and tankage at $120 per ton, the feed cost per pound of gain was 18.55 cts. for corn alone and 13.78 cts. for corn and tankage.

In another test a bushel of corn fed alone produced 8.18 lbs. of gain, and when fed with 168 lbs. of skim milk the gain was 21.82 lbs., each 100 lbs. of skim milk replacing 54.91 lbs. of corn. In one instance corn alone resulted in 11.77 lbs. of gain per bushel, and corn and skim milk fed in equal quantities by weight produced 16.52 lbs. of gain. On the basis of skim milk at 50 cts. and hogs at $16 per 100 lbs. the corn netted $2.36 per bushel as against $1.[illegible] when fed alone.

In a comparison of rations of corn alone and of corn and linseed-oil meal 5:1, 1 lb. of oil meal replaced 1.52 lbs. of corn, and the rate of gain with corn and oil meal was 19 per cent higher than with corn alone.

The results of a comparison of a ration of corn and wheat middlings with one of corn and tankage showed that pigs fed corn and middlings, 1:1, gained 24.4 per cent less rapidly and required 9.5 per cent more feed per unit of gain than those fed corn and tankage, 9:1.

To determine the amount of supplement that should be fed with corn, rations averaging 4.9, 10.3, and 18.9 lbs. of corn to 1 lb. of tankage were compared in a test in progress for 20 weeks. The rate of gain was found to vary directly with the amount of the tankage. Slightly less feed per unit of gain was required of the medium ration than of either of the other two, and this ration also gave the highest value of gains over cost of feed.

Pigs weighing an average of 72 lbs., self-fed on corn and tankage separately, consumed an average of eight parts of corn to one of tankage during the first seven weeks of an experiment, at the close of which they averaged 123.3 lbs. in weight, and during the remaining 7 weeks of test they consumed 17.2 lbs. of corn to 1 lb. of tankage.

In another experiment three lots of pigs given, respectively, 1, 3, and 5 lbs. of skim milk to 1 lb. of corn and a fourth lot given twice daily all the skim milk and corn they would consume, were compared with a lot fed corn alone and another lot fed corn and tankage, 9:1. At the prices given above and placing the value of skim milk at 60 cts. per 100 lbs., the pigs fed 3 lbs. of milk to 1 lb. of corn made the most economical gains. The cost of feed for the lot fed corn alone was $8.88 above the value of the gains. For the other lots the value of gains over cost of feed was as follows: Corn and tankage 9:1, $14.91; corn and skim milk 1:1, $20.62; corn and skim milk 1:3, $35.59; corn and skim milk 1:5, $14.43; and corn and skim milk ad libitum, $18.62.

Peanut meal and velvet bean meal for fattening swine, H. E. Dvorachek and H. A. Sandhouse (*Arkansas Sta. Circ. 45 (1918), pp. 4*).—The high price of tankage and limited quantities available suggested the two experiments here reported, in which peanut meal and velvet-bean meal were compared with tankage as supplements to corn in fattening young pigs.

In the first experiment 18 shotes, averaging 115 lbs. in weight, were divided into three lots, each receiving corn and one of the three supplements fed separately by the free-choice self-feeder system. In the other experiment 15 shotes, weighing about 100 lbs. each, were fed the same way, except that the lots were hand fed and the supplement was mixed with eight times its weight of ground corn chop. The first experiment lasted 11 weeks and the second 10. Results are given in the following table:

Comparison of supplements to corn in fattening shotes.

Feeding method.	Supplement.	Average daily gain per head.	Total corn consumed.	Total supplement consumed.	Cost per pound of gain.
		Lbs.	*Lbs.*	*Lbs.*	*Cts.*
Self-fed	Velvet-bean meal	0.85	2,302.5	128.5	19.57
Do	Peanut meal	1.24	2,204.5	422.5	14.19
Do	Tankage	1.03	2,300.0	141.5	17.04
Hand-fed	Velvet-bean meal	.10	600.7	71.1	59.54
Do	Peanut meal	.54	807.6	111.2	16.96
Do	Tankage	.41	776.0	96.0	20.49

Costs were figured on the following market prices per hundredweight: Corn, $3.20; velvet bean meal, $2.50; peanut meal, $2.85; and tankage, $5.20. The velvet bean meal proved unpalatable, so that the hogs when self-fed ate but little of it and made their gains on corn. When it was mixed with corn and fed by hand they ate little more than a maintenance ration. Peanut meal was much relished and was consumed freely. The lots receiving it made the largest gains in both experiments, and these gains were also the cheapest. It is, therefore, considered to be an excellent substitute for tankage in the South.

Garbage feeding and the care of garbage fed swine, R. R. Birch (*Cornell Vet., 8 (1918), No. 1, pp. 26–37*).—This article advocates the more extensive use of garbage in pig feeding, in view of the successful development of hog-cholera serum. Replies are given to a questionnaire sent to the mayors of 50 New York cities concerning the local methods of garbage disposal and the possibility of utilizing hogs for this purpose.

Making artificial daylight for poultry, G. R. Shoup (*Washington Sta., West. Wash. Sta., Mo. Bul., 6 (1918), No. 8, pp. 113-117, figs. 4*).—A popular article noting the purpose and use of artificial light in poultry management, and describing briefly electric lights, gasoline mantle lights, and kerosene lights for use in this connection.

Business methods in poultry keeping, V. G. Aubry (*New Jersey Stas. Hints to Poultrymen, 7 (1918), No. 2, pp. 4*).—The advisability and value of applying business methods to poultry keeping are pointed out, and suggestions as to planning the work in advance, keeping cost accounts and records, and ways of buying and selling are presented.

The Flemish system of poultry rearing, Madame Jasper (*New York: Charles Scribner's Sons, 1916, pp. VIII+174*).—An account of methods the author has used successfully in producing table fowls on a commercial scale in Belgium, with incidental advice to English poultry breeders.

American squab culture, E. H. Eggleston (*Chicago: Author, 1916, pp. 191, figs. 37*).—This book contains information on the different squab producing breeds and the care and management of the pigeon house, with some notes on market problems.

DAIRY FARMING—DAIRYING.

The production, distribution, and food value of milk (*Washington: U. S. Food Admin., 1918, pp. 41*).—This is a report of the milk committee, composed or C. L. King (chairman), F. A. Pearson, G. Pinchot, Mrs. A. W. Smith, J. W. Sullivan, and G. F. Warren, appointed by the U. S. Food Administration to consider the production and distribution of milk for city markets.

The first section deals with production. The veal problem, the size and productivity of herds furnishing market milk, and the small percentage of concentrates fed that are home grown are briefly treated. It is held that at least 1 heifer must be raised yearly for every 5 cows if production is to be maintained. A summary is given of data submitted by seven investigators as to the cost of milk production in 490 herds, averaging just under 20 cows each, located in Minnesota, Michigan, Massachusetts, Connecticut, New York, and New Jersey. The yearly average quantities of feed and labor required to produce 100 lbs. of milk are shown in the table given below. They equal 80.8 per cent of the average net cost. Definite figures showing the difference between summer and winter averages are provided by one of the reports, that from Broome County, N. Y., concerning 56 farms producing milk throughout the year approximately as needed by the New York market. These figures are given in the following table:

Feed and labor required per 100 lbs. of milk.

Locality and time of year.	Labor.	Grain.	Hay.	Other dry forage.	Silage.	Other succulent feed.
	Hrs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
All farms, yearly average	2.88	33.5	45.3	11.5	93.2	9.6
Broome County, N. Y.:						
Pasture season	2.79	6.2	.3	.3	6.6	22.0
Winter season	3.77	41.7	100.8	17.7	151.9	10.2
Yearly average	3.42	28.1	62.2	11.1	96.1	14.7

As a guide in the estimation of prices to be expected at different seasons, a tabulation is presented showing 10-year averages of the relative prices by months for both the Chicago and New York territories. An appendix gives, for each investigation separately, an itemized statement of the costs and credits per cow. By vote of the committee, all charges for managerial ability and risk were excluded from the computations. In most cases a statement is made of the percentage of the annual milk yield produced during the six months beginning with October. This percentage varied from 47.4 to 51.4.

The second section of the report summarizes replies to a questionnaire sent to the principal milk dealers of the country concerning details of their business. The 45 dealers replying were, with few exceptions, located east of the Mississippi River and north of the latitude of Washington, D. C. In most cases the replies were checked by an accountant employed by the committee. For each group of dealers information is furnished for the first six months of 1917 as to assets, sales, costs, earnings, depreciation of plant and equipment, the disposal of milk purchased, the number of retail and wholesale routes, and the number of "quart points" per route. The 45 companies disposed of 510,000,000 qts. in the six months. The net earnings per quart averaged 0.256 ct. The average cost of distribution after the milk had reached the city and had been pasteurized was 1.116 cts. per quart. The committee is of the opinion that duplication of routes within the city is less common at present than is generally supposed. It is believed that all duplication could be eliminated by the establishment of zone monopolies in each vicinity through the licensing of distributors.

The life of a milk bottle is estimated at from 20 to 30 trips. Over 50 per cent of the breakage occurs when bottles are in the hands of consumers, and about 40 per cent when in the plant. At the time of the survey, quart bottles cost about 4 cts. each. The committee points out that many municipal regulations affecting distribution are obsolete, and is unanimous in urging the repeal of all laws prohibiting standardization of milk. It also believes that the number of recognized grades of milk should be reduced.

The third section of the report is a compilation of familiar facts as to the food value of milk.

Milk production costs and milk prices, R. M. GREEN, D. C. WOOD, and A. C. RAGSDALE (*Missouri Sta. Bul. 156 (1918), pp. 36, fig. 1*).—A report on investigations approximately coinciding with the calendar year 1917 on production costs in the neighborhood of the three largest Missouri cities. In each territory representative herds of 10 or more cows were selected for study. The total number studied was 101, of which 9 were composed entirely of pure-bred cattle; 66 of grades with an occasional pure bred; and the rest, 26, of mixed or common stock. In the counties adjoining St. Louis, the herds of 49 dairymen were studied, of which 40 shipped their milk by express to St. Louis, paying a transportation charge of 1.5 cts. to 2 cts. per gallon. The remaining 9 retailed their milk locally in the smaller towns. In the vicinity of St. Joseph, 23 farms were studied, of which 13 either hauled their milk to a local creamery or sold it to a neighboring dairyman who had milk routes in the city. Ten retailed their own milk in St. Joseph, an average haul of 3.5 miles. In the Kansas City district records were secured from 29 dairymen, of whom 4 retailed in outlying towns and 25 sold to local creameries. Complete data are given in 19 tables. The table following gives some of the main items of cost and the prices received under various marketing conditions in the different localities, the 4 local retailers near Kansas City being omitted.

Production costs and selling prices of milk under different methods of marketing.

Territory.	Method of marketing.	Feed cost per gal.	Labor cost per gal.	Net cost per gal.	Price received per gal.	Average loss per gal.
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*
St. Louis	Wholesale by express	18.9	7.8	31.80	24.68	[illegible]
St. Joseph	Wholesale without express	20.8	9.2	33.05	20.69	[illegible]
Kansas City	Wholesale through creameries	17.1	7.6	24.71	22.34	[illegible]
St. Louis	Retailing in small towns	20.4	13.7	33.27	29.93	[illegible]
St. Joseph	Retailing in large town	22.4	12.6	37.94	43.43	[1] [illegible]

[1] Profit.

The net cost was secured by adding together the feed, labor, and miscellaneous costs, deducting credits for manure, stock sold, hides, etc., and then adding [illegible] per cent for managerial ability and risk.

The following table summarizes the more pertinent data as to feed and labor expenditures for St. Louis and St. Joseph, those for Kansas City not being complete in all items:

Feed and labor expended per gallon of milk produced annually per cow.

Cost item.	Corn.	Bran.	Cotton-seed meal.	Other concentrates.	Legume hay.	Non-legume hay.	Silage.	Man labor.	Horse labor.
Per cow:	*Bu.*	*Lbs.*	*Lbs.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Hours.*	*Hours.*
St. Louis	10.2	484.2	150.6	0.20	1.24	0.10	2.77	165.6	[illegible]
St. Joseph	12.8	445.0	147.0	1.53	1.72	.28	1.95	246.5	[illegible]
Per gallon:	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Hours.*	*Hours.*
St. Louis	1.40	.96	.30	0.80	4.90	.39	11.0	.33	[illegible]
St. Joseph	1.28	.79	.26	5.43	6.13	.99	7.0	.44	[illegible]

"In no case were the men who were producing and selling milk wholesale averaging a profit when all items of cost were considered. A few individual cases of profit were due to particularly favorable contract prices rather than to exceptionally good production. The producers who retailed milk averaged a net profit of 3.1 cts. per gallon."

It is pointed out that some of the items included in the production costs given do not represent immediate cash outlay, and that this explains why dairymen continue in the business in spite of low returns.

"On the basis of the difference between wholesale and retail prices it appears that central distributors can sell at the same price as farmer retailers with a margin three to four times as large, because milk can be bought wholesale cheaper than it can be produced."

Determining cost of milk production, F. A. Pearson (*Cream. and Milk Plant Mo., 6 (1917), No. 3, p. 35*).—Studies completed by the dairy department of the Illinois Experiment Station are cited to show that, in the Chicago milk district, the amounts of feed and labor entering into the average herd cost of milk produced per hundredweight are as follows: Grain 44 lbs., silage, 188 lbs., hay 50 lbs., bedding 89 lbs., and man labor 2.42 hours. The unitemized debits are approximately offset by credits for increase in stock, manure, etc., and both may be disregarded in making a practical rough estimate of the financial cost of production. The relative price paid per month in the past is taken as a fair indication of the proper distribution of prices by months. A table showing the monthly percentages of the average price in the Chicago district is provided for use in connection with the formula for determining a just price.

The milk supply of Dublin, D. HOUSTON (*Dublin: Coop. Ref. Libr., 1918, pp. 30; abridged in Better Business, 3 (1918), No. 2, pp. 97–109*).—Results of a survey show high bacteriological counts in milk supplied to Dublin. The author does not expect that the exacting standards required by some American cities for market milk can be adopted at once, but urges that even considerably lower standards would work great improvement. In three appendixes the complete report gives details of bacteriological examinations of milk samples and milk barns, together with specific suggestions for retailers.

The book of butter, E. S. GUTHRIE (*New York: The Macmillan Co., 1918, pp. XV+270, figs. 60*).—This is a textbook designed to cover the entire field of the composition, manufacture, and marketing of butter. After introductory matter on the history, chemistry, and food value of butter, there is given a chapter on cleanliness in the utensils, equipment, and personnel of the creamery. Succeeding chapters deal concisely with the care of milk after it leaves the udder; separation, grading, and neutralizing of cream; pasteurization, ripening, and churning; flavors of butter; storage; and marketing. There are also brief discussions on whey butter, renovated butter, and margarin. The volume closes with a glossary and directions for testing milk, cream, and butter.

The book of cheese, C. THOM and W. W. FISK (*New York: The Macmillan Co., 1918, pp. XVI+392, figs. 74*).—This volume emphasizes the science rather than the art of cheese making. It is not a laboratory manual, but a statement of the underlying principles and a compilation of facts for the use of the dairy student and the beginner cheese maker. Milk in relation to cheese, the theory of coagulation, lactic starters, and curd making are first discussed, and then follows a classification of cheeses, with chapters devoted to the main types. The manufacture of Cheddar cheese is discussed in considerable detail. Factory construction and organization, the history of the cheese industry in America, dairy tests of importance to the cheese maker, marketing cheese, the basis of payment for milk at the factory, and the use of cheese in the household are other topics considered. Many references to American and foreign literature are given in footnotes and as bibliographies at the end of chapters.

Condensed milk and milk powder, O. F. HUNZIKER (*La Grange, Ill.: Author, 1918, 2. ed., rev. and enl., pp. 317, figs. 67*).—This treatise is now considerably enlarged to include developments in the condensed milk industry during the four years since first publication (E. S. R., 31, p. 375). The additions consist chiefly of chapters on condensing milk by the continuous process, the manufacture of malted milk, the standardization of natural and condensed milks, and the use of the Mojonnier methods of testing milk products. The discussion of the manufacture of milk powder is considerably altered, the chapter on bacteriological methods is enlarged, and the information on markets and prices is brought up to date.

VETERINARY MEDICINE.

Some remarks on foot-and-mouth disease and other diseases in relation to differential diagnosis, A. H. BERRY (*Vet. Rec., 30 (1918), No. 1561, pp. 497–504*).—The diseases and abnormal conditions of the muzzle and buccal cavity considered by the author include catarrhal, petechial, papular, vesicular, pustular, ulcerative, necrotic, and actinomycotic stomatitis, foot-and-mouth disease, necrotic ulcers on the tongue, mycotic stomatitis or "dirty tongue" disease, pseudomembranous stomatitis of sucklings, spreading sores of lips, ranula or frog tongue, and pustular dermatitis.

Bacteria of infectious diseases of man and animals, D. H. JONES (*Ontario Dept. Agr. Bul. 265 (1918), pp. 38–68, figs. 7*).—A popular summary of information.

[Report of] health of animals branch, T. A. CRERAR (*Rpt. Min. Agr. Canada, 1918, pp. 58–65*).—A brief summary of the occurrence of and work with the more important diseases of live stock during the year under report.

Annual administration report of the civil veterinary department in Baluchistan for the official year 1917–18, S. G. HAJI (*Ann. Admin. Rpt. Civ. Vet. Dept. Baluchistan, 1917–18, pp. 13*).—This, the usual annual report (E. S. R., 37, p. 274), includes an account of the occurrence of and work with infectious diseases of live stock.

Annual report of the civil veterinary department, United Provinces, for the year ended March 31, 1918, E. W. OLIVER (*Ann. Rpt. Civ. Vet. Dept. United Prov., 1918, pp. [6]+23*).—This is the usual annual report (E. S. R., 38, p. 180).

New and nonofficial remedies, 1918 (*Chicago: Amer. Med. Assoc., 1918, pp. 452+XXVI*).—This is the 1918 edition of the book previously noted (E. S. R., 37, p. 876). Certain products described in the 1917 edition have been omitted, new products have been added, and some revisions have been made in the definitions and statements of the physical and chemical properties of certain substances. Special attention is called to the discussion of foods for diabetics, of hypochlorites and hypochlorite substitutes, and of pollen extract preparations.

Revised supplement to new and nonofficial remedies, 1918 (*[Chicago: Amer. Med. Assoc., 1919], pp. 19*).—This is a supplement to the book noted above.

Relative irritant properties of the chlorin group of antiseptics, G. E. CULLEN and H. D. TAYLOR (*Jour. Expt. Med., 28 (1918), No. 6, pp. 681–699, pls. 3, figs. 2*).—The relative irritant action of Dakin's solution prepared in various ways, of other hypochlorite solutions, and of the organic chlorin antiseptics, chloramin T and dichloramin T, have been studied by means of the effect produced by these reagents on the ears of rabbits. From the observations reported the following conclusions are drawn:

Dakin's hypochlorite solutions, of which the alkalinity is kept within the range of from 100 to 1,000 times the alkalinity of water (pH of 9.3 to 10.2) by means of buffer salts, have practically the same degree of irritant action whatever method has been employed in preparing these solutions. Solutions that have an alkalinity less than that indicated by the end-point of alcoholic solution of phenolphthalein (pH of 8.5 to 8.8) or greater than that indicated by the end-point to powdered phenolphthalein (pH of 10.2) are intensely irritating. Solutions of hypochlorite from which most of the calcium has been precipitated and calcium hypochlorite solutions seem less irritating than Dakin's solution. Two per cent chloramin T solution has no irritant action, and 5 per cent dichloramin-T in chlorcosane and chlorcosane alone are only slightly irritating.

Dakin's solution and Dakin's oil in the normal peritoneal cavity of the dog, E. G. GREY (*Bul. Johns Hopkins Hosp., 29 (1918), No. 332, pp. 221–223*).—Both the neutral solution of chlorinated soda (Dakin's solution) and dichloramin T in chlorinated paraffin (Dakin's oil) when injected into the normal peritoneal cavity of a dog were found to lead to an inflammatory reaction, the degree of which was directly proportional to the amount of chlorin antiseptic used. The author emphasizes the necessity of caution in the use of chlorin antiseptics in intra-abdominal infections and the importance, if they are used, of maintaining an adequate drainage tract.

A study of pyotherapy in various suppurations, G. A. Chanier (*Réc. Méd. Vét., 94 (1918), No. 15–17, pp. 403–411*).—The author, in cooperation with Dupont, has tested the efficacy of autopyotherapy and of monovalent and polyvalent pyotherapy in the treatment of various suppurating wounds.

Excellent and similar results were obtained with all the methods employed. The general results are summarized, from which the conclusion is drawn that pyotherapy should be considered as an adjuvant rather than a panacea and should be used only in connection with the usual surgical treatment. Its mode of action is considered to be a stimulation of phagocytosis augmenting the natural defense of the organism rather than the creation of a state of resistance conferring immunity.

Sterilization of the skin and other surfaces by a mixture of crystal violet and brilliant green, V. Bonney and C. H. Browning (*Brit. Med. Jour., No. 2994 (1918), pp. 562, 563; abs. in Vet. Rev., 2 (1918), No. 4, pp. 484, 485*).—The solution employed contains 1 per cent of a mixture of equal parts of crystal violet and brilliant green dissolved in equal parts of rectified spirit and water. The skin of the operation area is painted with the solution six hours before the operation, and is then covered with lint soaked in the solution and protected by waterproof cloth. This is kept on until the operation. A sterile and actively antiseptic condition of the skin with no irritation is produced.

The results of the application of this method have been satisfactory both in chemical and in bacteriological tests.

The protective action of diet against tartrate nephritis, W. Salant and A. M. Swanson (*Jour. Pharmacol. and Expt. Ther., 11 (1918), No. 1, pp. 43–62*).—"When tartrate was given by mouth to rabbits on a diet of oats large doses were required to inhibit the elimination of phenolsulphonephthalein. The effects produced with medium doses were very moderate. Recovery was observed in all cases. Even small doses of sodium tartrate injected subcutaneously into rabbits on a diet of oats caused a very pronounced inhibition of the elimination of dye. Considerable improvement occurred after three to five days, but complete recovery of function was never observed.

"Evidence of disturbance of the renal function was seldom obtained with medium doses of sodium tartrate when injected subcutaneously into rabbits on a diet of fresh young carrots. Large doses showed a decrease of functional activity within a few hours after injection, but tests made one or more days later indicated considerable improvement and in some cases recovery.

"After the subcutaneous injection of sodium tartrate into rabbits on a diet of oats, the time of appearance of the phenolsulphonephthalein injected was delayed and the duration of elimination longer than in rabbits which had been receiving carrots.

"When sodium tartrate was injected subcutaneously in gradually increasing amounts, no impairment of renal function was observed even after very large doses (4 and 6 gm. per kilogram) if the diet consisted of carrots exclusively, but the efficiency of the kidney was markedly decreased if oats alone were fed, although the amount of tartrate administered was only one-fourth or one-sixth of that given to rabbits on a diet of carrots."

The influence of diet on the toxicity of sodium tartrate, W. Salant and A. M. Swanson (*Jour. Pharmacol. and Expt. Ther., 11 (1918), No. 1, pp. 27–41*).—"The toxicity of sodium tartrate was most marked on a diet of oats, hay, and cabbage. Diets rich in sugar were efficacious in decreasing toxicity, the effect being most pronounced on a diet of young carrots. A marked increase of resistance to tartrates was also observed on a diet of carrot leaves.

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"The favorable effects of some diets on the toxicity of tartrates might be due to several factors, among them inhibition of bacterial activity in the intestine, vitamins, or unknown constituents that might be present in some diets."

Complement fixation with protein substances, R. L. Kahn and A. McNeil (*Jour. Immunol.*, *3* (*1918*), *No. 4*, *pp. 277–293*).—The purpose of the studies reported was to determine whether or not the findings of Wells and Osborne (E. S. R., 35, p. 679), that the specificity of the anaphylactic reaction depends upon the chemical structure of the protein molecule, are applicable to the complement-fixation reaction. The substances employed consisted of proteins, split proteins, racemized proteins, and animal tissues. These were introduced parenterally into rabbits and specific complement-fixing antibodies sought for in the blood of these animals at definite intervals.

The results obtained showed that "what has been found to be true in the case of other immunity reactions appears to be true also in the case of the complement-fixation reaction, namely, that the specificity of the complement-fixation reaction depends upon the chemical structure of the protein molecule, and if the molecule be split or modified by racemization its specific complement binding power is lost."

A note on the relation between proteolysins and hemolysins, A. McNeil and R. L. Kahn (*Jour. Immunol.*, *3* (*1918*), *No. 4*, *pp. 295–299*).—This paper reports the results of an attempt to determine whether proteolytic substances are produced in rabbits as the result of protein injections. Proteolysis was determined by observing the increase in amino nitrogen after digesting mixtures of the immune serum, the specific protein, and complement for a given period.

The results gave no evidence of any increase in amino acids under these conditions, which would indicate that hemolysis and proteolysis are probably two distinct phenomena.

A study of the immunizing properties of bacterial vaccines prepared after various methods, M. W. Perry and J. A. Kolmer (*Jour. Immunol.*, *3* (*1918*), *No. 4*, *pp. 247–259*; *abs. in Jour. Amer. Med. Assoc.*, *71* (*1918*), *No. 24*, *p. 2021*).—A comparative study is reported of the efficacy of vaccines of *Bacillus typhosus*, including living, heat-killed, and chemically killed preparations injected subcutaneously into rabbits in doses similar to those employed in human beings and according to body weight. The antibody response was studied by means of the agglutination and complement-fixation reactions, and the nonspecific reaction was followed by means of total leucocyte counts and temperature observations. The results of the study are summarized as follows:

All vaccines of *B. typhosus* prepared in various ways usually produced slight leucocytosis and slight increase in temperature, the alcohol-killed sensitized sediment producing these nonspecific reactions in the highest degree. Agglutinin and complement-fixing antibodies were produced in the highest degree by the administration of living and autolyzed vaccines, followed in order by the mercurophen-killed, tricresol-killed, heat-killed, and alcohol-killed sensitized sediment vaccines.

The bactericidal action of whole blood, with a new technique for its determination, G. D. Heist and S. and M. Solis-Cohen (*Jour. Immunol.*, *3* (*1918*), *No. 4*, *pp. 261–276*, *figs. 2*; *abs. in Jour. Amer. Med. Assoc.*, *71* (*1918*), *No. 24*, *p. 2021*).—A five-stemmed capillary pipette is described by means of which blood, as it flows from the capillaries, may be brought into contact with living organisms in varying dilutions. By the use of this device it has been shown that if small numbers of living pneumococci are seeded in pigeon's blood before it coagulates the pneumococci fail to multiply, while if seeded in mouse's or rabbit's blood under similar conditions the pneumococci grow with great vigor.

The globoid bodies of poliomyelitis were found to grow readily in uncoagulated human blood, while they failed to grow when seeded in uncoagulated rabbit's blood.

The hypothesis advanced to explain the facts observed is that "when small numbers of bacteria are planted in fresh, uncoagulated blood only those bacteria grow and multiply which are pathogenic for the species from which the blood is drawn. Further, the number of given organisms destroyed by blood from different species is, to a certain extent, proportional to the natural immunity of those species to the organism. This likewise appears to be true of the immunity induced by inoculations."

Researches on the abnormal figures for sodium chlorid in the serum of sick horses, AUGUSTIN (*Rev. Gén. Méd. Vét., 27 (1918), No. 321, pp. 425–433*).—Observations are reported showing that the sodium chlorid in the serum of horses is susceptible to wide variations in the course of infections of the pasteurella type, an ascending curve of temperature very often coexisting with a descending curve of sodium chlorid. In the course of protracted convalescence a normal temperature is accompanied by a high sodium chlorid figure.

It is recommended that, in severe infections where injections of physiological serum are employed, 5.5 or 6 gm. of sodium chlorid per 1,000 should replace the concentration of 7 or 7.5 gm. per 1,000 usually employed, in order not to change too abruptly the strength of the sodium chlorid in the blood. The author also recommends the daily administration of about 200 gm. of sodium chlorid as an essential adjuvant to the ordinary medication.

The influence of arsphenamin and mercuric chlorid upon complement and antibody production, I. TOYAMA and J. A. KOLMER (*Jour. Immunol., 3 (1918), No. 4, pp. 301–316; abs. in Jour. Amer Med. Assoc., 71 (1918), No. 24, pp. 2021, 2022*).—A study is reported of the probable influence of arsphenamin and of mercuric chlorid upon (1) the production of immune antisheep and antihuman hemolysins and agglutinins for sheep and human erythrocytes in rabbits, (2) the production of immune typhoid agglutinin in rabbits, (3) hemolytic complement and normal antisheep hemolysin in rabbit serum, and (4) normal typhoid agglutinin and hemolytic complement in human serum.

The general result of the experiments indicates that while massive doses of arsphenamin and mercuric chlorid tend to suppress antibody production and cause a decrease in hemolytic complement, smaller doses tend to increase the production of antibody agglutinins and augment the complement content after a primary decrease.

On the concentration of antitoxic sera, ANNIE HOMER (*Jour. Physiol., 52 (1918), No. 4, pp. XXXI–XXXIII*).—Additional suggestions to those previously noted (E. S. R., 39, p. 487) are given for the concentration of antitoxic sera. If cresylic acid is to be used (E. S. R., 38, p. 504), it is considered advisable to determine experimentally for each consignment the minimum amount necessary to produce clear end-points. Preliminary adjustment of the reaction of the plasma to pH 8.3 is thought, however, to give more reliable results than those obtained by the use of either phenol or cresylic acid.

If both the first and second fraction precipitates are to be extracted with brine, the author recommends that, instead of filtering the plasma after the addition of 30 per cent ammonium sulphate, the ammonium sulphate content be brought up to 46 or 50 per cent saturation and the liquid then filtered. The precipitates, consisting of those of both the first and second fraction precipitates, are macerated in a volume of brine about twice that of the original plasma, salt is added, and after standing at room temperature for at least three days the brine extracts are filtered. To the filtrate is added 0.3 per cent glacial acetic acid, and the ensuing precipitate is filtered, pressed, and dialyzed in the usual manner.

Further observations on the properties of antitoxic sera, ANNIE HOMER (*Jour. Physiol., 52 (1918), No. 4, pp. XXXVII, XXXVIII*).—Certain factors influencing the concentration of antitoxic sera by methods involving the fractional precipitation of the heat-denatured sera by ammonium sulphate and by sodium chlorid are discussed.

On the concentration of antitoxic sera by the salting out of the heat-denatured serum proteins with sodium chlorid, ANNIE HOMER (*Biochem. Jour., 12 (1918), No. 3, pp. 190–209*).—This paper reports a study of the possibility of shortening the process of concentration of antitoxic sera by treating the heated sera directly with sodium chlorid, together with a further study of the factors influencing the heat denaturation of the serum proteins and of the extent to which the denaturation can be carried without rendering the protein antitoxin complex insoluble in brine. The results of the study are summarized as follows:

The concentration of antitoxic sera can be successfully conducted by a regulation of the heat denaturation of the serum proteins, followed by a direct treatment of the heated sera with brine and salt. The end products thus formed are clear and more readily filterable than those resulting from methods involving the use of ammonium sulphate.

With heat denaturation of the order of from 30 to 40 per cent, the method led to the removal of about 50 per cent of the serum proteins. The potency of the end products was about five times that of the original serum. The degree of concentration was not improved by a further increase in the extent of the heat denaturation, nor by the addition of substances such as cresylic acid or sulphates to the serum previous to its being heated. Under some conditions the heat-denatured proteins precipitated during the heating of sera containing cresylic acid or of which the reaction is more acid than pH=5 do not redissolve in brine, even on long standing. There is, however, evidence that the proteins precipitated during the heating of sera containing electrolytes can be redissolved by the prolonged treatment of the precipitates with a large volume of brine. For the successful concentration of sera, the precipitation of those proteins to which the antitoxin is attached must not be changed from a reversible to a nonreversible type of action.

The method discussed has not furnished end products showing so great a percentage removal of the serum proteins nor a degree of concentration so high as that obtained by the author with the Banzhaf and the Homer methods (E. S. R., 39, p. 487), but is suggested as a practicable alternative method.

The absorption or saturation test of Castellani: Its applications in serodiagnosis, and in the recognition of bacterial species, F. E. TAYLOR (*Jour. Hyg. [Cambridge], 17 (1918), No. 4, pp. 415–438*).—This is an account of the absorption or saturation test of Castellani, previously noted (E. S. R., 14, p. 393), with a general review of its use by different investigators in the study of infections of the typhoid-paratyphoid group, dysentery, the meningococcal group, tetanus, and plague. The technique employed in the application of the test to the serodiagnosis of mixed infections and to the differentiation of closely allied species and types of bacteria is described.

A preliminary report on the intrapalpebral mallein test, L. PRICE (*Jour. Amer. Vet. Med. Assoc., 53 (1918), No. 5, pp. 597–606, figs. 4*).—This is a discussion of the intradermo-palpebral test for glanders as observed in the examination of over 500 healthy and 27 glandered horses.

The author concludes that the intradermo-palpebral test "is comparatively a simple, accurate, convenient, and reliable method for detecting glanders in horses. It is the most suitable method of testing with mallein in war times or when large numbers of animals must be speedily tested. If the local reaction alone is considered, a large number of horses may be examined in a short period of time."

Observations on epizootic lymphangitis, CAPMAU (*Bul. Soc. Cent. Méd. Vét., 94 (1918), No. 16–18, pp. 337–360*).—A comparative study is reported of the Belin method of autopyovaccination (E. S. R., 38, p. 587) and the Velu method of pyovaccination (E. S. R., 38, p. 587) in the treatment of epizootic lymphangitis. In the technique of both methods the author recommends as thorough a removal as possible of the infected tissue before the injection of the pyovaccine.

The conclusion is drawn that, while excellent results can be obtained with both methods, the autopyovaccine appears to have no advantage over the pyovaccine, and to have as disadvantages the difficulty of procuring sufficient pus to make the necessary amount of vaccine and the danger of abscesses at the point of inoculation.

Slight modifications of the Velu method are outlined, and the necessity of certain precautions is pointed out. It is suggested that the reactions obtained with pyovaccine are not reactions of immunity but rather of phagocytosis.

Antiparatyphoid B vaccination with sensitized virus, A. BESREDKA and S. BASSECHES (*Ann. Inst. Pasteur, 32 (1918), No. 5, pp. 193–201; abs. in Chem. Abs., 12 (1918), No. 22, p. 2362*).—A study is reported of the relative value of different methods of vaccination with paratyphoid bacilli, using mice as experimental animals. The following vaccines were used: Living and dead nonsensitized paratyphoid bacilli, living and dead bacilli in the presence of variable amounts of antiparatyphoid serum, and living sensitized bacilli. The various preparations were introduced subcutaneously in one series of experiments and orally in another series. From the results obtained the following conclusions are drawn:

Vaccination with living paratyphoid bacilli confers immunity only after several days. On account of the virulence considerable risk is involved in its use. Vaccination with killed bacilli confers immunity after four or five days, but the vaccine has a marked toxic power. Vaccination with living sensitized bacilli confers immunity on the following day, and the vaccine is neither toxic nor virulent. The presence of serum, even in traces only, renders immunity by vaccination passive instead of active. Immunity following ingestion of the bacilli is established very slowly and is lasting only in the case of living organisms.

A study of the agglutination and complement fixation tests with equine paratyphoid bacillus in horses with typhoid infections, R. COMBES (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 6, pp. 288–291; abs. in Vet. Rev., 2 (1918), No. 3, p. 303*).—Continuing investigations previously noted (E. S. R., 39, p. 392), the author reports a study to determine whether, in the blood of horses and mules infected with the equine paratyphoid bacillus, corresponding antibodies are produced.

A study of the agglutination and complement fixation reactions showed that the serum of horses infected by the equine paratyphoid bacillus had agglutinating power for the bacillus in dilutions up to 1:4,000, while in all other cases agglutination did not take place at a dilution of more than 1:100.

The author concludes that by means of serum diagnosis it would be possible in cases of equine influenza to determine those cases in which the infection is due to the equine paratyphoid bacillus and those in which this organism is absent.

Contagious abortion questions answered, F. B. Hadley (*Wisconsin Sta. Bul. 296 (1918), pp. 36, figs. 8*).—Information relating to this disease in cattle is given in the form of questions and answers.

Contagious abortion in cattle, A. Theiler (*Rhodesia Agr. Jour., 15 (1918), No. 3, pp. 268–278*).—A review of the present status of knowledge of this disease, the occurrence of which in South Africa is said to have been known for a considerable time, although its identity with the European disease was demonstrated only a few years ago.

Cattle scab and methods of control and eradication, M. Imes (*U. S. Dept. Agr., Farmers' Bul. 1017 (1918), pp. 29, figs. 15*).—The nature and habits of the scab mites, the symptoms caused by each species, methods of distinguishing the different kinds of cattle scab, and means for eradication by dipping or spraying are given in popular form.

Coccidia in the intestines, red dysentery of cattle.—Observations on Eimeria zurni-rivolta, B. Galli-Valerio (*Trans. in Vet. Jour., 74 (1918), No. 516, pp. 219–223*).—The author's conclusions are as follows:

"Coccidian dysentery of cattle is due to a specific coccidium, *E. zurni-rivolta*. It is chiefly transmitted by ailing animals in stalls, stables, and sheds. Infected abodes not disinfected or insufficiently disinfected maintain infection for ages. For a good prophylaxis the following are necessary (a) a strong sterilizing therapy of the sick animals associated with their isolation, (b) the destruction of their feces and disinfection of the standing (sulphuric acid), and (c) the draining of pastures and distribution of good potable water."

Report of experiments on immunizing against hog cholera, L. L. Lewis and C. H. McElroy (*Oklahoma Sta. Bul. 119 (1918), pp. 3–15*).—The investigations reported included experiments to prove whether hogs given the simultaneous treatment will or will not be a source of infection for hogs that have not been vaccinated, to test the effect of desiccation on the virulence of hog cholera virus, to determine how long immunity will last in young hogs after they are immunized against hog cholera by the simultaneous method, and to determine the period of immunity in hogs receiving only the serum treatment. From the results obtained the following conclusions are drawn:

Hogs given the simultaneous treatment for hog cholera will probably not be a source of danger when put with hogs that have not been vaccinated. No immunity is produced by using hog cholera virus dried for such a length of time that it will not produce the disease. Young pigs three weeks old or older may be successfully immunized by the simultaneous treatment. Probably a still higher immunity may be acquired by an additional inoculation of 0.5 cc. of virus in about two weeks after the simultaneous treatment has been administered. Serum-alone treatment will not give hogs immunity for more than three or four weeks.

RURAL ENGINEERING.

Surface water supply of the United States, 1915, IX, X, XII B, XII (*U. S. Geol. Survey, Water-Supply Paper, 1918, Nos. 409, pp. 236+XXXIV, pls. 2; 410, pp. 255+XL, pls. 2; 413, pp. 215+XLIX, pls. 2; 414, pp. 182+XLIX, pls. 2*).—These papers deal with measurements of flow made on streams during the year ended September 30, 1915, as follows: Paper 409, Colorado River Basin; 410, The Great Basin; 413, North Pacific Drainage Basins—Snake River Basin; 414, North Pacific Drainage Basins—Lower Columbia River and Pacific Drainage Basins in Oregon. Paper 409 was prepared in cooperation with the States of Arizona, Nevada, Utah, and Wyoming; 410 with Utah, Nevada, California, and Oregon; 413 with Idaho, Oregon, Nevada, and Washington; and 414 with Oregon and Washington. In each case the usual appendix of gauging stations and publications relating to water resources are included.

Surface water supply of the United States, 1916, II, III, V (*U. S. Geol. Survey, Water-Supply Paper, 1918, Nos. 432, pp. 58+XXVI, pls. 2; 433, pp. 205+XXXII, pls. 2; 435, pp. 207+XXIX, pls. 2*).—These papers deal with measurements of flow made on streams during the year ended September 30, 1916, as follows: Paper 432, South Atlantic and Eastern Gulf of Mexico Basins; 433, Ohio River Basin; and 435, Hudson Bay and Upper Mississippi River Basins. Paper 433 was prepared in cooperation with the States of Illinois and Kentucky, and 435 with Minnesota, Wisconsin, Iowa, and Illinois. In each case the usual appendix of gauging stations and publications relating to water resources are included.

Surface water supply of Hawaii, July 1, 1916, to June 30, 1917 (*U. S. Geol. Survey, Water-Supply Paper 465 (1918), pp. 191*).—This report, prepared in cooperation with the Territory of Hawaii, contains the results of measurements of flow of certain streams and ditches and records of rainfall in the Territory of Hawaii made during the year ended June 30, 1917.

Artesian waters in the vicinity of the Black Hills, S. Dak., N. H. DARTON (*U. S. Geol. Survey, Water-Supply Paper 428 (1918), pp. 64, pls. 13, figs. 11*).—This paper describes in detail the geology of the region and discusses the underground waters with reference to their occurrence in different geological formations in various parts of the region.

It is stated that the slopes of the Black Hills and the plains adjoining them are underlain by 6,000 ft. of sedimentary rocks, including several thick beds of water-bearing sandstone which receive their water supplies from rainfall on the higher ridges and slopes. The Dakota and Lakota sandstones are considered to be the principal beds in which artesian water is to be expected in the plains adjoining the Black Hills, the greatest volume occurring in the latter. Some wells are said to show surface pressures of 175 to 200 lbs. per square inch.

The water from these sandstones is said to be the source of supply for numerous wells 400 to 2,000 ft. deep, which furnish large volumes of water in eastern and central South Dakota, and it is believed that this water is also available under the plains lying immediately east of the Black Hills. Analyses of waters from various wells are included.

Drainage methods and foundations for county roads, E. W. JAMES, V. M. PEIRCE, and C. H. MOOREFIELD (*U. S. Dept. Agr. Bul. 724 (1918), pp. 86, pls. 12, figs. 19*).—The purpose of this bulletin is to supply information concerning the proper methods of draining roadbeds, constructed of various kinds of soil, under different topographic conditions, and also to explain how foundations may be designed to suit the soil conditions, the road surface, and the system of drainage. Considerable engineering data on the design of drains and gutters is given, but about half the bulletin is devoted to the design of foundations. A final section on specifications is included.

Practical hints on running a gas engine, A. P. YERKES (*U. S. Dept. Agr., Farmers' Bul. 1013 (1919), pp. 16*).—This publication gives general suggestions to inexperienced operators on how to avoid or remedy the more common forms of engine trouble. A trouble chart, in which possible sources of trouble are listed, is included.

Small sawmills: Their equipment, construction, and operation, D. F. SEERRY (*U. S. Dept. Agr. Bul. 718 (1918), pp. 68*).—This bulletin offers to portable-sawmill operators suggestions regarding methods of organization, milling, and logging which have been proved by experience to give the best results. It is meant particularly for operators in National Forest timber, but is considered useful to other owners of portable mills where conditions are like those in the

National Forests. An appendix giving engineering data on the development of water power, the calculation of the speed of saws, pulleys, and drums, and on saw gauges, and a list of mill-machinery and lumber terms are included.

Housing farm poultry, A. G. Philips (*Indiana Sta. Circ. 84 (1918), pp. 12, figs. 13*).—The principles underlying the proper location, arrangement, and construction of poultry houses are explained and illustrated with drawings showing working models for houses to accommodate 65 and 100 fowls. These models can be lengthened and widened to meet any desired capacity.

RURAL ECONOMICS.

Country life and rural problems, Mary K. Reely (*New York: The H. W. Wilson Co., 1918, pp. 39*).—This is a study outline of some of the social problems of the country community, grouped under five main heads—the farm home, rural school, country church, community life, and country town. Suggestive topics for discussion and a bibliography are given under each head, together with a general supplementary list of 23 books.

The cost of crop production in Ohio, C. E. Thorne (*Mo. Bul. Ohio Sta., 3 (1918), No. 11, pp. 337–348*).—This article is based upon figures from the U. S. Census of 1910 and other official sources and upon the author's estimates.

Figures from Bulletin 266, previously noted (E. S. R., 32, p. 135) show the average employment in the field of man labor and horse labor in the production and harvesting of an acre of corn. Similar tables based upon common experience show that the estimated field labor expended in the production of an acre of wheat is 27 hours of man labor and 38 hours of horse labor, and that of an acre of hay crops, 17 hours of man labor and 26 hours of horse labor. The estimate of total field labor employed in crop production on the average Ohio farm, which, according to the census of 1910, consists of 88½ acres, gives a total of 1,429 hours of man labor and 1,806 hours of horse labor expended.

The author notes such items as overhead cost; weather hindrance; cost of horse labor; cost of implements and machinery; fertilizers; average yields of principal crops for the 10 years, 1906 to 1915, inclusive, and average farm prices by U. S. Department of Agriculture estimates for the same period and by the scale of estimated average prices for 1918; land rental; and labor's share. Setting aside one-third of the crop for rental of the land and computing man labor at 15 cts. an hour at the lower rate and 25 cts. at the higher, and horse labor at 10 and 15 cts., respectively, and adding 50 per cent to the man hours for corn loss through unavoidable hindrance, the average cost of producing a bushel of corn in 1918 reaches $1.10, that of wheat $1.86, oats 79 cts., and of a ton of hay $14.07, as compared with 61 cts., $1.04, 48 cts., and $8.40, respectively, the cost per bushel or ton of producing these crops in the 10-year period 1906–1915. At the average rate of 35 cts. an hour for man labor, the cost of producing wheat reaches $2.12 a bushel for the average Ohio yield of 15 bu. over the seed sown; the cost of corn likewise $1.30.

The calculations in this study indicate that the Ohio farmer owning his farm, the land and equipment having been purchased before the war, may receive about 6 per cent on his original investment and a salary of $800 to $1,000. The salary of the tenant farmer may be much less than that.

Producing family and farm supplies on the cotton farm, C. L. Goodrich (*U. S. Dept. Agr., Farmers' Bul. 1015 (1919), pp. 16*).—The author uses data from Bulletins 648, previously noted (E. S. R., 39, p. 293), and 410, previously noted (E. S. R., 36, p. 289). In the first of these it is shown that on 106 farms in Brooks County, Ga., the families in 1914 consumed food averaging in value

$526, approximately 85 per cent of which was produced on the farm and constituted an average of 18 per cent of the net income on farms having 250 acres or more of crop land and 48 per cent of the net income of farms having less than 75 acres of crop land. Data in the second bulletin referred to indicate that on 149 farms evenly distributed in Gaston County, N. C., Troup County, Ga., and McLennan County, Tex., the average family consumed food to the value of $454, of which 69 per cent was produced on the farm.

Data from Bulletin 602, previously noted (E. S. R., 38, p. 792), are given to illustrate a similar relative importance of the value of products of home gardens to town families. The size and plan of the home vegetable garden and fruit garden are discussed, and tables are given as to yields of garden vegetables; planting periods, width of row, and distance of plants in the row for garden vegetables; and a suggested planting of vegetables for a farm family of five adults or their equivalent in the middle cotton belt.

The author makes suggestions for the production of farm supplies of cereals; sirup and sugar; animal foods for the family, including milk, butter, and cottage cheese, pork and pork products, chickens, and eggs; and of feed for the family live stock. He apportions the following acreages, calculated on the basis of average yields in the cotton States, for food and feed crops which will be required to supply adequately a two-mule family farm with an average of five adult persons or their equivalent: Garden 2 acres, corn with cowpeas 13½ acres, sugar cane ½ acre, oats and oat hay 7½ acres, soiling crops 2 acres, and pasture 7 acres. Roughage for cows and work stock, cowpea or velvet bean hay, and cotton seed for cows are taken as by-products or second crops. A second crop may be grown on 7 of the 25½ acres, and cowpeas or peanuts should be planted between the corn rows.

Relation of the Government to the marketing problem, B. T. GALLOWAY (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 50–55*).—The data presented have been previously noted from another publication (E. S. R., 35, p. 89).

The economic bearing of future trading in agricultural commodities, H. C. EMERY (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 21–25*).—The author states that organized future trading in articles which naturally permit it, in their relation to the whole mechanism of trade and credit by which agricultural products are carried to all parts of the world from producer to consumer, increases the possibilities for a prompt market for the producer under definitely known conditions and a prompt service to the buyer, and that the gap between the consumer's and the producer's prices (plus freight) is thereby reduced to a minimum.

Uniform grades and standard packages, C. T. MOBE (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 468–474*).—The benefits of these conditions are set forth.

Municipal terminal markets, C. O. MILLER (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 720–729*).—The author discusses the salutary influence of proper wholesale markets on many pressing problems in this country, such as encouragement to the farmer to increase his production, the reduction of food prices, etc. He states that it is of far more importance that the farmer sell his whole crop at moderate prices than to sell a part at high prices and the remainder not at all, that the chief reason farming has not paid is the lack of marketing facilities in the cities, that it has been proved that the establishment of a large terminal market insures steady sales at moderate prices, and that the quick returns of cash for goods consigned to the market stimulates production.

Monthly Crop Report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 11, pp. 133–144*).—In addition to the customary data on crop conditions, estimated farm value, average prices received by producers of important products, and range of prices of agricultural products at important markets, this number contains a crop summary for November 1, 1918; special reports on materials used in brewing; acreage of pasture land and its carrying capacity; exports of domestic feeding stuffs from the United States; leaf tobacco held by manufacturers and dealers; clover and alfalfa seed prices, 1916–18; the corn production, 1918, with comparisons; area and yield of sugar-beet seed, 1918; live-stock changes in the United States; hog production and consumption; data on how the corn crop is harvested; a special sectional apple report; a comparison of the commercial tomato pack of 1917 and 1918; and miscellaneous data.

Farmers' market bulletin, W. R. Camp (*North Carolina Sta. Farmers' Market Bul., 5 (1918), No. 25, pp. 7*).—This number contains the current partial list of products which farmers have for sale, with notes on marketing and directions to growers for reporting their needs.

Price Current-Grain Reporter Yearbook, 1918, E. G. Osman (*Price Current-Grain Rptr. Yearbook 1918, pp. 104*).—This issue continues data previously noted (E. S. R., 37, p. 595), giving statistics for the year ended May 1, 1918.

[Agricultural statistics of Sweden] (*Statis. Arsbok Sverige, 1917, p. 70–86; 1918, pp. 72–90*).—These reports continue data previously noted (E. S. R., 35, p. 894) by adding information for the years 1917 and 1918.

AGRICULTURAL EDUCATION.

Have the agricultural colleges fulfilled their obligation in the present war emergency? W. D. Hurd (*Proc. Soc. Prom. Agr. Sci., 38 (1917), pp. 95–104*).—This paper, presented at the 1917 meeting of the society, briefly surveys some of the things which the U. S. Department of Agriculture and the agricultural colleges with their cooperating organizations have done through their scientific, technical, and military instruction to meet the war emergency.

The advisability of collegiate courses on marketing and distribution, T. N. Carver (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 396–399*).—The author discusses the necessity of a study of the problem of marketing and ways in which this problem enters into the general scheme of theoretical economics. He concludes that "colleges and universities are the proper places for the study of any problem which is, in the first place, of such profound importance to the welfare of the community as the problem of marketing, and, in the second place, of such difficulty and magnitude as to challenge the best efforts of educated men."

The institute of tropical agriculture of the Pacific Coast, H. J. Webber (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 599–602*).—An account is given of the functions and equipment of the Graduate School of Tropical Agriculture and Citrus Experiment Station at Riverside, Cal., established as a branch of the College of Agriculture of the University of California.

The public school system of San Francisco, Cal. (*U. S. Bur. Ed. Bul. 46 (1917), pp. 649, figs. 79*).—This report of a survey of the public school system of San Francisco contains among others a chapter on home economics (pp. 442–478), including a discussion of the conditions as they existed at the time of the survey committee's visit, a statement of ideals in regard to this phase of education, and a series of recommendations for immediate modifications and the ultimate development of courses, instructional corps, and material equipment.

A chapter is also devoted to the educational and economic value of school-directed gardening (pp. 570–620), including a discussion of the present status of gardening in the city of San Francisco, the irrigation of gardens, the advisability of training the youths of the city in agriculture, teacher training, the value of school-directed home gardening to San Francisco children, and the present status of instruction in nature study and elementary science which are required subjects.

In conclusion it is stated that school and home gardening and elementary agriculture have not been given adequate recognition or financial aid in the school system. Brief accounts are given of a dry-farming club project and of a study of the economic value of gardening and agricultural interests of the home that might become school-directed projects. It is recommended that a director of nature study and school and home gardening be appointed to act under the direction of the deputy superintendent responsible for vocational education and the manual arts, and that he should work out a complete plan of home and school gardening and other home project activities for the city. From 10 to 15 grade teachers should also be appointed at once as school and home garden teachers under a schedule which would permit them to teach gardening in the upper grades during school hours and direct the practical work out of school hours.

Annual report of the Atlantic County vocational schools, Atlantic County, N. J. (*Ann. Rpt. Atlantic Co.* [*N. J.*] *Vocat. Schools, 1917, pp. 27*).—This is a statement, by the director of the schools, of the history and organization of the instruction in agriculture and home economics in the schools of agriculture located at Hammonton, Pleasantville, Cologne, and Minotola, N. J., and part-time schools, including statistics of student enrollment and attendance, and the number and kinds of projects undertaken, together with an outline of the course of study and extension work.

Directors of agriculture: Regulations governing appointment and duties (*Univ. State N. Y. Bul. 654* (*1918*), *pp. 11*).—Information is given concerning the requirements and qualifications of directors of agriculture in New York cities, towns, and school districts not maintaining a school of agriculture, mechanic arts, and homemaking. This is followed by an outline of suggested types of work, a description of types of work carried on during the summer of 1917 by the directors of agriculture in the city of Troy and in a rural community in Montgomery County, and a summary of four type projects.

The home project as a phase of vocational agricultural education, F. E. HEALD (*Fed. Bd. Vocat. Ed. Bul. 21* (*1918*), *pp. 43*).—This bulletin has been prepared in order to supply information and suggestions concerning the nature and conduct of home-project work as a phase of secondary instruction in vocational agriculture. It discusses the application of the term "home project" and the essentials of a home project; the project plan in detail, including a form of agreement; the relation of schoolroom instruction to home-project work, including types of outlines for various projects; detailed project records and reports; and the supervision of projects. A memorandum on instruction in agriculture in vocational schools and extension work in agriculture, and a list of typical publications dealing with the teaching of agriculture and invoving the home-project method, are included.

Farm science, W. J. SPILLMAN (*Yonkers-on-Hudson, N. Y.: World Book Co., 1918, pp. VII+344, figs. 174, pls. 2*).—This text deals with the fundamental principles underlying agriculture, the subject matter being presented in a form suitable for classroom use. Its four parts treat respectively of the soil, the plant, the animal, and the farm, the latter including a discussion of the farm business, how to secure the best results from growing crops, live stock enterprises, and the farm investment and income. The experiments following the various chapters require no apparatus and, for the most part, no materials not readily obtainable on the farm.

Home projects in horticulture and field crops, G. H. WHITCHER (*N. H. Dept. Pub. Instr., Div. Insts., No. 83 (1917–18), pp. 18, fig. 1*).—Project requirements for standard New Hampshire schools and suggestions for the horticultural projects in the freshman year of the high school are given.

The book of the school garden, C. F. LAWRANCE (*London: Evans Bros., Ltd., [1918], pp. XII+231, figs. 79*).—This book consists of four parts dealing respectively with (1) vegetable culture, including the planning and cropping of school gardens, manual operations in the garden, fertilizers. seed sowing, thinning and transplanting, harvesting and storing garden produce, seed saving, potato culture, and allotment management; (2) garden friends and foes; (3) fruit culture, treating of methods of propagation, planting, pruning and training fruit trees and bushes, and dealing with established fruit trees; and (4) discussions for indoor work for the gardening class and for making useful appliances and tools, useful hints on intercropping, rotation of crops, manuring, etc., instructions for growing a number of vegetables and flowers, and a simple method of protecting early and late crops. A model allotment cropping plan and a model school garden plan are included. A scheme of work for the school garden, the classroom and correlation, a table of seed quantities, etc., a garden calendar, directions for using spraying machines, and formulæ for various sprays are appended.

The home and the family, HELEN KINNE and ANNA M. COOLEY (*New York: The Macmillan Co., 1917, pp. VI+292, pl. 1, figs. 196*).—This text, which is written in story form, is intended for use in elementary schools as a supplementary reader to the authors' two textbooks, Clothing and Health and Food and Health, previously noted (E. S. R., 36, pp. 396, 497), and for the home people. It describes how the cottage loaned to the pupils of the Pleasant Valley school was decorated, furnished, and kept clean. Suggestions for laundering are made, and a chapter on the care of the baby is included. The final chapter consists of a series of lessons on personal efficiency, suggesting some helps in keeping well and including a lesson on the care of the sick. Practical exercises and problems are included.

MISCELLANEOUS.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 3 (1918), No. 11, pp. 321–349, pl. 1, figs. 8*).—This contains several articles abstracted elsewhere in this issue, together with the following: War Time Uses of Timber, by E. Secrest; Fall Practices to Destroy Cereal Crop Insects, by T. H. Parks; and Autumn Lawn and Flower Garden Work, by W. E. Bontrager.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 8, pp. 106–120, figs. 6*).—This number contains brief articles on the following subjects: The Washington State Land Settlemen Association, by E. F. Benson; Vinegar Making by the Storage Method, and Sauerkraut, both by J. L. Stahl; Post-mortem Examination of Poultry, by W. T. Johnson; Making Artificial Daylight for Poultry, by G. R. Shoup (see p. 280); and How Some of Our Common Vegetable Diseases and Insect Pests Pass through the Winter, and What Can Be Done toward Controlling Them at That Time, by A. Frank (see p. 245).

NOTES.

Arizona University and Station.—A comprehensive building plan of some thirteen projects has been favorably recommended by the legislative committee after a thorough inspection of the work of the institution. Among the structures recommended are an administration building, a science building, a general assembly and students' activities building, and additional dormitories.

Sheep feeding experiments are being begun at the Salt River substation near Mesa. The feeds tested will be, for the most part, those produced on the substation farm, notably sorghum silage, which has not thus far been used very largely in the State. A 10-acre fruit orchard is being set out on the Salt River farm and a 3-acre orchard on the university farm near Tucson, while the plantings of citrus fruits and grapes at Yuma are being increased materially.

Arkansas University and Station.—Appropriations recently made by the legislature for the support of the university under the provisions of the millage tax law will provide a considerable increase in funds for the ensuing biennium. Among the allotments is one of $75,000 for the purchase of land during the next six years, $25,000 being made available for each of the three biennial periods.

Louisiana Stations.—Seth S. Walker, formerly of the Florida Station, has been appointed soil chemist at Baton Rouge.

Minnesota University and Station.—Phil C. Bing, assistant editor of publications and assistant professor of journalism since 1917, died February 23, aged 35 years. Recent appointments as instructors include Lavinia Stinson in foods and cookery, R. W. Hall in agricultural physics, P. B. Barker in agricultural education, L. V. Wilson in dairy husbandry, A. L. Anderson in animal husbandry, and George E. Holm (returned from military service) in agricultural biochemistry.

Missouri University and Station.—Dean F. B. Mumford, who has acted as Federal food administrator for the State of Missouri, has again taken active charge of the administration of the college and station. C. A. Helm, assistant professor of farm crops, L. J. Stadler, assistant in farm crops, and E. H. Hughes, superintendent of short courses and assistant to the dean, have also returned from National service. A. C. Ragsdale, extension professor of dairy husbandry, has been appointed professor of dairy husbandry, beginning April 1, vice Dr. C. H. Eckles, whose Minnesota appointment has been previously noted.

New Jersey College and Stations.—A new building is being constructed on the college farm to house all the farm machinery and provide for instruction work in farm mechanics.

New home economics equipment has been installed in the short course building. A large room has been remodeled to provide for model unit kitchens and a dining room for instruction work, and another room has been equipped as an experimental laboratory for the study of methods of canning and drying, new recipes, etc.

The station, the college of agriculture, and the extension division have established a new publication known as *New Jersey Agriculture*. This is to be issued monthly and distributed to a restricted mailing list of persons interested in advancing the agricultural activities of the State.

The short courses in agriculture, which ended February 19, were completed by 45 students. A special school in tractor instruction was conducted at Hammonton, February 24 to March 1, following a petition from 30 farmers.

Director J. G. Lipman has been appointed chairman on agriculture of the industrial commission of New Jersey. This commission consists of 15 members appointed by the State manufacturers' council, 5 of these members representing agriculture. The purpose of the commission is to formulate a reconstruction program for the State.

Dr. H. C. McLean has resigned as soil research chemist. Van E. Leavitt, extension specialist in fruit growing, died December 23, 1918.

The following men who have been in military service have returned to the station: William M. Regan, dairy husbandman; J. M. Hunter, animal husbandman; W. C. Thompson, assistant poultry husbandman; Roscoe W. DeBaun, extension specialist in market gardening; J. Vincent Breazeale, foreman in vegetable growing, and Dr. William H. Martin, appointed associate in plant pathology to devote his entire time to problems in potato growing.

Recent appointments include Ingrid C. Nelson as assistant editor; Henry B. Seaver as instructor in horticulture, Edson J. Currier and F. Raymond Hunter as assistant chemists, and Howard F. Huber as assistant State leader of farm demonstration.

New Mexico College and Station.—A small drying house has been completed for use in drying *Yucca elata*, which is being studied in connection with the range cattle nutrition investigations.

George R. Quesenberry, professor of farm management and in charge of the college farm, and Cleave W. Humble, Gates S. Vickers, and E. L. Barrows, assistants, respectively, in animal husbandry, poultry, and irrigation, have returned from military service.

Oregon College and Station.—Walter Sheldon Brown, extension associate professor of horticulture, has been appointed professor of pomology vice V. R. Gardner, effective February 1. Frank Heidtman Lathrop, instructor in entomology and assistant entomologist, Leon W. Wing, instructor in dairy husbandry, and Clair Wilkes, instructor in farm management, have returned from military service.

Rhode Island Station.—Recent appointments include the following assistants: Helena A. M. Tibbetts and Walton E. Scott in animal breeding and pathology, and J. Roy Haag in chemistry.

Virginia Station.—After leave of absence for military service E. T. Batten has resumed his duties as superintendent of the substation at Holland. W. G. Harris has been appointed associate chemist and Charles F. Warren assistant horticulturist. B. G. Anderson, superintendent of the substation at Appomattox and county agent, is to give his entire time to experimental work.

American Farm Management Association.—The ninth annual meeting of this organization was held in Baltimore, January 8, 9, and 10, 1919.

The presidential address, presented by G. A. Billings, had to do primarily with an outline of the problems confronting farm management workers. The necessity for saving labor and for the economic utilization of land was emphasized. The need for information regarding the cost of production on the farm led to the suggestion that a committee be appointed to study production costs and farm practices.

Two joint sessions were held with the American Association for Agricultural Legislation at which the following papers were presented: Agricultural Competition between Nations after the War, by M. S. Lane; Opportunities in After-the-War Agriculture for the Young Man without Capital, by W. J. Spillman; Purpose and Plans of the American Association for Agricultural Legislation, by R. T. Ely; Colonization and Control, by H. L. Russell; Some After-the-war Problems in Agriculture, by G. F. Warren; and Purpose and Plans of the National Board of Farm Organizations, by C. A. Lyman.

Other papers presented before the association were as follows: Economic Studies of Farm Tractors, by A. P. Yerkes and D. S. Fox; Methods of Fertility Maintenance Practiced on the More Successful Farms—viz: Cotton Growing Region, by A. G. Smith; General Crop, Dairy, Truck, and Potato Farms in New Jersey, by F. App; Appalachian Region, by J. H. Arnold; and Dairy Regions of the Northeast, by J. A. Foord; Economic Studies of Cotton Farms under War Conditions, by J. R. Fain; Enterprise Studies in Sugar Beet Areas, by L. A. Moorhouse; Some Points Brought Out by Successive Surveys of the Same Farms, by H. W. Hawthorn; Primary *v.* Derivative Foods in Times of Food Shortage, by H. W. Mumford; Principles Involved in Fixing the Price of Milk, by F. A. Pearson; The Farm Labor Outlook for 1919 and What Should Be Done, by G. I. Christie, with a discussion led by E. V. Wilcox; Man Power in Agriculture, by H. M. Eliot; Constructive Criticisms of Extension and Demonstration Work in Farm Management, Based on Apparent Results to Date, by M. C. Burritt; The Ideal Relationship between Extension and Demonstration Work, and Investigation in Farm Management, by C. B. Smith; and How to Get and Use Credit in Farming, by H. C. Taylor.

G. I. Christie, Assistant Secretary of Agriculture, outlined the attitude of the Federal Department of Agriculture toward farm management investigations, and also led a general discussion on cost accounting with the view of standardizing the methods employed. Quite detailed reports were presented by the committees on teaching, investigations, the formation of local sections, and terminology.

After considerable discussion it was decided that the growth of the activities of this organization justified a change of name to the American Farm Economics Association. Changes in the constitution made necessary by the change of name were agreed to, the most important being a restatement of the object of the association as "to promote investigation and teaching of farm management and other economic questions pertaining to agriculture."

The executive committee was instructed to determine the feasibility of starting a journal comprising not more than four numbers the first year. It was further recommended that committees be appointed as follows: To work toward obtaining money for investigations in farm management and other economic phases in agriculture, preferably from the Hatch fund; to draw up suggestions for the Treasury Department relative to levying the income tax on farms; and to confer with the Office of Extension Work North and West, of the U. S. Department of Agriculture, on farm management demonstration projects.

Officers for the ensuing year were elected as follows: President, J. R. Fain; vice president, L. A. Moorhouse; and secretary-treasurer, F. W. Peck.

American Society of Agronomy.—The eleventh annual meeting of this society was held in Baltimore, January 6 and 7.

The presidential address, prepared by Dr. T. L. Lyon, was presented at a joint session held with the Society for the Promotion of Agricultural Science. The subject of Dr. Lyon's address was The Influence of Higher Plants on Certain Bacterial Activities in Soils, and it constituted a suggestive review of the status of existing knowledge on the subject.

Other papers presented before the society included the following: Effect of Varying Degrees of Heat on the Viability of Seeds, by J. L. Burgess; Field Crop Inspection, a Necessity to Standardization and Crop Improvement in Cereals, by H. L. Bolley; The Small Grain Varieties of Utah, by George Stewart; Carrying Capacity of Native Range Grasses in North Dakota, by J. H. Sheppard; Green Sand Deposits as a Source of Potassium, by R. H. True; Fertilizer Experiments on De Kalb Soils in Pennsylvania, by F. D. Gardner; A Method for Determining the Proper Stand of Corn under Southern Conditions, by C. A

Mooers; The Work of the Committee on Seed Stocks, by R. A. Oakley; and A Reason for Contradictory Results in Corn Experiments, by Lyman Carrier.

The usual reports of the standing committees of the society were omitted. The executive committee was asked to ascertain the sentiment of the members toward meeting with Section M (agriculture) of the American Association for the Advancement of Science, rather than with the Association of American Agricultural Colleges and Experiment Stations as now provided for in the constitution.

Officers were elected as follows: President, J. G. Lipman; vice presidents, F. S. Harris and A. B. Conner; and secretary-treasurer, Lyman Carrier.

Society for the Promotion of Agricultural Science.—The thirty-ninth annual meeting of this society, held in Baltimore January 6 and 7, was opened with the usual joint session with the American Society of Agronomy. The presidential address for the society was given by Dr. Herbert Osborn, upon the subject The Problem of Permanent Pasture with Special Reference to its Biological Factors. Dr. Osborn discussed some of the complex relations between the various forms of animal and plant life entering into the pasture problem, and suggested its fitness as a subject for coordinated research through some central agency such as the society.

President W. O. Thompson presented an account of his observations of agricultural conditions in England and France in connection with the visit of the Agricultural Commission to Europe. A great difference was found in the conditions prevailing in the two countries, with a corresponding divergence in the farm practices followed and needs for the future.

At the remaining sessions papers were presented as follows: Occurrence of Nitrates in Sugar Beet Soils and in Wheat, by W. P. Headden; Use of Wood for Fuel, by F. W. Rane; More Study of Pastures and Pasture Needs, by M. L. Fisher; Poisonous Plants, by O. A. Beath; Relation of the Society for the Promotion of Agricultural Science to Extension Work, by D. W. Working; A Study in Community Cattle Breeding, by J. H. Sheppard; Some Codling Moth Life History Studies, by C. P. Gillette and G. M. List; Seasonal Variations in the Butter Fat Content of Milk in Southern Arizona, by R. W. Clothier; Training Students for Soil Specialists, by H. J. Wilder; Lime as a Factor in Soil Fertility, by J. G. Lipman and A. W. Blair; and Utilizing Soil Potash by Means of Intermediary Crops, by A. W. Blair.

The functions and future policy of the society were subjects of considerable discussion. Its usefulness as a forum for the presentation and discussion of papers relating to agricultural science as a whole rather than the reporting of investigations in specialized fields was pointed out, and likewise its opportunity for service in the coordination of some of the more complicated problems. The question of affiliation and meeting with section M of the American Association for the Advancement of Science was also taken up, although a recommendation to the executive committee was ultimately adopted advocating the holding of the next annual meeting as usual with the Association of American Agricultural Colleges and Experiment Stations.

Officers for the ensuing year were elected as follows: President, R. W. Thatcher; vice president, B. L. Hartwell; and secretary-treasurer, J. G. Lipman. F. B. Linfield was elected as a member of the executive committee.

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EXPERIMENT STATION RECORD.

CONTENTS OF VOL. 40, No. 4.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

[1] On leave of absence for military service.

METEOROLOGY.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

U. S. Department of Agriculture.

U. S. Department of Agriculture—Con.

U. S. Department of Agriculture—Con.

[1] Printed in scientific and technical publications outside the department.

EXPERIMENT STATION RECORD.

VOL. 40. MARCH, 1919. No. 4.

The annual convention of the Association of Southern Agricultural Workers has become a noteworthy event among gatherings of the year, and one which concerns the experiment stations quite intimately. It brings together for conference the representatives of the agricultural colleges and the departments of agriculture in the Southern States, and with them other agencies which are laboring similarly for agricultural advancement in that section. It thus expresses the broad common interest and the strength of a closer union.

Starting some twenty years ago as a gathering of the State departments of agriculture, the scope has gradually broadened until it includes the various agencies and lines of effort concerned in the promotion of agricultural measures of regional interest. The association views problems not alone from the standpoint of investigation and the dissemination of intelligence through teaching, but in their external relationships to the agricultural industry, and this has led from time to time to inviting representatives of business interests to meet with the convention and discuss special topics. The democracy of the organization is illustrated by the election to the presidency for the coming year of Dr. Tait Butler, long associated with the agricultural work of southern institutions but now connected with the agricultural press.

The meeting this year at Birmingham, Alabama, February 26 to 28, was no exception to the rule in the interest of the matters considered and the generally representative character of the attendance. Over one hundred were present, and nearly all of the southern institutions were represented by men from their experiment stations, extension divisions, or other departments. Invitations were extended to the southern section of the American Phytopathological Society and to the Association of Cotton States Entomologists to affiliate with the association, which would broaden the scope further along two important lines.

In his presidential address Prof. J. F. Duggar, of Alabama, called pertinent attention to the fundamental necessity of maintaining the financial support of the experiment stations on a plane commensurate with the importance of that branch of activity. The various interests represented in the association made the occasion an appropriate one for pointing out the key position of agricultural research, and the dependence upon it of all other measures for steady advancement and effectiveness. The stations have now quite generally reached their limits under their present appropriations, and many of them are feeling keenly the pressure resulting from the higher cost of services and materials. In seeking further funds for agricultural purposes, their interests will need to be safeguarded not only by the station men themselves but by those engaged in other branches of agricultural effort, for the interest in adequate means for keeping agricultural research thoroughly abreast of the whole movement is a common one in which all are involved. It is gratifying to see that this is realized in the section represented by this body, and that more adequate station support is looked upon as the most important present need.

The association has two main sections, agronomy and live stock. Committees representing these branches have for several years been actively engaged in considering the experimental work with a view to giving it the highest efficiency in solving problems of the South. These committees have assembled the projects in these fields under way at the various stations, and published lists of them in their reports as a means of familiarizing members with the lines in progress and where common topics are being studied. An ultimate purpose has been to effect a closer union in common efforts, to make experiments in similar lines more readily comparable, and to illustrate the advantage of working with a common understanding of what is in progress throughout that section. This survey lends emphasis to the opportunity for cooperation and coordination in specific cases, and calls attention to the extent of unnecessary or ineffective duplication which has occurred in certain lines.

The live stock committee, for example, showed in a recent report that despite the amount of experiment in that field, it had been distinctly individualistic in character and in many cases is conspicuous for the diversity of method and plan followed in experiments directed at similar ends. The report pointed to a lack of coordination or of attempt to carry out local experiments in accordance with common plans, or even in such a way that the results could be readily harmonized. There was found to be much duplication which was not as effective as it should have been in solving common questions, because owing to this diversity the results were not cumulative or complementary. The committee urged in its last year's report that "the demand for careful study of some of the broader live stock problems, with relatively small increases in the appropriations for conducting experimental and research work and the greatly increased appropriations for extension work, has made it apparent that some system should be devised whereby experiment stations might closely cooperate in the future planning, execution, and reporting of their work."

Similarly the agronomy committee has sought by cataloging the projects to bring about a closer relationship and a larger coordination in the main lines of effort, in order that new work may be so planned that the results will fit in with other work where the soil and climatic conditions are similar. It has made considerable progress in outlining group projects, defining requirements of comparable effort, and suggesting the organization of work on the basis of soil provinces. The committee has also been working in the direction of improving the procedure in field experiments, directing work into specific lines, and making the combined program of the stations such as to more effectively cover the leading problems in a conclusive way. This year its efforts in that direction were continued and a number of specific recommendations made.

The live stock committee likewise dealt this year with methods and planning, the taking of data and recording of results, with a view to strengthening experiments in some directions and to systematizing procedure. Its recommendations, embodying tangible and concrete plans, should be of much value in strengthening the attack and the conclusions in regard to various feeding questions.

A matter bearing on a growing branch of agricultural industry in the South was a carefully prepared and comprehensive report upon oleomargarin, with special reference to its relation to dairying. This was from a committee appointed last year to investigate the subject, of which Director W. R. Dodson, of Louisiana, was chairman. The report was not apprehensive of danger provided existing laws are enforced.

The subject of soft pork resulting from certain widely used feeds, notably peanuts, was given much attention. Although not a new topic it is regarded as one of the most important in southern agriculture, being related to the cropping and farming systems as well as the returns in marketing one of the chief products. The matter was discussed in its various aspects, added interest being given by the presence of representatives of the packing houses who presented their side of the problem. It was pointed out that soft hogs can not be marketed in the North except at greatly reduced prices, can not be used for export, and are not suitable for making the high grade products sold under nationally advertised brands. Consequently as soon as the South has reached the limit of its own consumption of this class of pork the market declines and prices and profits are materially affected. The packers maintain that all pork cuts from soft hogs show an unusually heavy shrinkage in curing, that they do not chill properly in the cooler, and never become firm enough to permit cutting into economical, attractive cuts. They also show a heavy waste in retail cutting, and at ordinary storage temperatures it is said to be impossible to prevent standard cuts from dripping oil which not only means an additional loss but affects the appearance of the meat.

This problem is therefore seen to be one of unusual importance. The rapidly increasing hog production in the South makes the thorough, systematic study of the whole question of the effect of feed on quality of product a matter which can not be overlooked. Considerable attention has already been given to it, but such features as the transference or replacement of fat, the physiological aspects of the change, the period for hardening pork, etc., remain distinctive lines of study for the southern stations. There can be little doubt that in working out the practical and research features of this problem there would be marked advantage from united, correlated effort in place of the quite independent and disassociated action of the past.

The association has committed itself quite definitely to the desirability of closer union in station work, and has done much through its meetings for several years past to propagate the idea and gain acceptance for it. The work of its committees has blocked out prominent features in the field of experimental inquiry in the Southern States, and formulated procedure for a further unification of plans and methods. Through these committees the association has therefore become an effective means of promoting cooperation, coordination, and systematized effort in the study of southern problems. It is prepared to serve as a medium for bringing together groups of workers engaged on subjects common to them, in order that there may at least be mutual understanding in the further conduct of their experiments.

The provision of such an agency is an important advantage, for while such a joining of effort must necessarily be voluntary and as free as possible from set machinery, some means is usually required to furnish the initiative and make definite proposals. Where this agency directly represents the institutions themselves its position is strengthened and the suggestion of self-interest or domination is removed. The association deserves credit and support for the position it has taken and the movement it has set in motion.

An interesting discussion has been going on for some time in a number of scientific periodicals of the Allied nations regarding the effect of the war on the various abstract journals and similar bibliographical mediums upon which scientific workers have come to depend quite largely for information as to the current status of research. An increasing conviction seems to be developing that more adequate provision should be made for the establishment and maintenance of this class of publications, that the auspices under which they are issued are of more importance than has sometimes been realized, and that much more is involved than that somewhere and somehow the abstract journal and up-to-date compendium should exist.

One aspect of the matter was touched upon by Dr. B. M. Duggar at the Baltimore meetings last December. Dr. Duggar pointed out that the extent to which American workers had had to depend upon the abstract journals of foreign countries in bringing their work to the attention of the scientific world had inevitably resulted in considerable delay. Furthermore, it was suggested that the foreign abstracts have not always presented this work in sufficient fullness to reflect satisfactorily the significance of its results. These difficulties, in his judgment, could best be met by the maintenance of American abstract journals.

Another and very important consideration has been brought out by Professor E. B. Wilson of the Massachusetts Institute of Technology in a communication to *Science*. Professor Wilson shows quite forcefully how dependent scientists have been upon German sources for obtaining much of their information as to existing knowledge. He points out that any scientist must have the means wherewith to look up readily the literature on his subject, and "that the great compendiums of science, the great yearly reviews of scientific progress, are made by Germans, and published in the German language." This magnifies the position of that country as a scientific center and a source of both original and compiled information in science. It also lends prominence to the language as a vehicle for the dissemination of scientific work. He queries whether the English speaking people of the world will continue thus dependent upon Germany for their standard reviews and handbooks of science.

Another writer who has contributed several articles on the general subject of the handling of scientific literature is M. Paul Otlet, general secretary of the Institut International de Bibliographie since its organization at Brussels in 1895. M. Otlet likewise deplores the predominance of German influence through Centralblätter and Jahresberichte, and maintains that the Allied nations should henceforth give more attention to the various methods through which the results of scientific investigations can be made widely known. Very naturally he emphasizes the opportunities for international cooperation in the publication of periodicals, abstracts, bibliographies, dictionaries, and textbooks. He draws particular attention to what is being done along these lines by the International Institute of Agriculture at Rome, whose activities, it will be recalled, were described in these pages some months ago.[1] He looks forward to the foundation of a

[1] Experiment Station Record, 38 (1918), pp. 701–707.

somewhat similar institution for general science, supported on an international basis, and suggests as one important function the publication of the International Catalog of Scientific Literature, but eventually in greatly enlarged form.

It is of interest to note in this connection that the publication of bibliographical works in all branches of science formed one of the topics of discussion at the Interallied Conference on International Scientific Associations held in London October 9–11, 1918, and was among the subjects referred to a special committee of inquiry to be convened later in Paris. The view was quite generally manifested that irrespective of existing publications elsewhere it was important that complete abstracts and bibliographies of science should be published in the Allied countries. It was apprehended that the income from the sale of these publications would not defray the relatively high cost of preparation and printing, and the plan of Government subsidies was advocated for their support.

Whatever may be the developments along international lines, a distinct increase in the facilities afforded by abstract journals in the English language is already in evidence. At the outbreak of the war chemical literature was receiving quite comprehensive treatment in *Chemical Abstracts* and the *Journal of the Chemical Society*, and the *Review of Applied Entomology* had been established the previous year for abstracts in that subject, but as regards the sciences related to agriculture these journals stood virtually alone in the comprehensive character of their reviews. A limited number of abstracts as well as book reviews have, of course, been published by *Phytopathology*, the *Bulletin of the Torrey Botanical Club*, the *Journal of Home Economics*, the *Journal of Dairy Science*, and certain other periodicals, but in none of these cases has a complete summary been attempted.

In 1916, *Physiological Abstracts* was begun by the Physiological Society of Great Britain and Ireland, with the cooperation of the American Physiological Society. *Abstracts of Bacteriology*, published by the Society of American Bacteriologists, followed in 1917, and in the same year the *Veterinary Review* began an extensive abstract section.

Most recent of all is *Botanical Abstracts*, the initial number of which appeared in September, 1918, and contained 206 abstracts. This publication is now a monthly serial, "furnishing abstracts and citations of publications in the international field of botany in its broadest sense," and is therefore of special interest. It is announced that the membership of its board of control is to be representative of some thirteen North American botanical organizations. Among these are Section G (Botany) of the American Association for the Advancement of Science, the American Genetic Association, the

American Phytopathological Society, the American Society of Agronomy, the Botanical Society of America, the American Society for Horticultural Science, the Society of American Bacteriologists, and the Society of American Foresters. A force of fully 400 collaborators has already been organized, and comprehensive plans are being worked out for abstracting as completely as possible the botanical literature of the world, estimated to be scattered through from two to three thousand serial publications. This suggests the wide range the journal is intended to cover and the interpretation to be given to the field of applied botany.

The question of abstract journals has likewise received attention in France, although no definite plans are as yet available. The newly established Superior Council for the Agronomic Stations and Agricultural Laboratories of France has included among its proposed activities the publication of reviews of publications in all countries bearing on the field of these institutions, with a view to keeping their workers posted and thus strengthening their activities.

Regarding the present status of the German abstract journals, it may be said that copies are gradually reappearing in this country. It seems that with some modifications, such as consolidated numbers, curtailments in space, and the like, most of these publications have been continued. A recent note in *Nature* states that the Deutsche Chemische Gesellschaft has celebrated its jubilee by collecting a fund of 2,500,000 marks for the more extensive publication of chemical works of reference. Announcement has also been made of a ten-year agreement effective January 1, 1919, between the Deutsche Chemische Gesellschaft and the Verein der Deutscher Chemiker for the discontinuance of the "Referate" section of the *Zeitschrift für angewandte Chemie*, and in its stead the joint publication of abstracts in *Chemisches Zentralblatt*. The Verein der Deutscher Chemiker is to contribute 25,000 marks per annum for this purpose.

The growth of agencies in this country for agricultural education and research, and especially agricultural schools and extension work, has enlarged the range of those making use of *Experiment Station Record* and made it increasingly important to our system. The *Record* is now in its thirtieth year, and with the close of the fiscal year on July 1 will complete its fortieth volume. In common with other publications, it has suffered some handicaps during the war, among them a depletion of its staff, a shortage of paper, and serious congestion of publication facilities. These causes have collectively contributed to regrettable delays in the assembling and printing of abstracts, but it is hoped that with the gradual improvement in conditions less difficulty will henceforth be experienced.

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RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Practical physiological chemistry, P. B. Hawk (*Philadelphia: P. Blakiston's Son & Co., 1918, 6. ed., rev. and enl., pp. XIV+661, pls. 6, figs. 185*).—This is the sixth edition of the volume previously noted (E. S. R., 35, p. 311). The chapters on metabolism, blood analysis, gastric digestion, and quantitative analysis of urine have been expanded, and a new chapter on acidosis has been introduced. In the quantitative section, Van Slyke's procedure has been adopted as the sole method for the determination of acetone bodies in the urine, and the use of urease for the determination of urea. Several new illustrations have been added.

The globulins of the jack bean, Canavalia ensiformis, J. B. Sumner (*Jour. Biol. Chem., 37 (1919), No. 1, pp. 137–142, pl. 1*).—By subjecting jack beans to dialysis the author has separated three globulins in place of the two found by Jones and Johns (E. S. R., 37, p. 8). Bisphenoid crystals, to which the name concanavalin A has been given, are precipitated first; a noncrystallizable globulin, canavalin, separates next as spheroids; and finally a small amount of material crystallizes in the form of needles. This last has been named concanavalin B. By filtering off the precipitates as they appear, a partial separation of the globulins can be made, but a more complete separation is brought about by the use of salt solutions. Canavalin is readily soluble in 1 per cent sodium chlorid solution, concanavalin B slowly soluble in 10 per cent salt solution, and concanavalin A insoluble in any but concentrated salt solutions.

All three globulins are said to give the usual protein color and precipitation tests when purified.

New reflux condenser, J. J. Bajda (*Jour. Indus. and Engin. Chem., 11 (1919), No. 1, p. 52, fig. 1*).—A modified type of reflux condenser is described which is said to be very satisfactory, especially in those cases in which the refluxing liquid has a comparatively high boiling point.

The modification consists of a vapor conduit forming a part of the condenser through which the vapors pass and are led into the upper part of the condensing coil. At the lower end of the coil is a trap by means of which is provided regular and undisturbed flow into the receiver.

Absorption pipettes, E. Van Alstine (*Jour. Indus. and Engin. Chem., 11 (1919), No. 1, pp. 51, 52, fig. 1*).—An absorption apparatus to be used with the Parr carbon apparatus for determining both carbonates and total carbon in soils is described and illustrated, in which the use of glass beads or glass rods is dispensed with by means of a siphoning device enabling the gas to come in close contact with the absorbing liquids. It is stated that it is not necessary to shake the apparatus to insure rapid action, as must be done when bulbs without beads or rods are used, yet absorption is as rapid as with either.

The wet process for the determination of carbon, W. Stepp (*Biochem. Ztschr., 87 (1918), No. 3–4, pp. 135–142, fig. 1*).—Certain improvements in the wet method of estimating carbon are suggested. These include slight modifications in the apparatus and more careful purification of the reagents employed. The sulphuric acid is purified by heating first with potassium dichromate and afterwards with potassium permanganate. Instead of potassium dichromate for the oxidation of organic salts, the author employs a mixture of chromic and sulphuric acids.

Determination of free alkalis and carbonate in alkaline hypochlorite solutions, M. PHILIBERT (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 9, pp. 260–272*).—The method proposed consists essentially of determinations of the total alkali and of the free alkali or bicarbonates, preceded by the destruction of oxidizing substances by hyposulphites as in the method of Mestrezat previously noted (E. S. R., 40, p. 112). Instead of adding the hyposulphite directly to the alkaline liquid, the solution is first acidified and the destruction of oxidizing substances brought about in the presence of potassium iodid. This is considered to give much more constant and accurate results than those obtained in an alkaline medium.

A simplification of the Mestrezat method is also proposed in which the use of phenolphthalein is dispensed with by noting the successive color changes of litmus from blue to violet and from violet to red. The first color change corresponds to the phenolphthalein test and represents the change from carbonate to bicarbonate.

The separation and gravimetric estimation of potassium, S. B. KUZIRIAN (*Proc. Iowa Acad. Sci., 24 (1917), pp. 547–550*).—From studies conducted at the Iowa Experiment Station on the use of anilin perchlorate for the gravimetric estimation of potash, the author concludes that the best results are obtained when the following points are observed:

"The exact strength of the alcohol used must be known, and none used that runs below 99.5 per cent. For every 1.5 cc. of water used for dissolving the mixed chlorids, 50 cc. of absolute alcohol should be added. A weighed amount of anilin perchlorate dissolved in 50 cc. of absolute alcohol must be added to the dissolved chlorids drop by drop with constant shaking and set aside for one hour before filtering." It is considered necessary to add the anilin perchlorate slowly in order to avoid the occlusion of some of the potassium chlorid with the perchlorate. If sufficient precautions are taken to prevent this occlusion, a complete conversion of the chlorids into perchlorates is said to take place.

The use of anilin perchlorate instead of perchloric acid is said to shorten the process considerably, to afford the best means for direct quantitative separation and estimation of sodium in the alcoholic filtrate, and to cheapen the process by doing away with platinic chlorid.

The determination of nitrates and nitrites, W. STRECKER (*Ber. Deut. Chem. Gesell., 51 (1918), No. 10, pp. 997–1004, fig. 1*).—A method is described for the determination of nitrites and nitrates in the same solution which includes (1) the reaction between the nitrites and ammonium chlorid in which nitrogen is evolved, collected in a nitrometer, and measured, and (2) the reaction between nitrates and ferrous salts in which nitric oxid is evolved and collected in the same nitrometer.

A diagram is given of the apparatus, in which special precautions are taken to remove the air by means of carbon dioxid. The method is also applicable to the determination of nitrates alone.

The determination of nitrites, F. DIENERT (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 10, pp. 366, 367; abs. in Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 7, pp. 217, 218; Jour. Chem. Soc. [London], 114 (1918), No. 672, II, p. 370*).—The method depends upon the following reaction: $NaNO_2+2HI=NaI+I+NO+H_2O$. To prevent the oxidation of the nitric oxid formed and its subsequent action on hydrogen iodid, the reaction is conducted in the absence of air by saturating the flasks containing the reagents with carbon dioxid. The liberated iodin is then titrated with N/70 arsenious acid.

Determination of residual nitrogen in blood serum, FISCHER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 102 (1918), No. 5–6, pp. 266–274*).—An examination of different methods of precipitating the proteins in blood serum preliminary to the determination of the nonprotein nitrogen is reported, the results which indicate that precipitation with uranium acetate in the cold is preferable to precipitation with an acetic acid solution of either sodium chlorid or sodium acetate at boiling temperature. The details of the method are as follows:

Ten cc. of blood serum is mixed in a 50 cc. cylinder with 10 cc. of a 1.6 per cent uranium acetate solution and made up with water to 50 cc. The mixture is shaken well, allowed to stand for 5 minutes, and then filtered. A mixture of 25 cc. of the clear filtrate and 10 cc. of Kjeldahl sulphuric acid solution is made in a Kjeldahl flask and the nitrogen determined according to the usual method.

The colorimetric determination of blood sugar by the reduction of picric acid, C. SALOMON (*Biochem. Ztschr., 90 (1918), No. 1–2, pp. 39–52*).—This is a résumé and critical review of the original method of Lewis and Benedict for the determination of blood sugar by reduction of picric acid and subsequent modifications of the method (E. S. R., 39, p. 112). A bibliography of 20 titles is appended.

Chemical analysis of bacteriological bouillons, F. C. COOK and E. LEF[...] (*Amer. Jour. Pub. Health, 8 (1918), No. 8, pp. 587–589*).—Chemical analyses of standard bouillons prepared from fresh beef, meat extract, and fresh liver are reported from the Bureau of Chemistry of the U. S. Department of Agriculture. The bouillons were prepared by the cold infusion method. Five hundred gm. of finely ground beef or liver was infused in 1,000 cc. of water for 24 hours, and the fluid obtained after pressure and filtration was made up to 1,000 cc. The meat extract bouillons were prepared from 3 gm. of Liebig's beef extract and [...] gm. of Witte's peptone, made up to a volume of 1,000 cc. with water. The samples of each series were analyzed for total solids, ash, P_2O_5, total nitrogen, purin nitrogen, protein nitrogen, creatin, and creatinin.

The liver bouillon was found to contain a higher percentage of all these constituents than the meat extract of beef bouillon, with the exception of creatin and creatinin, while the beef bouillon contained more of all constituents than the beef extract, with the exception of protein, which was present in practically equal amounts. These results are thought to afford an explanation of the higher bacterial counts frequently found on beef bouillon media than on beef extract media and of the failure of certain organisms to grow on the latter.

A study of the extent of loss of peptone resulting from the addition of Witte peptone to beef juice prior to coagulation and filtration showed that on an average 12 per cent of the peptone is held by the coagulum and therefore wasted, indicating that the economical procedure is to add the peptone to the filtrate after coagulation.

A new and novel method of determining the amount of methyl alcohol in mixtures of ethyl and methyl alcohol, W. G. TOPLIS (*Amer. Jour. Pharm., [...] (1918), No. 9, pp. 636–640*).—The method described depends upon the fact that when methyl and ethyl alcohols are mixed and treated with metallic sodium the yield of hydrogen is proportional to the amounts of the two alcohols in the mixture. The fact that commercial samples containing higher alcohols yield [...] in a different ratio as their molecular weight varies is considered not to affect the application of the method in determining the minimum of methyl alcohol. The determination is conducted simultaneously with that of a previously prepared standard denatured alcohol, the hydrogen being collected over gasoline

A reading of the unknown lower than that of the standard indicates a deficiency in, and higher than the standard an excess of, methyl alcohol.

The reaction called "l'eclair bleu" and its application to the control of vinegars and wines, [J.] JEANPRÊTRE (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 6, pp. 338–346, figs. 4*).—The author recalls the report of Landolt,[1] who found that if to a mixture of equal volumes of sulphurous and hydriodic acids containing a certain amount of starch solution various acids are added, the liberation of iodin is accelerated under the same conditions of temperature and concentration, in direct proportion with the constant of dissociation of the acid used. The sudden appearance of the blue color led to the name of "l'eclair bleu," or blue flash.

In the present application of the test to the control of vinegars and wines, the reagents employed are 2 per cent solutions of sodium iodate and of sodium sulphite and a 0.5 per cent solution of starch. At the time of the test, 10 cc. each of the iodate and sulphite solutions and 5 cc. of the starch solution are made up to 100 cc. with distilled water. The test consists of mixing rapidly 10 cc. of the acid liquid and 10 cc. of the reagent and noting the time of appearance of the blue color.

With pure N/10 solutions of different acids, the blue color appeared as follows: Acetic acid in 438 seconds, succinic 320, malic 52, citric 45, and tartaric 26; with N/10 solutions of oxalic and of mineral acids the reaction was instantaneous.

The author discusses the interpretation of results with mixtures of acids, the effect of different factors on the results, and the application of the method to the analysis of vinegars and wines. While the reaction does not permit of an exact determination of the degrees of acidity, it is considered to be of value not only for the control of acid beverages, but also for determining the purity of the greater part of organic acids and their acid salts.

New methods for the analysis of butter, P. ERCULISSE and H. DACKWEILER (*Ann. Chim. Analyt., 23 (1918), No. 11, pp. 225–234; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 24, p. 780A*).—The customary determinations in the examination of butter are described and criticized. As substitute determinations, there are proposed the index of saponification, the silver index, and the magnesium index, these being respectively the number of milligram molecules contained in 1 gm. of fat, of fatty acids, butyric acid, and caproic, caprylic, and capric acids. From these values can be calculated the true Reichert-Meissl, Polenske, and Hehner numbers.

The saponification index is obtained in the usual manner of determining the saponification number. The silver index is obtained by precipitating a known amount of neutral soap by slver nitrate, which precipitates everything but butyrate. The index is then determined by comparison with the saponification index. The magnesium index is obtained by precipitating a new amount of neutral soap by magnesium sulphate, which leaves in the filtrate only those acids with fewer than 12 carbon atoms (with the exception of butyric acid). These are then precipitated with N silver nitrate.

The methods, which are described in detail, are said to be more rapid and accurate than the customary determinations, and to be capable of application to the analysis of all kinds of fats and their derivatives, such as soaps.

A rapid and accurate method for butter analysis, suitable for factory control work, E. F. KOHMAN (*Jour. Indus. and Engin. Chem., 11 (1919), No. 1, p. 36*).—A method of butter analysis is described in which the fat and salt are determined in connection with the moisture test as follows:

[1] Ber. Deut. Chem. Gesell., 19 (1886), pp. 1317–1365.

The moisture in a 10 gm. sample is determined in the usual way in a tall, lipped 100 cc. aluminum beaker. After the beaker is weighed to determine the loss of moisture, the fat is extracted with successive portions of petroleum ether, which is removed by decantation. The excess of petroleum ether is removed by evaporation and the percentage of fat determined by difference upon reweighing the beaker and its contents. The salt may then be determined by titration.

The method is said to be very rapid and to give results as accurate as those obtained by the official methods.

Report of the committee on the analysis of commercial fats and oils, W. D. RICHARDSON (*Jour. Indus. and Engin. Chem., 11 (1919), No. 1, p. 69*).—This report contains a few corrections to the tentative standard methods for the sampling and analysis of commercial fats and oils, previously noted (E. S. R., 38, p. 804), and new methods for the melting point and cloud test determinations.

Quantitative determination of soluble starch in the presence of starch and its hydrolytic cleavage products, J. C. SMALL (*Jour. Amer. Chem. Soc., 41 (1919), No. 1, pp. 107–112*).—The method described consists essentially in precipitating the iodid from its solution of dextrins and lower carbohydrates by ammonium sulphate. The precipitate is washed free from the other carbohydrates by successive portions of a saturated solution of ammonium sulphate and heated in water suspension to drive off the iodin. The soluble starch is then hydrolyzed by acids and estimated by the usual methods for determining dextrose.

A method for the preparation of soluble starch, J. C. SMALL (*Jour. Amer. Chem. Soc., 41 (1919), No. 1, pp. 113–120, fig. 1*).—The following method has been found by the author to be more satisfactory than the Lintner method for the preparation of a soluble starch containing a minimum of carbohydrate:

The starch is hydrolyzed by means of redistilled 95 per cent alcohol in the presence of a small amount of concentrated hydrochloric acid (sp. gr. 1.19). At the end of from 6 to 15 minutes the acid is neutralized with sodium bicarbonate, the neutral alcohol filtered off, and the starch washed with several additions of fresh alcohol.

Analyses of samples obtained by this method are reported which indicate that the principal factors influencing the conversion of starch to soluble starch in this process are the time of exposure, concentration of acid, and density of the starch suspension. A study of the effect of concentration of acid showed that the greatest yield of soluble starch is obtained when 0.75 volumes per cent of concentrated hydrochloric acid in 95 per cent alcohol is used and the hydrolysis continued at the boiling temperature for 10 minutes. The indication that under the proper conditions starch seems to be wholly converted to soluble starch before further hydrolysis occurs is considered to support the idea that soluble starch is a hydrated starch from which maltose has not yet been split off.

An improvement applied to the volumetric determination of reducing sugars, D. SIDERSKY (*Bul. Assoc. Chim. Sucr. et Distill., 35 (1917), No. 1–3, p. 39*).—In order to bring about a more rapid settling of the cuprous oxid precipitate in the usual determination of reducing sugars, the author recommends the addition of magnesium sulphate to the copper sulphate solution in the proportion of 5 gm. $MgSO_4$ to 34.64 gm. $CuSO_4$ dissolved in 500 cc. of water.

Determination of glucose with hypoiodid, R. WILLSTÄTTER and G. SCHUDEL (*Ber. Deut. Chem. Gesell., 51 (1918), No. 8–9, pp. 780, 781*).—It is stated that glucose can be determined quantitatively by means of a hypoiodid solution, even in the presence of fructose or sucrose, if certain precautions are observed. The details of the method are as follows:

The glucose solution is treated with from one and one-half to four times the amount of iodin in N/10 solution, then with one and one-half times the amount of N/10 sodium hydroxid solution required for reaction, and allowed to stand at room temperature for from 12 to 15 minutes. The solution is acidified with dilute sulphuric acid and titrated with thiosulphate in the presence of starch.

The influence of raffinose on the determination of sugar beet molasses prepared by different methods, H. Pellet (*Bul. Assoc. Chim. Sucr. et Distill., 35 (1917), Nos. 1–3, pp. 16–30; 4–6, pp. 106–115*).—The earlier methods for the determination of raffinose based on its inversion by hydrochloric acid are reviewed, and a detailed description is given of the method employed by the author, which is based on the inversion of raffinose by two special yeasts as described by Hudson and Harding (E. S. R., 34, p. 313). Analytical results are given of the application of this method to the determination of raffinose in solutions of pure sugar and in the molasses from sugar cane and from sugar beets.

Contribution to the study of nonfermentable sugars in sugar cane molasses, C. Muller (*Bul. Assoc. Chim. Sucr. et Distill., 35 (1917), No. 4–6, pp. 95–105*).—The literature on the subject of the nonfermentable sugars designated under the name glutose is reviewed and discussed and results obtained by the author on the determination of nonfermentable sugars in sugar cane and beet molasses obtained in different localities and by different methods of extraction are reported.

The results seem to indicate that the various processes of treatment of molasses do not have so great an influence on the proportion of nonfermentable sugars as do the locality in which the sugar is produced, the season, and the stage of growth of the cane. Beet molasses contained traces only of nonfermentable sugars.

An attempt to transform nonfermentable sugars into fermentable sugars led to the following results: With sugar cane molasses, less nonfermentable sugars were obtained after than before heating with sulphuric acid, the difference being greater in factories in which carbonation was not employed. With molasses from the refinery, on the contrary, more nonfermentable sugars were obtained after heating than before. As an explanation of this phenomenon, the theory is advanced that certain organic substances, probably carbohydrates, if partially removed by carbonation under the action of heat, would produce a nonfermentable reducing substance. This would, however, be hydrolyzable by acids and become fermentable. This substance does not exist in refined molasses, where the action of sulphuric acid on the organic matter produces nonfermentable reducing substances.

The author proposes the name "glutocose" for the unknown substance which becomes fermentable after hydrolysis.

Utility of blanching in food canning. Effect of cold shock upon bacterial death rates, Eva M. Bruett (*Jour. Indus. and Engin. Chem., 11 (1919), No. 1, pp. 37–39*).—From a study of the velocity coefficients of the death rates of bacterial spores of *Bacillus pseudotetanicus* during temperature changes approximating those of the blanching process in canning, the conclusion is drawn that bacterial spores are apparently not made more sensitive to heat by preliminary heating followed by chilling, and that consequently blanching as a preliminary to the cold-pack process does not have bacteriological justification on the basis of increased susceptibility of the bacteria to sterilization because of cold shock. The author points out, however, that there is some bacteriological justification for blanching on account of the marked cleansing action of the process, which results in the introduction of smaller numbers of spores initially into the canned product and may thus reduce the time required for sterilization.

Report of the agricultural chemist, J. C. Brünnich (*Ann. Rpt. Dept. Agr. and Stock* [*Queensland*], *1916–17, pp. 37–48*).—This is the customary annual report, containing a general statement of the work performed during the year 1916–17, together with tables of analyses of Queensland soils, waters, wheats, flours, and farm and vegetable seeds.

METEOROLOGY.

On the cooling of air near the ground at night, G. Hellmann (*Abs. in Sci. Abs., Sect. A—Phys., 21* (*1918*), *No. 252, p. 488*).—Observations with 10 minimum thermometers arranged at 5-cm. intervals above the ground from 5 to 50 cm. showed that on clear nights there was a regular increase of temperature with height, following an exponential law. On the average, the difference between the temperature at the surface of the ground and at a height of 50 cm. was 3.7° C. An increase of cloudiness by 1° of the usual scale (0=clear, 10=overcast) diminished this difference by a full third of a degree Centigrade. With an overcast sky there was no difference of temperature. In rainy and windy weather there was a diminution of temperature of a few tenths of a degree.

The "warmth of dawn," O. Meissner (*Phys. Ztschr., 19* (*1918*), *No. 17, pp. 387, 388; abs. in Sci. Abs., Sect. A—Phys., 21* (*1918*), *No. 252, p. 488*).—"From hourly readings of temperature as recorded at the Potsdam Observatory, the conclusion is reached that the difference in point of time between temperature-minimum and sunrise has a definite seasonal variation, both for clear nights only and on the average of all nights. From May to September the time of minimum temperature occurs 30 minutes after sunrise; in spring and autumn the interval is reduced to 15 minutes, but in winter minimum temperature occurs 10 minutes earlier than sunrise. Thus there is nothing in the observations to support the 'warmth of dawn' theory."

On a possible relation between certain weather changes and radio-active emanations from the earth, E. Bandl (*Phys. Ztschr., 17* (*1916*), *No. 10, pp. 193–196*).—Observations in mountain regions are reported which are thought to indicate a relation between radio-active emanations and weather changes.

[Climatic conditions of the Belle Fourche reclamation project], B. Aune (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1917, pp. 4–6, fig. 1*).—Observations on temperature, precipitation, evaporation, killing frosts, and wind velocity at the experiment farm for the ten years, 1908 to 1917, are recorded. The precipitation in 1917 was 13.32 in., 0.56 in. less than the 10-year average. "The ground had a fair covering of snow from December to March, and most of the precipitation came before June 1." The spring was cold and wet. "The precipitation after June 1 came in such small quantities that little benefit was derived from it. Consequently, very poor stands of all crops that were planted late on spring plowing were secured."

British rainfall, 1917, H. R. Mill and C. Salter (*London: Edward Stanford, Ltd., 1918, pp. 240; rev. in Nature* [*London*], *102* (*1919*), *No. 2568, p. 383*).—Records are given for over 5,000 stations and analyzed as usual. The report also contains, among a number of special articles, one relating to the diminution of rainfall with height above the ground at Greenwich Observatory. This showed that at approximately 10 ft. above the ground there is a diminution of about 3 per cent, at 22 ft. 10 per cent, at 38 ft. 20 per cent, and at 50 ft. 35 per cent.

Sulphuric acid content of snow and rain water, E. Küppers (*Ztschr. Angew. Chem., 31* (*1918*), *No. 29, Aufsatzteil, pp. 74–76; abs. in Jour. Soc. Chem. Indus., 37* (*1918*), *No. 13, p. 388A; Chem. Abs., 12* (*1918*), *No. 22, p. 2395*).—It is reported that the sulphuric acid (SO_3) content of snow and rain water varied with the proximity of industrial centers and the prevailing direction of the wind. In an industrial district, freshly fallen snow was found to contain on an average from 15 to 20 mg. per kilogram and fresh rain water from 17 to 18 mg. per liter of sulphuric acid, much lower amounts than have been recorded for certain agricultural stations. Distilled water exposed in an industrial district absorbed 1.2 mg. of sulphuric acid per 100 square meters in 24 hours. The true sulphuric acid content of snow and rain was obtained only with freshly fallen samples.

SOILS—FERTILIZERS.

Soil factors affecting the toxicity of alkali, F. S. Harris and D. W. Pittman (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 5*, *pp. 287–319*, *figs. 27*).—Continuing previous work at the Utah Experiment Station, an attempt was made to determine with more exactness the quantities of the various salts that prohibit crop growth under different soil conditions. The general method of procedure was the same as was used previously (E. S. R., 34, p. 125) in studying the effects of different salts and combinations of salts. In these experiments, sodium carbonate and sodium sulphate were used at rates of 500, 1,000, 3,000, 5,000, 7,000, and 10,000 parts per million of dry soil, and sodium chlorid at rates of 400, 1,000, 2,000, 3,000, and 4,000 parts. Wheat plants were grown in the glass tumblers for 21 days in sand, loam, clay, and garden soil, with and without addition of peat or manure and with varying amounts of moisture. About 12,000 determinations of the effect of the salts on germination and growth under the different conditions were made.

Summarizing the results, it is stated that "size of particles of a sand independent of other factors does not seem appreciably to influence the toxicity of alkali. Loam soils are more tolerant of alkali than either sand or clay. The coarser loams are more tolerant than the finer at the same moisture content, but if the heavier loams are maintained at an equivalent moisture content they are more tolerant.

"Organic matter increases the resistance to alkali when the soil containing it is given sufficient moisture, but where present in large quantities organic matter decreases the resistance if the moisture supply is low. Increasing the moisture content of a soil up to the maximum that will produce good crops increases resistance to alkali.

"The toxicity of sodium chlorid and sodium sulphate seems to depend to quite an extent on the relation between concentration of salt and percentage of moisture present, while the toxicity of sodium carbonate is more largely affected by the presence of organic matter. Organic matter in the soil seems actually to remove sodium carbonate from the soil solution in large quantities. This probably explains why in experiments where sodium carbonate is added to a loam soil, it is less toxic than sodium chlorid, while in field studies where the salt is determined by analyses and in solution and sand culture studies the sodium carbonate is more toxic.

"Practical conclusions that may be drawn from these experiments are: (1) Loam soils and soils with a high water-holding capacity may be successfully farmed at a higher alkali content than others; (2) soils in which alkali reduces crop yields should be kept as moist as is compatible with good plant growth; and (3) manure, or other organic matter, should be beneficial to alkali soils, especially those high in carbonates."

Determining the absolute salt content of soils by means of the freezing-point method, G. J. Bouyoucos and M. M. McCool (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 6*, *pp. 331–336*).—In investigations at the Michigan Experiment Station it was found that when different kinds of soil were washed until their soluble salt content was greatly reduced, their lowering of the freezing point was practically identical. This suggested that at a comparatively high moisture content the influence of the unfree water on the concentration of the soil solution was practically negligible, if not entirely absent. It was found further that air-drying did not increase the freezing-point depression of the soils. On the basis of these facts, the following method to determine the absolute salt content of soils at high moisture content was devised:

"The soils are allowed to air-dry if freshly taken from the field. Then a 15-gm. sample of soil is taken and poured into the freezing tube containing 10 cc. of distilled water. The soil is stirred, usually by shaking, allowed to stand for a few minutes, and its freezing-point depression determined. For accomplishing the latter the tube is placed directly in the ice mixture, having a temperature of about −2.5° C., and the soil is stirred constantly with the Beckmann thermometer until the temperature falls to about 1° above the zero point of the thermometer. Then it is allowed to remain undisturbed until the temperature falls to about 0.5° below the zero point, when the soil is again stirred with the thermometer in order to cause solidification to take place. As soon as solidification begins, the tube is at once taken out of the ice mixture and placed in the air jacket in the same bath. The soil is gently stirred and the thermometer gently tapped, and the freezing point read by means of a lens. By this procedure it takes only about 10 minutes to make a freezing-point determination."

Tests of the method which indicate a high degree of accuracy are reported.

Chemical estimation of the fertility of soils in Fulton County, Ind., R. H. Carr and W. K. Gast (*Proc. Ind. Acad. Sci., 1917, pp. 201–210, figs. 8*).—The results of determinations of total organic matter, nitrogen, and phosphorus in 128 soil samples, including 38 subsoils and 20 virgin soils, are presented and a correlation of the data with the yield of corn per acre attempted. Observations were also made upon the presence of carbonates and upon soil acidity.

About one-half the soils of the county were found to contain less than 4 per cent of organic matter. Six of the samples are described as unusually acid and 52 as slightly acid to litmus, most of the acid soils also being low in organic matter. Both the nitrogen and phosphorus content of a large number of these soils was less than 1,500 lbs. per acre (to a depth of 6⅔ in.). The cultivated soils showed a considerable decrease in plant-food elements as compared with corresponding virgin soils. The results are held to indicate that corn yields increase with an increase of the nitrogen and phosphorus content of the soil.

Granitic and gneiss soils of the Corso (*Rev. Sci. [Paris], 57 (1919), No. 1, p. 26*).—Brief reference is made to a recent monograph by D. Hollande on the geology of the Corso, in which the character of the soils derived from granites and gneiss, and the processes by which they are formed, are discussed.

Soil acidity as affected by moisture conditions of the soil, S. D. Conner (*Jour. Agr. Research [U. S.], 15 (1918), No. 6, pp. 321–329*).—Supplementing previous investigations at the Indiana Experiment Station on soils from tiled and untiled land (E. S. R., 40, p. 22), five typical acid Indiana soils were studied under controlled moisture conditions in pots, namely, at full water-holding capacity, at one-half water-holding capacity, and at one-fourth water-holding capacity, other portions of each soil being taken when the pots were filled and kept in an air-dry condition in the laboratory. Samples of the soil of each pot were tested for acidity by the potassium-nitrate, calcium-acetate, and ethyl-acetate methods in both moist and air-dried condition, and the potassium-nitrate extracts were analyzed.

It was found that the acidity as measured by the different methods varied with different conditions of moisture and aeration. "With each soil and each method used the samples which had been kept half-saturated were higher in acidity than they were at the start of the experiment. The acidity of the half-saturated soils was greater than the acidity of the fourth-saturated soils. The soils high in organic matter showed the greatest acidity when kept fully saturated. The soils low in organic matter showed the greatest acidity when kept half-saturated.

"When the moist samples of soil taken at the close of the experiment were air-dried, the fully saturated samples showed loss of acidity. The half and fourth saturated samples showed both gains and losses in acidity when air-dried.

"The potassium-nitrate extracts of the fully saturated soils contained much larger amounts of iron than extracts of other samples. This soluble iron was in the ferrous form and was oxidized and made insoluble when the soils were dried.

"With the mineral soils the fully saturated soils had much greater amounts of soluble manganese than the other samples. Drying the soils did not render the manganese insoluble as it did the iron.

"There was less soluble aluminum in the fully saturated mineral soils, but with the soils high in organic matter this was not true. There was both increase and decrease of soluble aluminum on drying the soils.

"Calcium, magnesium, and silica showed variations in solubility owing to different moisture conditions, but the variations were not as striking as those of iron, manganese, and aluminum.

"In correlating the soluble iron and aluminum with the acidity obtained from the potassium-nitrate extracts, it was apparent that the titrated acidity could not be entirely explained on this basis. Doubtless this acidity is partly due to soluble acid organic compounds. The measurable acidity of acid soils varies to a large degree under different conditions of moisture and aeration. These variations are due to chemical rather than physical changes in the soils. The extreme sensitiveness of the chemical compounds of soils and the wide variations caused by changing moisture conditions leads to the conclusion that some soil investigations should be conducted with undried samples. The soil moisture of acid soils is acid in reaction as shown by hydrogen-ion determinations.

A list of references to literature cited is given.

Are unusual precautions necessary in taking soil samples for ordinary bacteriological tests? C. B. Lipman and D. E. Martin (*Soil Sci., 6 (1918), No. 2, pp. 131–136*).—This paper, a contribution from the California Experiment Station, describes tests with bacteriological samples taken from an alluvial loam soil at Hayward and a blow sand at Oakley, to determine the extent of contamination due to sampling with a post-hole type of auger as compared with sampling with a sterile spatula from the flamed vertical wall of a pit (E. S. R., 27, p. 822). Samples were taken for each foot to a depth of 5 ft. and determinations made of the number of bacteria which would grow on bouillon agar, the ammonifying power of the soil with 0.1 per cent of peptone, the nitrifying power with soil nitrogen alone and with the addition of 0.2 per cent of ammonium sulphate, and nitrogen fixation in solutions containing 2 per cent of mannite and in soil with 1 per cent of mannite.

It is concluded that "for ordinary bacteriological work on soils no special precautions are necessary in taking soil samples." No significant differences in the points studied were observed between the two methods of sampling. That the sampling itself from the vertical wall constituted a "precautionary" method is said to have been indicated by the marked differences in bacterial numbers and biochemical activities which characterized the various soil layers. It is thought that methods devised for soil sampling for ordinary soil bacteriological work have been based upon an erroneous assumption that the dangers from contamination are considerable. "The soil flora in a given sample of soil seem to be so large, so characteristic, and so firmly established and adapted to the conditions under which they are found that the introduction of relatively small numbers of contaminating organisms into that sample is without perceptible effect on the original flora as shown in ordinary tests on soils."

Large bacterial numbers and well-marked bacterial activities were observed at relatively great depths in soils of the arid region, although the surface foot of soil was by far the most active biochemically and was the most densely populated. In some phases of bacterial activity the second foot approached or equaled the first, while, as a rule, the soil layers from 2 to 6 ft. were nearly uniform in bacterial population and activity.

The importance of mold action in the soil, S. A. WAKSMAN (*Soil Sci., 6 (1918), No. 2, pp. 137–155*).—In this paper, a contribution from the New Jersey Experiment Stations, the author discusses in some detail the metabolism of molds which are commonly found in the soil, basing his observations and conclusions upon the work of different investigators, but chiefly upon the results of his own studies. The points receiving consideration include the occurrence of molds in the soil, nitrogen fixation, nitrification, ammonification, decomposition of carbon compounds in the soil, utilization of nitrogen compounds, enzym production by molds, the possible modification of soil reaction by the action of molds, the effect of molds upon the mineral transformations in the soil, and the relation of soil fungi to plant diseases.

Summarizing, the author states that "molds have been isolated in large numbers from different cultivated and uncultivated soils, and the identity of many genera and species isolated from widely different localities has been established. The cultivated soils contain by far a smaller number of molds than they do bacteria and Actinomycetes. Molds live and produce mycelium in the soil, and therefore take an active part in the transformation of some of the organic and inorganic substances which are important factors in the fertility of the soil. The plate count of molds in the soil can not be taken as an indication of the actual numbers of molds living in the soil.

"The molds present in the soil, at least most of them, do not fix any atmospheric nitrogen, and even where fixation was shown to be positive the quantities are so small as to be negligible in the study of soil fertility problems. Molds do not seem to play any part in the process of nitrification. The molds play an important rôle in the decomposition of organic matter with the subsequent liberation of ammonia. The amount of ammonia produced depends not only on the source of nitrogen, but also on the carbohydrates available.

"The molds take an active part in the decomposition of the simple and complex carbohydrates in the soil, with the production of carbon dioxid; this brings about a mineralization of the organic matter which is thus made available for higher plants. The molds utilize very readily the nitrogen compounds usually added to the soil in the form of different fertilizers and convert them into complex body proteins, thus competing with the green plants and exerting an injurious effect upon soil fertility. This may be somewhat counterbalanced by the fact that some of the soluble nitrogen compounds are thus saved from loss by drainage from the soil and that the fungus body undergoes autolysis, thus liberating in a soluble form most of the nitrogen that it has assimilated.

"The molds isolated from the soil produce a number of enzyms which may help to bring about decomposition processes, which are important to the upkeep of the fertility of the soil. The production of acids by some molds in the soil may account for some of the soil acidity, and may help to dissolve the insoluble phosphates and other minerals necessary for the growth of the green plants. A number of organisms parasitic to green plants have been isolated from soils, upon which these plants have often never been grown before."

A list of 62 titles comprising the literature cited is appended.

Nitrate reduction in cultivated soils, Alice Oelsner (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *48* (*1918*), *No. 10–15*, *pp. 210–221*).—The author describes investigations with different types of soil containing from 18 to 50 per cent of moisture and to which solutions of nitrates had been added, decided nitrate reduction resulting without the addition of any energy-producing material. The effects were most pronounced with the higher moisture contents, and the conclusion was reached that the exclusion of air from the soil led to the utilization of the oxygen of the nitrates by the soil organisms. The end product of this reduction is said to be elemental nitrogen, while the necessary energy material was thought to be derived from carbonaceous matter in the soil. It is concluded further that danger of denitrification in the field is always present if soil aeration is seriously interfered with, even in the absence of cellulose, straw, or other similar materials usually regarded as sources of energy for denitrifying processes.

Researches on certain "soil sicknesses" in the Netherlands, N. L. Sölmgen, A. Knetemann, and K. T. Wieringa (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat.* [*Netherlands*], *No. 21* (*1917*), *pp. 121–165*, *figs. 6*; *abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, *9* (*1918*), *No. 6*, *pp. 659–662*).—The so-called "soil sicknesses" appearing in Holland, Germany, and Denmark are briefly noted, and studies made by the authors of soil acidity and its influence on vegetation are described. It is stated that the direct and immediate cause of these soil sicknesses has not yet been ascertained, but that a close relationship was observed between their appearance and the free humic acid content of the soil, enabling the soil to be rendered healthy by means of suitable treatment.

[Report of soil fertility work in Kansas, 1917] (*Kansas Sta. Rpt. 1917*, *pp. 16, 17, 21, 22, 24*).—Corn grown continuously since 1910 produced 23 bu. per acre in 1916 as compared with 42.25 bu. for that grown in rotation with cowpeas and wheat. Wheat grown in rotation also yielded better than wheat grown continuously.

Applications of barnyard manure on corn in a rotation of corn, cowpeas, and wheat had a marked effect on the succeeding wheat crops, although the wheat yields were almost identical on plats receiving one-half the manure on corn and one-half on wheat. Marked increases in yields were also obtained from the use of manure on alfalfa grown continuously and in rotation with corn and wheat.

Commercial fertilizers on corn grown in rotation failed to increase yields sufficiently to pay for the fertilizers, but decided increases in yields followed their use on corn grown continuously since 1911. Phosphorus is said to be the principal factor in increasing yields. Fertilizers on wheat grown continuously increased yields, potassium giving only slight increases, while applications of phosphorus alone or in combination resulted in a test weight of 2 lbs. or more per bushel above the other plats. Pronounced effects were obtained from the use of fertilizers on alfalfa grown continuously but no marked influence was noted where it was grown in rotation.

Observations on the effect upon the nitrogen content of the soil of prolonged alfalfa production indicated that in the semiarid portion of the State the alfalfa soils had as great a percentage of nitrogen as the soils in native sod and that the difference between the nitrogen content of the latter and of the cultivated soil was small. In the humid region the soils in native sod contained more nitrogen than the alfalfa soils, while nearly all of the latter contained a greater amount of nitrogen than soils continuously cropped. In the semihumid section of the State the results resembled those of both the semiarid and humid regions.

Analyses of the soil types occurring in Montgomery County are said to indicate deficiencies in calcium, a low phosphorus content, and less potash than the average for good soils in the State.

Experiments with the Rehmsdorfer nitrogen fertilizer, C. von Seelhorst et al. (*Jour. Landw., 66 (1918), No. 2, pp. 105–119*).—Pot tests comparing both the immediate and after effects of the Rehmsdorfer nitrogen fertilizer with ammonium sulphate for mustard and oats are said to indicate that the nitrogen of the former is only about one-sixth as effective as that of the latter. Additional experiments with barley, oats, potatoes, and rape, made in boxes, led to similar conclusions.

A means of relieving the fertilizer crisis, A. de L'Écluse (*Vie Agr. et Rurale, 8 (1918), No. 22, pp. 369–371; abs. in Rev. Sci. [Paris], 56 (1918), No. 23, pp. 727, 728*).—A method of precipitating ammonium-magnesium phosphate from urine by adding an acid magnesium salt is described, and tests of the fertilizing value of the product so obtained are briefly discussed. It is estimated that the average amount of urine produced per man annually is 1,029.56 lbs., and that this contains sufficient fertilizing material to keep 0.05 acre of soil in good productive condition.

Experiments with phosphate fertilizers in Minnesota, F. J. Alway (*Univ. Minn. Col. Agr., Ext. Div. Spec. Bul. 23 (1918), pp. 8*).—On the basis of results so far obtained in experiments made on the substation farms and on the university farm with both rock and acid phosphate on the ordinary farm crops, it has been concluded that the general use of phosphate fertilizers is not justified even with the prevailing high prices. However, on a large proportion of the soils in the west-central part of the State the use of acid phosphate alone for wheat and clover has been found profitable where grain has been grown for a long time without the application of manure. These conclusions are said not to apply to peat soils or to truck crops.

[Phosphates in the Ukraine], C. Doelter (*Abs. in Nature [London], 102 (1918), No. 2562, p. 271*).—It is stated that phosphorites are found in great abundance in many districts of the Ukraine and can be obtained from opencast workings at a low cost. They generally contain a high percentage of calcium phosphate, analysis showing 27.5 per cent of phosphoric acid.

A preliminary report on the potash industry of Nebraska, G. E. Condra (*Bul. Nebr. Bd. Agr., No. 245 (1918), pp. 233–269, figs. 20*).—This describes the potash regions of Nebraska, and notes the present status and progress of the industry in the State.

The Alsace potash deposits and their economic significance in relation to terms of peace, P. Kestner (*Jour. Soc. Chem. Indus., 37 (1918), No. 21, pp. 291T–299T, figs. 2; abs. in Amer. Jour. Sci., 4. ser., 47 (1919), No. 277, p. 68*).—The Alsatian deposits are described and compared with other deposits in North Germany, Galicia, Spain, Italian Eritrea, and the United States. It is estimated that the known deposits in Alsace contain about 1,500,000,000 tons of salts averaging 22 per cent of actual potash (K_2O). The salts are, as a rule, of higher grade than the Stassfurt deposits and need no refining for agricultural purposes.

Wood ashes as a source of potash, F. B. Guthrie (*Agr. Gaz. N. S. Wales, 29 (1918), No. 11, pp. 817–819*).—An analysis is reported of mixed unleached hardwood ashes from a sawmill furnace which contained 1.34 per cent of potash.

Reference is also made to miscellaneous analyses of ashes of mixed timbers, which showed from 0.06 to 5.04 per cent of potash. A table is given of analyses of ashes of different kinds of Australian woods, in which the potash varied from 0.13 per cent in gray ironbark to 9.23 per cent in mountain ash. A potash content of 18.67 per cent is reported for *Pinus insignis* and 16.71 per cent for bracken fern.

The effect of liming on crop yields in cylinder experiments, J. G. LIPMAN and A. W. BLAIR (*Soil Sci., 6 (1918), No. 2, pp. 157–161, figs. 3*).—The authors describe certain modifications in soil treatment in the cylinder experiments which have been in progress at the New Jersey Experiment Stations since 1898 (E. S. R., 39, p. 817). The treatments under consideration comprised annual applications representing 160 and 320 lbs. of sodium nitrate per acre and of ammonium sulphate and dried blood in quantities equivalent to 320 lbs. of sodium nitrate per acre. All cylinders also received annual applications of acid phosphate and potash at the rate of 640 and 320 lbs. per acre, respectively, and in addition generous amounts of ground limestone were applied at the beginning of the experiment. All treatments were made in triplicate, and beginning with the spring of 1908 the A cylinders in each series received no further additions of lime, the B and C cylinders received generous applications of ground limestone once in each 5-year rotation, and in the C cylinders a leguminous green manure crop (vetch and crimson clover) was grown twice in each rotation. Tabulated data are presented showing the yield in dry matter for each cylinder for each year of the 20-year period, 1898–1917, inclusive, and a comparison is made of the yields obtained in the first and second 10-year periods.

The average yields for all treatments for the first 10 years amounted to 222.4, 223.1, and 215.2 gm. for the A, B, and C cylinders, respectively; and for the second 10 years 128.9, 205.1, and 245.5 gm. per cylinder, respectively. The differences observed between the various treatments are briefly discussed, and the conclusion is reached that "the continued use of acid phosphate, muriate of potash, nitrate of soda, sulphate of ammonia, and dried blood, in amounts corresponding to those employed in the experiments described here, is bound to lead, sooner or later, to an unsatisfactory soil reaction and to the need of generous applications of lime. Indeed, the writers are convinced that sufficient stress is not laid on the importance of systematic and adequate liming of land whose production is to be brought up to constantly higher levels by the generous use of commercial fertilizers. Emphasis is also laid on the importance of introducing leguminous crops in the rotation at frequent intervals for the purpose of increasing the supply of available nitrogen and also to maintain a good supply of organic matter."

Experiments with lime and marl, H. R. CHRISTENSEN (*Tidsskr. Planteavl., 25 (1918), No. 3, pp. 377–522, fig. 1*).—The results of experiments with lime and marl carried on for a series of years at several Danish experiment stations are reported at length and data from the different experiments are tabulated in detail. The object of the work was to compare marl and lime, the use of different quantities of the two substances, and the use of different forms of lime. The soils upon which the tests were made included acid and neutral clay soils and light neutral and light, strongly acid, sandy soils. Laboratory tests showed that samples of these soils, with only one exception, were incapable of developing Azotobacter.

The available plant food content of the soil proved to be one of the greatest factors in determining the effect of lime on lime-poor soils, the effect of the applications of lime or marl on such soils increasing as the fertility of the soil decreased. In this connection it is pointed out that, where experiments with oats and crop mixtures were conducted for a series of years and the fertility of the soil improved as the work progressed, the average yearly effect of lime applications as measured by increase in yield decreased.

The best response from the use of lime was secured on a light, strongly acid, sandy soil and the largest increases in yield were obtained with turnips and grass mixtures. Striking increases in yield were also secured with rye and oats. In one of the tests with grass mixtures on a light, strongly acid, sandy soil, clover practically disappeared on the plats receiving no lime. The increase in yield of fodder beets also was quite definite from the use of lime on the soil, and this is believed to have been due largely to the action of lime in reducing plant diseases. Other results seemed to confirm this view, and it is stated that since the favorable action of lime is influenced by the fertility of the soil as well as by the disinfecting power of the lime itself, results of a field test to determine the lime requirement of the soil can not be expected always to show the true condition of the soil with regard to its need of lime.

Alfalfa and black medic as a rule responded to a much greater extent to applications of lime than did clover, bird's foot trefoil, and kidney vetch, although clover made practically no growth in one test on a lime-poor soil without lime application. In one of the tests oats as compared with rye proved the more resistant to unfavorable soil conditions in lime-poor soils, and under similar conditions barley in a mixture of barley and oats nearly disappeared on the unlimed plats, but always made a better showing, relatively and otherwise, where lime and marl had been applied.

The results of comparisons of lime and marl, applied on the basis of equal quantities of calcium carbonate, indicated that marl proved somewhat more beneficial than did lime.

Of different pulverized forms of lime compared, chalk was most effective but not enough so to be of particular value. It is advised that the price per unit of weight of calcium carbonate be used as a deciding factor in the purchase of finely pulverized forms of lime. When lump lime is used the softer forms or those more readily acted upon by the weather are considered as preferable at times.

On the particular soil on which different quantities of lime were tested, the use of 12,000 lbs. of pulverized chalk per töndeland (8,823 lbs. per acre) gave an increase about 50 per cent greater than was secured from the use of 4,000 lbs. When chalk in the raw state was applied, the last 4,000 lbs. of a total application of 12,000 lbs. showed only about 10 per cent of the effect of the first 8,000 lbs. used. The application of 8,000 lbs. of raw chalk was found much more effective than the use of 4,000 lbs. of pulverized chalk. In one test on a light acid sandy soil, in which the applications ranged from 8,000 to 24,000 and 48,000 lbs. of calcium carbonate in the form of lime or marl, the increase in yield rose consistently with the quantity of lime or marl applied, and the results showed that the soil may take as high as 24,000 lbs. of calcium carbonate per töndeland without quite satisfying its lime requirement. An application of 1,000 lbs. of lime annually for seven years was found about one-fourth as effective as a single application of 8,000 lbs. per töndeland on a strongly acid reacting soil.

The injurious effect of borax in fertilizers on corn, S. D. Conner (*Proc. Ind. Acad. Sci., 1917, pp. 195–199, figs. 2*).—Pot tests made at the Indiana Experiment Station are described, in which a study was made of the effect upon corn of a commercial fertilizer, carrying 5 per cent potash and 5 per cent available phosphoric acid, which was found to contain 1.92 per cent of borax, and of a similar fertilizer prepared in the laboratory with and without the addition of 2 per cent of borax. The materials were applied in varying amounts both in the row and broadcast.

The results are said to indicate that 2 per cent of borax in a fertilizer used at the rate of 100 lbs. per acre in the row will bleach the leaves of the corn plant and cause more or less permanent injury.

Crops thrive under Imhoff-tank sludge tests at Dallas, C. SAVILLE (*Engin. News-Rec., 81 (1918), No. 4, pp. 164, 165; abs. in Chem. Abs., 12 (1918), No. 22, p. 2401*).—In tests of the sludge with peanuts, cowpeas, corn, and cotton, grown on sandy loam which had a tendency to bake in dry weather, it was found that the growth of corn and cotton was increased and that the physical condition of the soil was materially improved.

AGRICULTURAL BOTANY.

The effects of inbreeding and crossbreeding upon development, D. F. JONES (*Connecticut State Sta. Bul. 207 (1918), pp. 3–100, pls. 12, figs. 3*).—This bulletin, which was prepared as a thesis to be presented to the faculty of Bussey Institution of Harvard University, is a progress report on inbreeding and crossbreeding. The experiments on inbreeding of maize, on which much of the bulletin is based, were conducted at the station by the author and others. Extensive reviews of literature are given, the experimental work with maize mentioned above is described at length, and the theoretical importance of inbreeding is pointed out. After a summary showing the effects of inbreeding and crossbreeding, the author gives a Mendelian interpretation of heterosis and describes the part it has played in the establishment of sex.

In conclusion, the author states that the good or bad results of inbreeding depend solely upon the constitution of the organisms before inbreeding is commenced. Inbreeding is concerned only with the manifestation of conditions preexisting. As a means of analyzing and of purifying a cross-bred stock by the elimination of undesirable qualities, inbreeding is therefore a method of first importance in plant and animal improvement.

The relation of mutational characters to cell size, W. W. TUPPER and H. H. BARTLETT (*Genetics, 3 (1918), No. 1, pp. 93–106, figs. 2*).—Reporting a continuation of the study previously noted (E. S. R., 36, p. 222), the authors claim to have shown that what is thought to be a mutant of *Œnothera gigas* or *Œ. semigigas* may be a cell giant and at the same time a half dwarf. The half-dwarf habit of the mutant *latifolia* is due not to its being composed of smaller but of fewer cells, and results from a life cycle shortened not as to duration but as to number of cell divisions.

From a comparison of the form *typica* and the mutant *gigas*, they conclude that the supposed tetraploid forms have much larger cells and are differentiated from *typica* by characters of organization as well as of proportion. It is impossible to be certain which characters are due directly and which indirectly to the doubling of the number of chromosomes. The fact that the supposed *gigas* mutations differ widely among themselves, some apparently belonging to the category of half dwarfs, suggests that some characters may be independent of the doubling and due to an independent mutation at the time of origin of the tetraploid number.

The nature and signification of the chondriome, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 16, pp. 649–651*).—On account of contradictory views among observers regarding the chondriomes and on account of their supposed importance in cellular physiology, the author discusses briefly the distinctive characters, relations, and functions of mitochondria and the technique appropriate to their demonstration.

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Mitochondria are stated to present well defined characters which are in most cases easily studied, especially in certain animal cells.

Generally the chondriome of the vegetable cell is represented very early by granular mitochondria. In the embryonic cells, some of these elements are changed into chondriocontes which develop into plastids, while others usually remain as granular mitochondria, performing other functions or simply perpetuating the chondriome.

The relation of the plant to the reaction of the nutrient solution, D. R. Hoagland (*Science, n. ser., 48 (1918), No. 1243, pp. 422–425*).—In a previous paper (E. S. R., 38, p. 736), the author described the effect of the hydrogen and the hydroxyl ion concentration on the growth of barley seedlings. The experiments with barley seedlings are said to have indicated a strong tendency on the part of the plant to change the reaction of various potassium phosphate solutions in the direction of neutrality. The work has been extended to other solutions, including complete nutrient solutions, and observations have been made at all stages in the growth cycle of the barley plant. The experiments were carried out in sand and water cultures, and in addition to barley plants several varieties of beans were used.

In every instance, nutrient solutions of an acid reaction reached an approximately neutral reaction after contact with the plant roots for varying periods of time. The neutral solutions remained constant in reaction throughout the entire period. Chemical analyses of the solutions indicated that the change in reaction was the result of selective absorption of the various phosphoric acid anions, accompanied by a removal of positive ions. A marked regulatory absorption is said to have been apparent.

Considering the nature of acid soils and their relation to crop growth, the author states that it is often assumed that most agricultural plants require a slightly alkaline reaction in the soil. Previous work has shown that a reaction of pH 5 is in no way inhibitive to the growth of barley seedlings. This point has been further investigated with the use of several varieties of beans in sand cultures. The solutions were changed with sufficient frequency to maintain constantly an acid reaction, but no injury was apparent. Observations are given on some California peat soils, which were found to be decidedly acid, and, where other inhibiting factors were absent, first-class crops of barley, oats, beans, potatoes, onions, corn, and asparagus were produced. It is claimed that in these soils the acid reaction did not interfere with the growth of crops nor the formation of nitrates.

The value of certain nutritive elements in the development of the oat plant, J. G. Dickson (*Amer. Jour. Bot., 5 (1918), No. 6, pp. 301–324, figs. 5*).—Experiments carried out during the growing seasons of 1915–1917, and planned to show the effects of some of the essential nutritive elements on the development and composition of plants when other physico-chemical factors, such as unequal osmotic pressure and the addition of new chemical elements, were controlled as far as possible, are reported. The author, employing with *Avena sativa aristata* a modified Knop's solution, found that the general development of the plants studied was most severely affected by a deficiency of phosphorus or of nitrogen, these preventing the stooling of the plants.

A deficiency of calcium or magnesium increases vigor of growth but lengthens the period of development, which is shortened by a deficiency of potassium, phosphorus, or nitrogen. Grain production is lowered by a deficiency of magnesium, calcium, potassium, phosphorus, or nitrogen. The ratio of grain to straw is decreased by a deficiency in magnesium or calcium and is increased by a deficiency in potassium, phosphorus, or nitrogen. The water requirement is decreased by a deficiency in magnesium, slightly increased by a deficiency in calcium, and greatly increased by a deficiency in potassium, phosphorus, or nitrogen. In general, the effects upon the plants of limiting the supply of phosphorus or nitrogen are much more noticeable than the effects of limiting the supply of magnesium, calcium, or potassium.

Direct assimilation of organic carbon by Ceratodon purpureus, W. J. ROBBINS (*Bot. Gaz., 65 (1918), No. 6, pp. 543–551, figs. 5*).—The author, presenting results so far as obtained from an incomplete investigation begun in 1914 with *C. purpureus* in pure culture, states that this moss absorbed and utilized organic carbon in the form of levulose, glucose, galactose, lactose, cane sugar, and maltose; mannite, glycerin, and starch not being utilized. Starch forms in darkness from levulose, glucose, galactose, lactose, cane sugar, and maltose. Levulose was from two to seven times as effective as a sourse of carbon for growth as glucose, maximum growth occurring with the former in darkness, with the latter in light. Moss plants seem to require light as well as available carbohydrates for the best development.

Recent observations on the degradation of inulin and inulids in chicory root, B. GESLIN and J. WOLFF (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 11, pp. 428–430*).—The authors have followed, by means of two ferments differing as regards their mode of action, the changes which occur during the autumn and winter resting period of chicory root in the content of inulin and of the substances which the authors have previously (E. S. R., 38, p. 502) designated by the general term inulids.

These substances are divided by the authors into two groups according to their effects as regards fermentation and the successive degradations which they undergo, these differences being shown by comparative tests and tabulation of results. These results are said to be confirmed by those recently reported by Colin (E. S. R., 39, p. 524).

The sugar content of sorghum at various stages of its growth, D. BERTHELOT and R. TRANNOY (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 20, pp. 824–827, fig. 1*).—*Sorghum saccharatum*, studied at Meudon during 1917 in regard to sugar content, showed glucose and levulose earlier than saccharose, the last named reaching its maximum about October 5 and maintaining a somewhat lower level during the latter half of November, and the other two decreasing from about August 24 to November 16 but showing a slight rise during the rest of that month.

Development of the principal sugars of sorghum and the effect of castration, D. BERTHELOT and R. TRANNOY (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 22, pp. 907–910, fig. 1*).—Having studied the history of sugars at an earlier period than that of the work noted above, the authors found that saccharose followed the same general course as in the previous study, castration making no apparent difference in the saccharin content. Comparisons are made between sorghum and beets as sugar-producing plants in regard to economic and other phases.

Chemical changes accompanying abscission in Coleus blumei, H. C. SAMPSON (*Bot. Gaz., 66 (1918), No. 1, pp. 32–53*).—Giving an account of studies on *C. blumei* and of methods employed, with discussion, the author states that abscission in *C. blumei* results from conversion of cellulose into pectose. This is further transformed into pectic acid and pectin, leading to an excess amount of pectic acid over that of the available calcium sufficient to maintain the solidity of the middle lamella of the cell walls of the abscission layer. These processes are possibly initiated and probably accelerated by the presence of oxidases and ferric ions, both of which accumulate in the abscission layer.

Metachromatin and phenol compounds in the vegetable cell, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 23, pp. 958–960*).—It is stated that the substance described as metachromatin in the higher pl not identical with the metachromatin of fungi but is a phenol compound formable directly into anthocyanin. The presence of this phenol comp the vacuole of plant cells, far from being general, is confined to special t Mitochondria, on the contrary, exists in all cells.

The salt content of a Kamerun plant, A. LACROIX (*Compt. Rend. Ac* [*Paris*], *166* (*1918*), *No. 25, pp. 1013–1015*).—Analysis of ash sent from run and said to be used as a source of salt by natives in African regio ing salt deposits is stated to give results resembling those obtained analyses of the ash of *Panicum crus-galli*.

The injurious effect of magnesium carbonate on plants, H. COUPIN (*C Rend. Acad. Sci.* [*Paris*], *166* (*1918*), *No. 24, pp. 1006–1008*).—Noting bri the effects of magnesium carbonate (which, ordinarily insoluble in wa comes sparingly soluble if a small proportion of carbon dioxid is pres a number of plants, the author states that a prejudicial effect on plants shown by diminution of the length of the main root, by reduction in s number of the rootlets, by a black or brown coloration of the branch rootlets, by a decrease in the number of absorbing root hairs, and by sened linear growth of the aerial portions.

The influence of the vegetable function of yeast on alcoholic yield; interpretation of fermentative capacity, L. LINDET (*Compt. Rend. Ac* [*Paris*], *166* (*1918*), *No. 22, pp. 910–913*).—The author gives in tabula the results of studies on the problem of the conditions affecting alco duction by yeast, such as sugar concentration, temperature, origin, vig amount of the yeast present; and alimentary value of grape juice and chemical medium employed.

Measurements of growth in sugar cane, J. KILIAN (*Arch. Suike Nederland. Indië*, *26* (*1918*), *No. 17, pp. 736–743, figs. 2*).—A brief acc given with graphical representation of records made by sugar cane b July 10, 1915, and March 10, 1916, as regards stooling and growth in tion with precipitation during a part of that period.

Photosynthesis, W. CROCKER (*Bot. Gaz.*, *65* (*1918*), *No. 6, pp. 568, 569*). is a summary, with critical comments, of several recent contributions views bearing upon photosynthesis, and more particularly upon heat a in that connection.

Behavior of plants in unventilated chambers, F. C. NEWCOMBE and BOWERMAN (*Amer. Jour. Bot.*, *5* (*1918*), *No. 6, pp. 284–294*).—The aut porting work with several economic plants, state that confinement of p small spaces or moist air produced no ill effects except by favoring p growths or abnormal growth of weak tissue. They reach the conclus not only is ventilation without effect in producing better seedlings in or a large darkened chamber, but that it is without visible effect on sitive reactions of geotropism and heliotropism.

Studies on the vegetation of New York State.—II, The vegetati glacial plunge basin and its relation to temperature, L. C. PETRY (*Bul. Bot. Club*, *45* (*1918*), *No. 5, pp. 203–210, figs. 3*).—This is in series with by Bray (E. S. R., 35, p. 146).

Data as regards air and soil temperatures are given for a glacial basin near Syracuse, N. Y., whose bottom lies at an altitude of 610 f sea level, the temperature over an area of some thousands of square y it remaining throughout the year below 70° F. The bottom area of th is occupied by an association of plants characteristically Canadian in tion, analysis of conditions demonstrating that temperature is the fac trolling plant distribution in this area.

New species of Uredineæ, X, J. C. ARTHUR (*Bul. Torrey Bot. Club, 45 (1918), No. 4, pp. 141–156*).—This descriptive list comprises 23 new species and 2 new combinations. The species are all North American, ranging from Wyoming and Vermont to Panama and the West Indies, the greater part being from Mexico and Central America.

Uredinales of Guatemala based on collections by E. W. D. Holway, I, J. C. ARTHUR (*Amer. Jour. Bot., 5 (1918), No. 6, pp. 325–336*).—Notes and descriptions are given of species of Coleosporiaceæ and Uredinaceæ collected in Guatemala during the period from 1914 to 1917, inclusive.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from October 1 to December 31, 1915 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 45 (1918), pp. 66, pls. 7*).—A list is given of 370 lots of seeds and plants introduced during the period from October 1 to December 31, 1915, the material collected by O. F. Cook in the high Peruvian Andes while attached to the Yale University-National Geographic Society expedition being included.

FIELD CROPS.

[Report of agronomy work at the Guam Station], G. BRIGGS (*Guam Sta. Rpt. 1917, pp. 17–29, pls. 2*).—This describes the continuation of work with field crops as previously noted (E. S. R., 37, p. 728).

In a comparison of different treatments for renovating Para grass (*Panicum barbinode*) areas, the heaviest yield of green forage, amounting to 132,257 lbs. per acre, followed an application of 15 tons of barnyard manure, as compared with an average yield of 48,481 lbs. from two untreated checks. The grass is said to be best suited to lowland pastures and to require a rest period at certain intervals throughout the year. *Paspalum dilatatum* continued to give excellent results as a pasture grass under droughty conditions and on many types of soil. Plantings made 12 in. each way with sod cut into 2-in. squares have given the best results. The necessity for allowing both Paspalum and Para grass to become well established before pasturing is emphasized.

The first successful introduction of Sudan grass into Guam was made during the year. The first crop, produced during the dry season, was harvested 108 days after planting, the yield being 9.83 tons of forage per acre.

Two fields of Amber cane sorghum planted in January yielded at the rate of 8 and 8.5 tons of forage per acre, respectively, at the first cutting and 5.92 and 10.4 tons at the second cutting. Kafir corn produced 10.5 tons of forage the first cutting and 31.65 bu. of grain per acre, and 7.98 tons of forage from the first ratoon crop. Limited data are thought to show a direct correlation between season, or time of planting, and the yield and number of days required to reach maturity for the grain sorghums. During the wet season the crop matures in less time but the yields are materially lower than in the dry season.

The fourth and fifth generations of corn obtained in improvement work with a native white variety matured during 1917. The fourth generation crop is described as quite satisfactory, maturing several days earlier than the original stock and producing an average of 37 bu. per acre, as compared with less than 25 bu. for the native kind. The fifth generation was practically a failure.

Results obtained in fertilizer, shading, and insect enemy studies with tobacco are held to indicate that insect control is the most important factor in producing marketable tobacco. Shading tobacco was found to be detrimental as well as unprofitable, while treatment with lead arseniate resulted in larger yields and a better grade. The results of the fertilizer tests for the past two years were so conflicting that no definite conclusions have been reached.

Observations have been made of different types of cotton to ascertain their relative value when grown as ratoon crop. The results are said to indicate that the upland varieties are more likely to produce a ratoon crop than are the Egyptian varieties, and that cotton plants generally die before or soon after being cut back for a second ratoon crop. Variety tests with cotton included three types of Egyptian grown in Hawaii, Arizona, and Guam, and two upland types, Hartsville and Covington-Toole, grown in Guam. Yields of seed cotton were obtained amounting to 921.8, 872.6, 823.4, 974.4, and 787.6 lbs. per acre, respectively.

Work with rice was a failure due to insufficient moisture and high winds which blasted the crops at blossoming time. Data obtained during the past two years with regard to the cost of producing rice showed an average cost of $22.50 per acre.

A number of leguminous cover crops have been tested, the most promising of which are velvet beans, jack beans, and pigeon peas. Cowpeas matured in about 80 days, but the yields were small and the growth of vine insufficient to cover the ground. Velvet beans have produced from 0 to 14.3 bu. of seed per acre and as high as 7.3 tons of green forage, and remained on the ground for several months, covering it completely. The jack bean matures earlier than the velvet bean and shades the ground fairly well, but its woody growth renders the plant difficult to work into the soil.

In tests with alfalfa, one plat in an apparently well-drained location died out after the heavy rains had continued for some time. All uninoculated plats were much slower in growth than the inoculated plats.

The use of arsenic sprays in weed eradication proved effective against the aboveground portions of the plants but did not kill the roots. Under local conditions the practice is deemed less effective and more expenisve than hand labor.

A brief report is presented on mechanical and chemical analyses of soil samples taken from the north end of the island and analyzed by the Bureau of Soils of the U. S. Department of Agriculture. The outstanding features were the extremely low silica content, high iron and aluminum content, and relatively high phosphoric-acid content.

[Report of field crops in Iowa, 1917] (*Iowa Sta. Rpt. 1917, pp. 18, 19, 22, 23*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 37, p. 30).

Cooperative tests made by 64 farmers with Iowa 302 corn resulted in an average increase in yield of 3.3 bu. per acre over the local varieties. Iowa 103 oats grown by 105 farmers and Iowa 105 oats grown by 75 farmers produced average yields of 48 and 51.3 bu. per acre, respectively, as compared with 43 and 47.3 bu. for the local sorts. A superior variety of barley grown in comparison with oats produced 1,419 lbs. or 1,206 lbs. of feed without the hulls, while the oats produced 1,390 lbs. of whole grain or 937 lbs. of feed.

In tests with soy beans to determine the need of inoculation, about two-thirds of those reporting noted an increase in vigor and in yield from inoculation. Red clover and alfalfa grown under identical conditions by 23 farmers resulted generally in better stands of red clover than of alfalfa. Beneficial results from inoculation and the use of lime were also noted in most instances.

Sudan grass as compared with millet gave larger yields and a better quality of forage.

American varieties of alfalfa, such as Grimm, Baltic, or common, are deemed superior to imported varieties for Iowa conditions. Seed from the Dakotas and Montana is said to have shown little superiority over seed obtained from

Nebraska and Kansas under normal conditions, while under severe winter conditions the Dakota and Montana seed has proved to be somewhat superior. The largest yields of alfalfa and the smallest percentage of failures were reported by farmers growing the crop on loam soil with clay or sandy subsoil, the greatest percentage of failures occurring on sandy and stiff clay soils. Approximately 40 per cent of all failures are said to have been due to a lack of inoculation or of lime, while 15 per cent were due to smothering by the nurse crop and 12 per cent to winterkilling.

To insure a stand of red clover when seeded with a small grain nurse crop, it is suggested that the grain be drilled in at a rate of not more than 2 bu. per acre. Iowa 105 oats is deemed far superior to all other varieties as a nurse crop. The removal of the grain crop for hay when in the milk stage often resulted in an excellent stand of clover when under similar conditions, but with the grain allowed to mature the clover failed.

[Report of work with field crops in Kansas, 1917] (*Kansas Sta. Rpt. 1917, pp. 17–19, 21, 23, 24, 25, 31, 32, 39, 40–42, 44, 45–47, 48.*)—This describes the continuation along the same general lines of work previously noted (E. S. R., 38, p. 630).

In tests of various methods of seed bed preparation for wheat the highest yield, 8.25 bu. per acre, was produced on the plat listed July 15 with the ridges subsequently worked down. Seasonal moisture and nitrate studies are said to indicate that nitrification is correlated with the actual available moisture during the summer, that the available moisture is controlled by cultivation through the prevention of weed growth, and that weeds not only waste soil moisture but utilize the nitrates developed, preventing an accumulation for the fall growth of wheat.

As a result of three years' observation on the effectiveness of soil mulches, it has been concluded that a cultivated soil surface is no more effective than a bare surface in checking evaporation, that nitrification may occur at the same rate on uncultivated soils with a bare surface as on cultivated soils, that weeds deplete the soil moisture and plant food, and that cultivation should aim at keeping the soil in a receptive condition for rainfall and at preventing weed growth.

Kanred wheat continued to give increased yields over the standard varieties, producing nearly 11 bu. per acre more than Turkey and 8.5 bu. more than Kharkof. Average yields for 6 years in field tests amounted to 31.1, 26.5, and 25.9 bu. per acre, respectively. Kanred is also said to be a superior variety for growing on all soil types throughout the hard wheat belt of the State. In 54 cooperative tests extending over three years Kanred gave an average increase of 4.4 bu. per acre over the local varieties.

A promising strain of oats has been isolated which is said to be much earlier and appears to be more productive than Red Texas. The kind of soil and its moisture content is held to have a very definite, though complex, relation to soil temperature and winterkilling in cereals. Seeding in furrows gave marked protection to grain during the winter.

Corn plats scraped to remove the weeds and those cultivated in the ordinary way gave practically the same yields, while plats cultivated every 10 days after the corn was laid by gave the lowest yields. Hybrid strains of corn generally gave higher yields than the average of the parents but not enough higher to justify the extra cost. Several hybrid strains grown at Manhattan showed superior drought resistance during the season of 1916 when there was a moisture deficiency of 6.26 in., all of which occurred in July and August. Cooperative tests with corn are said to have demonstrated that acclimated varieties are superior to introduced varieties and that the longer a variety is grown in a given environment the greater is its superiority over the introduced sorts.

Observations on 3,000 heads of Kafir corn to determine the relation of the number of whorls to the weight of heads indicated that heavy heads had fewer whorls than light heads and thrashed a higher percentage of grain. Kansas Orange sorghum was first, in a comparison with corn and Kafir corn for silage, for 5 years, with an average yield of 18 tons per acre. Soy beans have produced from a third to a half more hay per acre than cowpeas and from two to three times as much seed, several varieties averaging 25 bu. per acre or more for the past three years. Local adapted strains of Kentucky blue grass proved to be much superior to introduced strains.

Grazing experiments are noted in which a portion of the pasture was protected for a part of the season, while a similar area was grazed throughout the season. More seed is said to have matured on the protected area, and the average germination of the seed was twice as high. Sweet clover and several tame grasses were seeded in the native sod in an effort to improve the pasture, but sweet clover alone has proved promising. The yellow type appeared to predominate. Burning over the pasture early in the spring did not seem to injure the grass so far as its immediate effect was concerned.

A study was made of the effect of maturity and methods of harvesting and curing on corn, sorghum, and Sudan grass. Barren corn obtained by covering the silk at time of tasseling, was found to contain more protein and less crude fiber than normal corn. With sorghum the percentage of protein and crude fiber decreased and that of nitrogen free extract increased as the plant matured. The amount of protein in Sudan grass was closely related to the yield, the percentage of protein being higher with a smaller yield. The largest amount of total nutrient was obtained when the grass was cut in full bloom.

Work with potatoes included variety tests, disease control, and fertilizer experiments. Irish Cobbler and Early Rose have given the highest yields, while Colorado seed was less productive than either northern grown or Kaw Valley seed. As compared with liquid sprays, dry sprays were applied more rapidly and cheaply and were as effective in controlling the Colorado potato beetle. Liquid Bordeaux mixture was much more effective in controlling early blight. Fertilizer applications resulted in increased yields in favorable years, potash exercising the greatest influence on yields.

The highest yield of wheat, 34.3 bu. per acre, obtained at the Fort Hays substation was secured on land prepared for sorghum in 1915, but which was practically fallowed due to the poor stand of sorghum. The crop is said to have been produced at an average cost of 33 cts. per bushel. The average yield of wheat at the substation amounted to 24.2 bu. per acre. Studies of cultural methods under dry farming conditions and variety tests and selection work with cereals and forage crops for western Kansas are briefly noted. Several strains of Crimean, Kharkof, Turkey, and Malakoff wheat have been developed which are said to outyield the check varieties by as much as 4.5 bu. per acre.

At the Garden City substation the fallow and green manure plats of winter wheat were practically the only ones producing harvestable crops, the highest yield being 14 bu. per acre and the average yield for all tillage methods and rotations 5.4 bu. The average yields of stover from corn, Kafir corn, and milo maize were 2,100, 1,900, and 1,800 lbs. per acre, respectively. In the irrigation experiments greater differences in yields were produced during 1916 by the different amounts of water applied than at any time since the work was begun, these differences being most marked with the grain sorghums. Milo maize receiving 21.3, 14.3, 11.3, and 5.2 in. of water produced 58.6, 41.5, 16.3, and 7.5 bu. per acre, respectively. The forage sorghums did not respond to irrigation to such a marked extent, while in several instances the second rate of application to the cereals produced more grain than the highest rate. Millet, cowpeas, potatoes, and sugar beets responded somewhat to irrigation, but scarcely in proportion to the amount of water applied.

Unfavorable weather conditions during the spring and early summer of 1916 at the Colby substation resulted in poor stands of spring crops. Yellow milo is said to be the most promising grain sorghum for western Kansas and Red Amber the best kind for forage. In a test of winter wheat varieties, Kanred was first with a yield of 42.55 bu. per acre. Greatly increased yields were obtained from irrigated plats of potatoes, grain and forage sorghums, corn for silage and fodder, and Sudan grass.

At the Tribune substation Sudan grass sown broadcast produced over 2½ tons of hay per acre, and sown in 42 in. rows about 1½ tons. Millet and Sudan grass sown July 15 yielded over 1 ton per acre. Fair yields were obtained of dwarf milo, dwarf Kafir, and Freed sorghum.

[Work with field crops at the Belle Fourche reclamation project experiment farm in 1917], B. Aune (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1917, pp. 10–14, 24–28*).—In continuation of work previously noted (E. S. R., 38, p. 30), this report deals with rotation experiments with irrigated field crops, small grains, and variety trials with corn. Observations on corn and sunflower silage are also noted.

The average yields for all crops grown in the irrigated rotation experiments during 1917 amounted to 3 tons of hay per acre for alfalfa, 12.35 tons for sugar beets, 42.92 bu. for corn, 19.9 bu. for winter wheat, 27.8 bu. for spring wheat, 59.2 bu. for oats, 27 bu. for barley, 14.6 bu. for flax, and 148.7 bu. for potatoes. Clover for hay and seed winterkilled. Alfalfa two or more years old produced on the average 3.74 tons per acre; first-year alfalfa sown in the fall of 1916, 2.92 tons; and that sown in the spring of 1917, 1.08 tons.

The highest yield of beets, 20.86 tons per acre, was secured in a rotation of oats (manured) and beets, producing 8.2 tons more than a similar rotation without manure. The average sugar content of the beets for 1917 was 20.2 per cent and the average purity 87.2. The maximum yield of potatoes was obtained after beets and amounted to 205 bu. per acre. Potatoes cropped continuously for 6 and 5 years produced 146.5 and 192.7 bu. per acre, respectively. Considerable increases were noted in all rotations with manure, while the yields after alfalfa were low. The average percentage of marketable tubers for all cropping systems was 84.4. Oats after beets and potatoes have given uniformly good results, the maximum yield being obtained in a rotation of oats (manured) and beets. After corn the yields have not been satisfactory. Rotations with manure have not shown any decided increase in the yield of oats. The highest wheat yield, 36.9 bu. per acre, was obtained in a 4-year rotation where wheat followed alfalfa. Wheat after beets has also given good results. The maximum yield of corn, 53.8 bu., was secured where corn followed barley. The maximum flax yield, 17.6 bu., was obtained from plats sown continuously to flax for 6 years, while yields amounting to 16.1 and 15.5 bu. were obtained after corn (hogged off) and after beets, respectively.

Based on the results of observations covering a period of 6 years the following are deemed to be the more important indications:

"Alfalfa has shown no marked increase in yield on crops that followed it. Grains following a cultivated crop have given better net returns per acre than when following alfalfa or grain. The application of manure has shown a marked increase in the yields of potatoes and sugar beets, but not of grains. Sugar beets following a cultivated crop have given uniformly good results, and sugar beets following a grain crop without any manure and after clover have given uniformly poor results. Alfalfa seeded shortly after the grain has been removed in the late summer has given the most satisfactory stand and produced higher yields the first year after planting. Early-seeded spring grains have given much better results as to both quality and yield than late-seeded spring grains."

In variety testing with winter cereals, reported by J. H. Martin, Turkey selection wheat has given the highest average yield, 36.3 bu. per acre, for the 3 years 1915 to 1917, inclusive. Kharkof was second with an average yield of 35.7 bu. Swedish (Minn. No. 2) and North Dakota No. 959 rye produced 25.5 bu. and 25.3 bu. per acre, respectively. Winter emmer and winter spelt have not proved sufficiently hardy for this locality. Kubanka, a durum variety, has produced the highest average yield of the spring wheat varieties tested, with 21.8 bu. for the period of 1913 to 1917, inclusive. Marquis, with an average yield of 16.8 bu., is deemed the best common wheat. White Russian oats, a late variety, has given the highest average yield for the past 6 years, 45.8 bu. per acre, while Silvermine, with a 3-year average yield of 51.6 bu., is said to be one of the most promising of the midseason sorts. Early oats have not proved very productive under irrigation. Hannchen and Chevalier barleys, 2-rowed types, have outyielded all the 6-rowed varieties. Chevalier II produced an average of 31.1 bu. per acre for the 4 years 1914 to 1917, as compared with 20.3 bu. for Manchuria (Wis. No. 13). Hull-less types have produced from 19.2 to 22.8 bu. for the same period. White spring emmer yielded 46.3 bu. for a 4-year average, but the yield in pounds of grain per acre has been somewhat less than that of the better varieties of barley. Damont flax has given the highest average yield for the past 4 years, 13 bu. per acre, with Russian (N. Dak. No. 155) second with 12.6 bu.

Marten White Dent, Northwestern Dent, and Payne White Dent corn have produced average yields for the 5 years, 1913 to 1917, amounting to 42.8, 42.7, and 40.9 bu. per acre, respectively. Gehu Flint has yielded an average of 39.8 bu. for the past 3 years and is said to be the earliest ripening of all the varieties. Marten White Dent, Payne White Dent, Red Cob, and Sweet Fodder corn, grown for silage in comparison with Mammoth Russian sunflower, produced 9.55, 10.37, 11.98, and 8.67 tons per acre, respectively, the average yield for the sunflowers being 12.59 tons.

[A report of field crops work in the United Provinces, India], B. C. BURT (*Rpt. Agr. Expt. Stas. Cent. Circle, United Prov.* [*India*], *1917, pp. 1–24, 42–65, 73–81, 85–87*).—This reports the results of fertilizer tests with wheat, corn, potatoes, tobacco, and millet; field and variety tests with wheat, cotton, gram, peanuts, flax, sugar cane, millet, tobacco, indigo, barley, rice, and miscellaneous fodder crops; and cultural experiments with wheat, gram, and fodder crops at the Cawnpore, Atarra, and Orai experiment stations, and on demonstration and seed farms for the year ended June 30, 1917.

[Report of field crops work in South Australia], W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 21* (*1918*), *No. 7, pp. 576–582*).—Variety, cultural, and fertilizer tests with wheat conducted at three experimental centers during the seasons of 1916 and 1917 are reported, in continuation of work previously noted (E. S. R., 38, p. 433).

Rolling the land after plowing for wheat gave practically the same yield, about 16.3 bu. per acre, for 6 in. plowing as subpacking after plowing. For 3 in. plowing the respective yields were approximately 15.5 and 14.5 bu. See also an earlier note (E. S. R., 38, p. 240).

Applications of 2 and 3 cwt. of superphosphate per acre materially increased wheat yields.

New crops for Rhodesia, J. A. T. WALTERS (*Rhodesia Agr. Jour., 14 (1917), Nos. 3, pp. 327–331, pls. 4; 6, pp. 737–743*).—The author presents a brief report on some of the most recent crop introductions deemed of value to Rhodesian agriculture, as indicated by tests conducted at the Salisbury agricultural experiment station during 1916–17. The crops discussed include grasses and legumes for pasture, cereals, oil seeds, root crops, fiber plants, corn, and miscellaneous forage crops.

Oleaginous plants of Indo-China, C. CREVOST (*Bul. Écon. Indochine, n. ser., 20 (1917), No. 127, pp. 563–619, pls. 18*).—A comprehensive account, including brief botanical descriptions and cultural notes, of numerous oil-producing plants in Indo-China.

Cotton and other vegetable fibers: Their production and utilization, E. GOULDING (*London: John Murray, 1917, pp. X+231, pls. 12; rev. in Sci. Prog. [London], 12 (1918), No. 48, pp. 694, 695*).—This volume, with a preface by W. R. Dunstan, issued in the Imperial Institute series of handbooks to the commercial resources of the Tropics, deals with the present status and the future prospects of the world's production and utilization of fibers, including cotton, flax, hemp, ramie, jute, and cordage and miscellaneous fibers. Particular reference is given to the possibilities of extending production in the British Empire, especially in the tropical possessions.

Wheat and rye, C. A. ZAVITZ (*Ontario Dept. Agr. Bul. 261 (1918), pp. 31, figs. 4*).—This reports the results of variety and cultural tests with winter and spring wheat, winter and spring rye, emmer, and spelt conducted at the Ontario Agricultural College.

In variety tests with winter wheat covering a 22-year period, Dawson Golden Chaff and Imperial Amber have given the highest average yields, 50.2 and 47.2 bu. per acre, respectively. A hybrid, O. A. C. No. 104, obtained by crossing Dawson Golden Chaff and Bulgarian, has produced an average yield of 45 bu. per acre for a 6-year period, as compared with yields of 40.8 bu. for Dawson Golden Chaff and 37.5 bu. for Bulgarian for the same period.

In tests of various methods of soil preparation for wheat the maximum yield was obtained after bare summer fallow receiving 20 tons of barnyard manure per acre, the average being 40.9 bu. for a 4-year period, as compared with an average of 33.8 bu. after summer fallow alone. Wheat after field peas, buckwheat, and Dwarf Essex rape plowed under showed yields of 36.1, 29.6, and 30.4 bu. per acre, respectively.

Date-of-seeding tests covering a 6-year period resulted in average yields ranging from 48.6 to 49.7 bu. per acre for seedings made from August 25 to September 9, as compared with 45.7 bu. for seedings made after September 15. Four, 6, and 8 pk. rates of seeding showed average yields for a 6-year period of 40.15, 43.8, and 43.87 bu. per acre, respectively.

Experiments were begun in 1897 to study the effect of harvesting winter wheat at different stages of maturity, the cuttings being made at weekly intervals for 5 weeks, beginning 2 weeks before the usual time for cutting wheat throughout the Province. Seed from the different cuttings were secured and sown again in the fall, this process being repeated annually for 20 years and the yields of grain and straw being recorded. The average yield of grain varied from 21.1 bu. per acre for the first cutting to 51.17 bu. for the fourth, and 49.64 bu. for the fifth cutting. The yields of straw showed a gradual decrease as the date of harvest advanced, ranging from 3.49 tons per acre for the first cutting to 2.79 tons for the fifth. The weight of grain per measured bushel increased from 45.19 lbs. for the first cutting to 59.77 lbs. for the fourth, and 58.79 lbs. for the fifth.

The following average acre yields were obtained in a 5-year test of various methods of seed treatment for smut: Thirty-eight bu. from untreated seed, 40.6 bu. from hot water treatment, 40.2 bu. from immersion in copper sulphate solution for 12 hours, 41.1 bu. from sprinkling with copper sulphate solution, 43.3 bu. from immersion in dilute formalin, and 36.3 bu. from sprinkling with formalin.

As a result of seed-selection tests made in each of 6 years, average annual increases in yield are reported amounting to 6.8 bu. per acre for large over small seed, 7.8 bu. for plump over shrunken seed, and 35.6 bu. for sound over broken seed.

In tests with spring wheat varieties for a 27-year period, 1891 to 1917, the highest yields were obtained from Saxonka with 33.1 bu. per acre, Red Fife with 32.1 bu., and Pringle Champion with 31.9 bu. Arnautka, Roumania, and Wild Goose durum varieties have given average yields of 40.28, 39.38, and 38.9 bu. per acre, respectively, for a 5-year period. Seed selection tests employing two different varieties were conducted over an 8-year period, and resulted in average yields of 21.7 bu. per acre for large plump seed, 18 bu. for small plump seed, and 16.7 bu. for shrunken seed. Date-of-seeding tests conducted over a 5-year period resulted in a maximum yield of 21.9 bu. per acre for the earliest seeding date.

Tests with varieties of winter rye for a 14-year period resulted in an average maximum yield of 55.8 bu. per acre for Mammoth White. Grown as a nurse crop with hairy vetch, winter rye proved to be superior to winter wheat or winter emmer. Winter rye is said to have produced an annual average of 7.93 tons per acre of green forage in cooperative tests covering a 5-year period.

O. A. C. No. 61 and Saatroggen with 10-year average yields of 30.1 and 29.6 bu. per acre, respectively, were highest in variety tests with spring rye. Large, medium, small, and broken seed of spring rye have given average yields of 26, 24.4, 22.3, and 16.9 bu. per acre, respectively.

Variety tests with emmer and spelt have been conducted for 16 years, the highest yielding emmer variety being Iowa with 2,906 lbs. of grain per acre and the highest yielding spelt variety being Red with 2,120 lbs. Emmer is said to surpass spelt in freedom from rust, thinness of hull, weight of grain, and in yield of both grain and straw, spelt being superior only in strength of straw. Date-of-seeding tests with emmer and spelt for a 5-year period indicated that emmer could be successfully sown at a later date than spring wheat, while spelt gave the best results from early seeding.

The castor bean, A. E. Barthe (*Rev. Agr. [Santo Domingo], 13 (1917), No. 9, pp. 231–257, figs. 4*).—This presents a detailed description of the castor bean (*Ricinus communis*) and of its production, together with a discussion of the industrial exploitation of the crop and its products.

The production of the castor bean in North Africa, F. Couston (*La Culture du Ricin dans l'Afrique du Nord. Algiers: Govt., 1918, pp. 15*).—This presents a brief account of the present status of castor-bean production, methods of cultivation, adapted varieties, insect and disease pests, and the exploitation and utilization of the crop in northern Africa.

Storage of seed corn, F. A. Welton (*Mo. Bul. Ohio Sta., 3 (1918), No. 12, pp. 360–362*).—Tests of eight different methods of storing seed corn covering a period of five years, 1913–1917, inclusive, are described and tabulated data presented showing the percentage of germination and the yield secured with each method and for each year of the test.

The best average germination, 97.53 per cent, and the highest average yield, 75.06 bu. per acre, were obtained from seed hung up in the furnace room, and the lowest germination, 89.4 per cent, and yield, 71.02 bu., from seed stored under conditions similar to those which prevail where seed is selected from the crib in the spring. The average germination and yield of those lots receiving no heat was 93.77 per cent and 72.12 bu., respectively, as compared with 96.8 per cent germination and 74.21 bu. for those lots to which heat was applied in some way. With the abnormal weather conditions of 1918, germination varied from 1 per cent for seed stored in the crib to 95.67 per cent for that hung up in the furnace room.

Cotton variety tests for 1917, R. Y. Winters and V. R. Herman (*Bul. N. C. Dept. Agr., 39 (1918), No. 3, pp. 10*).—This reports the results of tests with 38 short-staple and 6 long-staple varieties of cotton at West Raleigh.

The highest yielding short-staple varieties were Jones Improved, Cook Improved, and Wannamaker Cleveland, with yields of lint amounting to 351, 349, and 330.4 lbs. per acre, respectively. Hartsville No. 12 and Webber No. 82, with yields of 207 and 210.8 lbs. of lint per acre, were the highest yielding long-staple types.

Note on protecting the cotton flowers from natural crossing, G. L. Kottur (*Poona Agr. Col. Mag., 9 (1918), No. 3, pp. 131, 132, figs. 3*).—A simple method for the prevention of cross-pollination in cotton is described.

Rings made of thin wire were employed in place of paper bags, the rings being slipped over the fully developed buds before they began to open. The protected flower was marked by a cotton thread attached to the stalk and ring.

Cotton culture, W. E. Packard (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 4, pp. 181–187*).—The production of cotton in southern California is described with particular reference to the San Joaquin, Sacramento, Imperial, and Palo Verde Valleys. The cost of production of three varieties has been estimated as follows: For picking, Mebane Triumph $15 per bale, Durango $20.80, and Egyptian $40.62; for ginning, $4.50, $4.50, and $14 per bale, respectively; and for the total cost of production on a basis of one bale per acre, Mebane Triumph from $48.80 to $71.85, Durango from $54.60 to $77.65, and Egyptian from $83.92 to $106.97.

The cost of cotton production, season of 1917–18 (*New York: H. F. Bachman & Co., 1918, pp. 27*).—This presents a statistical study of factors entering into the actual cost of producing cotton during the season of 1917. It is estimated that the average cost of production was 11.28 cts. per pound; the average price obtained by farmers, 27.5 cts. per pound; and the average net profit, $31.55 per acre.

Extracts from letters from several directors of experiment stations in the cotton States relative to a possible correlation of the potash scarcity and the small yield of the last year are given, from which it is concluded that very little, if any, reduction in yield was attributable to a lack of potash except on certain sandy soils of the Southeast.

The world's cotton shortage, J. A. Todd (*African World, 59 (1917), Nos. 765, pp. V, VI; 769, p. V; Agr. Jour. India, 13 (1918), No. 1, pp. 110–120*).—This presents an economic discussion of the present status of the cotton industry throughout the world, with special reference to the bearing upon the situation of cotton production in Egypt. While Egyptian cotton represents only about 6 per cent of the world's total, it is said to have the highest yield per acre, 450 lbs. of lint cotton, to supply 85 per cent of the second and 73 per cent of the third of the five recognized grades, and to have a value of from 50 to 100 per cent above that of American middling.

Potato culture in Maine, E. L. Newdick and W. J. Morse (*Bul. [Maine] Dept. Agr., 17 (1918), No. 1, pp. II+40, fig. 1*).—A general discussion of the production, harvesting, and marketing of potatoes in Maine is given by E. L.

Newdick, and directions for the control of potato enemies are given by W. J. Morse.

Selection of some standard Ilocano and Tagalog lowland rices, M. E. GUTIERREZ (*Philippine Agr. and Forester, 6 (1918), No. 5–6, pp. 135–152, figs. 3*).—Rather detailed observations are recorded on parent plant selections and their F_1 progeny of four Ilocano or bearded rices, including Ganado, Iroy, Binalayan, and Dequet & Bolilising, and two Tagalog or nonbearded varieties, including Binangbang and Binicol.

Paddy experiments at Sabour, S. N. SIL (*Agr. Jour. Bihar and Orissa [India], 5 (1917), No. 1, pp. 48–55, pls. 5*).—This notes the progress of variety, manurial, and cultural experiments with rice. Alternate green manuring, as compared with continuous green manuring of paddy land, resulted in average yields of 1,635 and 1,946 lbs. per acre, respectively.

Field experiments with rice, G. E. COOMBS and D. H. GRIST (*Agr. Bul. Fed. Malay States, 6 (1917), No. 3, pp. 159–161, fig. 1*).—In experimental work to determine the best size of small plats for pure-line breeding investigations with rice, greater accuracy was obtained from duplicated plats than from single plats. The size of plat ranged from 1/25- to 1/200-acre, and the variations in the probable error were from 5.5 to 9.9 per cent, respectively, for single plats and from 3.8 to 7.1 per cent, respectively, for duplicated plats.

Sisal in the Hawaiian Islands, V. MACCAUGHEY and W. WEINRICH (*Hawaii. Forester and Agr., 15 (1918), No. 2, pp. 42–48*).—This presents an account of the sisal (*Agave rigida* var. *elongata* and *A. rigida* var. *sisalana*) industry in Hawaii. An effort to produce a hybrid sisal derived from the two varieties named is briefly noted, together with chemical investigations of the waste products of the industry.

Sugar beets, C. A. ZAVITZ and A. W. MASON (*Ontario Dept. Agr. Bul. 262 (1918), pp. 12, fig. 1*).—The sugar beet industry in Ontario is described, and rather extensive variety and cultural tests with sugar beets are reported.

In variety tests covering a 6-year period, the three leading varieties in point of sugar production were Improved Imperial with 17 per cent sugar, Kleinwanzlebener with 16.6 per cent, and Petzscheke Elite with 16.1 per cent. The acre yields of roots for these varieties amounted to 18.42, 20.68, and 19.07 tons, respectively.

Duplicate tests were made of planting 3 large, 5 medium, or 8 small clusters of selected seedlings to insure a perfect stand, the plants being afterwards thinned to one in each place. Average yields were obtained amounting to approximately 22.9 tons per acre for the large clusters, 21.85 tons for the medium clusters, and 14.27 tons for the small clusters.

A comparison of flat and ridged cultivation extending over a 5-year period resulted in average yields of 19 and 18.1 tons per acre, respectively.

Experiments were conducted for 5 years with beets sown in 21-in. rows with the beets 7 in. apart in the row to determine the best planting depth. Average yields were obtained amounting to 19.9 tons per acre for a seeding depth of 0.5 in., 17.2 tons for 1 in., 14.4 tons for 1.5 in., 13.8 tons for 2 in., 10.6 tons for 3 in., and 5.8 tons for 4 in. Tests were also made of growing sugar beets in rows spaced from 12 to 28 in. apart. The average yields for 5 years ranged from 16.96 tons per acre for a planting distance of 28 in. to 20.52 tons for 12-in. spacing. The weight per root varied from 0.62 lb. for the 12-in. spacing to 1.11 lbs. for the 28-in. spacing. Only slight variations were observed in the percentage of sugar or in the purity of juice for roots grown in rows at different distances apart.

In thinning sugar beets to 2, 4, 6, 8, and 10 in. apart in the rows, the average weight per root varied from 0.39 lb. for 2-in. spacing to 1.25 lbs. for 10-in.

spacing, while the average yield of roots ranged from 15.48 tons per acre for 10-in. spacing to 17.75 tons for 2-in. spacing. As an average of 5 years' results, sugar beets thinned when 2 in. in height outyielded those thinned when 8 in. in height by 1.3 tons, those thinned when 0.5 in. high by 0.5 ton, and those thinned when 5 in. high by one-third ton per acre.

The cultivation of the crop and the by-products of the beet sugar industry are briefly discussed.

[The sugar beet industry in South Australia], A. J. PERKINS (*Jour. Dept. Agr. So. Aust., 21 (1918), No. 7, pp. 547–570*).—This is a rather comprehensive economic discussion of the sugar industry in Australia, with special reference to sugar beet production in Queensland, Victoria, New South Wales, and South Australia.

The cultivation of sugar cane in Cuba, J. T. CRAWLEY (*Estac. Expt. Agron. Cuba Bol. 35 (1917), pp. 82, pls. 29*).—This is a comprehensive account of the development and present status of the sugar cane industry in Cuba, with a discussion of local varieties of cane and of field practices and cultural methods employed in growing and handling the crop in the island.

Wheat variety tests, 1917–18, H. A. MULLETT (*Jour. Dept. Agr. Victoria, 16 (1918), No. 3, pp. 168–176, figs. 4*).—The results of variety tests with wheat conducted during 1917–18 on the permanent experiment fields at Longerenong College and at the Wyuna, Werribee, and Rutherglen farms, Victoria, are reported.

The highest yielding varieties at each station were, respectively, hybrid Gallipoli with 50.5 bu. per acre, Yandilla King with 32.7 bu., hybrid Indian H×Telfords with 29 bu., and Warden with 14 bu. Maximum average yields for the 5-year period 1913 to 1917, inclusive. were as follows: At Werribee, Major with 21.4 bu. per acre; at Longerenong, Federation (selected) with 36.1 bu.; and at Rutherglen, Yandilla King with 16.4 bu.

Tests of early (June 25) and late (July 28) seedings with early, midseason, and late varieties of wheat at Longerenong during 1917–18 resulted in average yields in favor of early seeding of 0.9 bu. per acre for Bunyip (early) and 5.1 bu. for Yandilla King (late), as compared with differences in favor of late seeding of 3.8 bu. for King Early, 4.3 bu. for Federation, and 2.7 bu. for Dart Imperial (both midseason varieties). Similar tests conducted at Wyuna showed an average difference in favor of late seeding (first week in July) of 9.9 bu. per acre for King Early, and in favor of early seeding (last week in May) of 3.9 bu. for Federation and 13.2 bu. for Yandilla King.

Problems of wheat storage: Damaged grain, O. MASSON ET AL. (*Aust. Advisory Council Sci. and Indus. Bul. 5 (1917), pp. 5–17; abs. in Jour. Dept. Agr. So. Aust., 21 (1918), No. 7, pp. 588, 589*).—Stored grain in New South Wales, Victoria, and South Australia having sustained serious damage from mice during the summer of 1916–17, experiments were undertaken to determine the effect of quicklime upon wheat in various conditions of soundness and pollution as suggested by Barrett.

Samples of wheat designated as ordinary, mouse tainted or smutty, damp musty, weevily, and mousey were passed through the ordinary wheat cleaning machinery of a mill and then mixed with 1 per cent, by weight, of fresh quicklime. The samples were stored for from 12 to 17 days, recleaned to remove the lime, tempered, ground, and the flour made into loaves. Tabulated data are presented showing the results of cleaning the samples, the moisture content of each before and after treatment, and the results of the examination of the water washings. The treatment was regarded as having given satisfactory results, and the conclusions arrived at may be summarized as follows:

Wheat treated with freshly burnt quicklime showed a considerable reduction in the number of bacteria on the outer layers of the grains, the surface being slightly corroded and cleansed from organic nitrogenous compounds. Upon wetting, the limed wheat turned yellow, although all the free lime was apparently removed by screening. With ordinary wheat the treatment facilitated the process of tempering and improved the quality of the bread baked from the flour. Weevils in the adult stage were not immediately killed by cold lime, nor were the eggs prevented from hatching. Damaged wheat was not improved when the grains were rotted throughout, but further deterioration was checked, due to the removal of the impurity and to the partial sterilization of the surface of the grains. Mousey tainted wheat, not otherwise deteriorated, was rendered suitable for bread making. The use of freshly ignited and hot lime was deemed essential. The ammonium content of the extract obtained by soaking the wheat in water is said to be a reliable measure of the degree of contamination or deterioration of the sample, the damaged samples examined yielding from 8 to 15 times as much ammonia as the cleaned samples.

Seed Reporter (*U. S. Dept. Agr., Seed Rpt., 2 (1918), Nos. 6, pp. 8; 7, pp. 8*).—In the first of these two numbers, statistics are presented showing the commercial stocks, receipts, imports, exports, and estimated sales of vegetable seeds for 1917 and 1918, based on information obtained from 525 concerns reporting in the seed surveys of February 1 and July 1, 1918, and including data from other sources. Data showing the commercial acreage, average yield per acre, commercial production, and estimated commercial consumption of vegetable seeds for the United States are given as secured in reports from 185 commercial vegetable seed growers reporting in the vegetable seed production survey of July 1, 1918, and including information and estimates from other sources.

Tabulated statistics regarding the estimated acreage, yield, prices, etc., of sorgo or "cane" seed in 1918 are presented and discussed. The lespedeza seed and Sudan grass seed outlooks are dealt with, together with notes on market conditions at Chicago and in the Missouri Valley and Pacific Northwest, and comparative data as to vegetable seed exports.

A brief account prepared in the office of the Seed Commissioner of Canada is given describing the regulations adopted in Canada to prevent the importation of undesirable seed. Measures taken by the Danish Government in establishing seed prices are also noted.

In the second number, tabulated statistics are presented showing the exports and imports of timothy and clover seed by months for the years 1913–1918, inclusive; shippers' stocks, shipments, prices, etc., of red, alsike, and sweet clover, alfalfa, and timothy seed by States as determined by information obtained December 14, 1918; and wholesale selling prices of 33 different kinds of field seeds January 1, 1919, and 1918, respectively.

Seed export information and seed import rulings are briefly noted. Other subjects dealt with include clover seed acreage, production, and stocks; the European seed situation; the export of seed corn to Canada; soy bean, cowpea, and velvet bean seed outlook; and rather extensive seed markets notes.

In both numbers, the usual data relative to imports of forage plant seeds permitted entry into the United States are given.

Fourth annual seed laboratory report, 1916–17, R. C. DAHLBERG and W. L. OSWALD (*Minnesota Sta. Bul. 175 (1918), pp. 5–14, figs. 2*).—This comprises a summarized report of germination and purity tests made during the year ended July 31, 1917. A total of 10,967 samples of seed were received.

Report of seed tests for 1917 (*Bul. N. C. Dept. Agr., 38 (1917), No. 9, pp. 55*).—This reports the results of purity and germination tests of 686 official samples of agricultural seed and 667 samples of vegetable seed collected by in spectors during the year ended July 15, 1917, in addition to 329 samples of agricultural seed received from private individuals.

The quality of agricultural seeds (*Jour. Bd. Agr.* [*London*], *24* (*1918*), *No. 11, pp. 1202–1213; abs. in Nature* [*London*], *101* (*1918*), *No. 2525, p. 51*).—This comprises a preliminary report and brief discussion of the viability and purity of agricultural seed, based upon tests of over 2,400 samples, including cereals, clovers and other legumes, root and forage crops, vegetables, and grasses, received by the official seed testing station from all parts of England and Wales.

Weed seeds in the soil, F. J. PIPAL (*Proc. Ind. Acad. Sci., 1916, pp. 368–377*).—Investigations, previously noted (E. S. R., 34, p 736), are described in which an effort was made to ascertain the number of viable weed seeds in different samples of soil, to compare carefully cultivated soils with those receiving poor cultivation with respect to weed growth, to determine at what depth most of the weed seeds occur, and to identify the most prevalent species. Tabular data are given showing the number and kinds of weed seeds found in the upper and lower 3 in. layers of 1 sq. ft. of soil from a rye field, abandoned orchard, cultivated experimental plat, garden, and sod. Similar data are also presented for 1 in. layers of 1 cu. ft. of soil from the rye field. The number of weed seeds per acre on various kinds of soil, including garden, overflow land, muck, plowed sod, cultivated fields, etc., has been calculated, based on reports of investigators mentioned in this paper.

Canada thistle and methods of eradication, A. A. HANSON (*U. S. Dept. Agr., Farmers' Bul. 1002* (*1918*), *pp. 15, figs. 4*).—The weed and its manner of growth are illustrated and described, its distribution in the United States indicated, and tested methods of eradication outlined. Summer fallow and clean cultivation with implements that cut the plants beneath the surface of the ground are said to effect the extermination of the pest over large areas, while small patches can be smothered out by covering with boards, roofing paper, or similar material.

Minnesota weeds, III, W. L. OSWALD and A. BOSS (*Minnesota Sta. Bul. 176* (*1918*), *pp. 5–43, figs. 25*).—This bulletin contains brief descriptions and notes on the eradication of 24 different kinds of weeds in continuation of work previously noted (E. S. R., 31, p. 633).

HORTICULTURE.

[Report of horticultural investigations in Guam], G. BRIGGS (*Guam Sta. Rpt. 1917, pp. 29–44, pl. 1*).—Notes are given on the acquisition and distribution of seeds and plants during the year, together with data on fertilizer tests of vegetables, longevity tests of vegetable seeds, and notes on fruits and other economic plants being tested by the station. These include the papaya, banana, mango, avocado, orange, lemon, coconut, cacao, coffee, various starch-yielding plants, the bay, camphor, and rubber trees, and a number of palms.

In the longevity test of vegetable seeds (E. S. R., 37, p. 742), the various seeds were stored both in ground-glass top exhibition jars and cloth sacks, placed in insect-proof wooden cabinet drawers. Duplicate sets of seeds were used in the germination tests, which were made about every 15 days. The first series of tests was begun August 1, 1915, and was completed March 15, 1917; the second series was begun September 1, 1916, and was completed the following June.

The results as a whole indicate that seeds rapidly lose their viability in Guam. Glass jars are preferable to sacks for storing seed. Neither method, however, will keep the seed in good condition for an entire year if the containers are opened at frequent intervals.

[**Report of horticultural work on the Belle Fourche reclamation project experiment farm in 1917**], B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1917, pp. 28–31*).—Data are given on tests of various kinds of trees for shade, ornamental, and wind-break use, that have been planted both on dry land and on irrigated land.

Observations covering eight years with dry-land tree planting indicate that the land to be planted must be thoroughly subdued previous to planting. Of the species tested, honey locust, green ash, Russian white olive, red cedar, and Siberian pea tree have given the best results. A much larger number of species has succeeded on irrigated land. For a quick-growing wind-break, cottonwood, poplars, and willows can be used. These may be flanked on either side by white elm, honey locust, green ash, Russian olive, and Siberian pea trees. Evergreens like bull pine and white cedar can be planted in the rows between the poplars, and may be cut out when the evergreens are well established. The Chinese elm and Chinese willow, as well as a number of shrubs, have been grown successfully for ornamental purposes.

Data are given on varieties of strawberries, raspberries, currants, and gooseberries tested on the farm.

Food, fruit, and flowers, W. P. WRIGHT (*London and Toronto: J. M. Dent & Sons, Ltd., 1917, pp. 336, pls. 39, figs. 29*).—A popular treatise on ornamental and kitchen gardening, prepared with special reference to war-time conditions in Great Britain.

Vegeculture.—How to grow vegetables, salads, and herbs in town and country, H. A. DAY (*London: Methuen & Co., Ltd., 1917, pp. VIII+152*).—A practical treatise on vegetable gardening, with special reference to British conditions.

Home-grown seed, E. B. STOOKEY (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 9, pp. 128–130, fig. 1*).—Practical suggestions are given for growing kale and mangel seeds.

Propagation by hardwood cuttings, L. Y. LEONARD (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 9, pp. 135, 136*).—Directions are given for propagating various trees and shrubs by means of hardwood cuttings.

Report on the statistics of vineyards, orchards, and gardens, and root crops for the season 1917–18, W. L. JOHNSTON (*So. Aust. Statis. Dept. Bul. 4 (1918), pp. 5*).—A report on the area and production of vineyards, orchards, market gardens, and root crops in South Australia for the season 1917–18, including comparative data for the previous five seasons.

Recommended list of hardy fruits, flowers, and plants, including shrubbery, shade, and ornamental trees, evergreens, etc., G. A. MARSHALL ET AL. (*Ann. Rpt. Nebr. State Hort. Soc., 48 (1917), pp. 159–177, fig. 1*).—This comprises revised lists of fruits and ornamentals prepared by the Nebraska State Horticultural Society, and recommended for planting in the different fruit districts of the State.

Orchard tree census, M. L. DEAN (*Bien. Rpt. Dept. Agr. Wash., 3 (1917–18), pp. 87–112*).—This comprises a tree census of apples, pears, peaches, plums, prunes, apricots, and cherries, as well as the acreage of other fruits planted in the State of Washington.

[**Report on orchard studies**] (*Kansas Sta. Rpt. 1917, p. 25*).—A brief statement of progress made in soil management and pruning investigations.

The soil management factors considered thus far show that the use of alfalfa as a companion crop in an orchard may encourage the work of the buffalo tree hopper (*Ceresa bubalus*). A more vigorous wood production results from thorough cultivation than from growing trees in sod, or in alfalfa plats where the alfalfa is allowed to grow within 3.5 ft. of the trees.

A comparative study was made of the effects of summer pruning, winter pruning, and lack of pruning, summer pruning producing the most finely developed and well-balanced tops. The summer-pruned trees were also less affected by the severe winds that followed several hard fall rains than the other trees. The summer-pruned trees produced fruit spurs and a few blossoms on the current season's growth, whereas none of the others produced any blossoms.

Orchard fertilization experiments.—Method of rejuvenating trees on wornout hilly soils, F. H. Ballou (*Mo. Bul. Ohio Sta., 4 (1919), No. 1, pp. 9–16, figs. 5*).—A popular summary of the results secured in the station's orchard rejuvenation experiments in southeastern Ohio (E. S. R., 36, p. 40).

Report on apple breeding work (*Iowa Sta. Rpt. 1917, pp. 31, 32*).—A brief statement of results secured in apple breeding work at the station.

A number of promising varieties of apples have been secured, one of which, resulting from a cross of Hibernal and Delicious, has a much better keeping quality than Delicious although not as high a quality early in the season. Several promising seedlings have been produced from a cross of Salome and Jonathan. The keeping quality, attractive color, and high quality of these seedlings indicate that they will be of considerable value in the future apple plantations of the northern portions of the United States. High quality fruit has also been produced from a selected lot of Vermont seedling apple stocks.

The plantation of C. G. Patten of Charles City, Iowa, where several thousand seedlings of apples, pears, and other kinds of fruits representing 40 years of effort by Mr. Patten are located, has been purchased and added to the station material.

Varieties of apples for the home orchard, F. W. Faurot (*Missouri Fruit Sta. Circ. 12 (1918), pp. 8*).—A descriptive list of apples, including also lists of crab apples and pears adapted for planting in Missouri.

Effect of various dressings on pruning wounds of apple trees, D. H. Rose (*Missouri Fruit Sta. Circ. 10 (1917), pp. 4*).—A preliminary report on a pruning experiment begun in January, 1916, to determine the best time to prune and also to test the value of various paints and pruning compounds as dressings for wounds.

The results thus far secured indicate that winter is the poorest time to make large pruning wounds in Missouri orchards, since the wounds heal slowly and are very likely to become infected with cankers. The best time to do such pruning is between March and June, preferably in May and June, when there is less danger from canker infection and bark injury around the wound. Wounds heal more quickly, show less bark injury, and are less in danger from canker infection when covered with a soft grafting wax than when untreated or when covered with any of the other wound dressings commonly in use. Untreated wounds heal no better than those treated with lead and oil, and show a slightly greater tendency to become infected with New York canker than do those treated with lead and oil or grafting wax.

Two years of success with dusting, J. R. Cossette (*Agr. Gaz. Canada, 6 (1919), No. 2, pp. 168, 169*).—Dusting experiments conducted at the Oka Agricultural Institute for two years indicate that the use of powdered sulphur and lead arsenate on apple trees is efficient in preventing scab and wormy apples, but is of no value in checking canker.

Peaches, plums, and cherries for the home orchard, F. W. Faurot (*Missouri Fruit Sta. Circ. 13 (1918), pp. 7*).—A descriptive list of peaches, plums, and cherries recommended for planting in Missouri.

The Hernito grape, P. Thayer (*Mo. Bul. Ohio. Sta., 3 (1918), No. 12, pp. 372, 373, fig. 1*).—The grape here illustrated and described is a seedling of the Herbert and was originated by T. V. Munson. The author regards the Hernito variety as one of the best of grapes for storing after maturity. It keeps well in both cellar and cold storage.

Spray schedule for grapes, D. H. Rose (*Missouri Fruit Sta. Circ. 11 (1918), pp. 4*).—This circular comprises a spray schedule for the control of the more important diseases and of insect pests of grapes, including directions for preparing spray material.

Choosing gooseberry varieties.—Experimental results with American and English fruits, P. Thayer (*Mo. Bul. Ohio Sta., 4 (1919), No. 1, pp. 22–27, figs. 3*).—Notes are given on a number of American and English varieties of gooseberries that have been tested at the station since 1912. Of the American varieties the Downing and Houghton were the leading varieties, and of the English varieties the Industry and Whitesmith were the most satisfactory and are recommended for trial wherever English varieties are desired.

Agricultural explorations in Mexico, W. Popenoe (*Cal. Citrogr., 4 (1919), No. 3, pp. 63, 69, 70, 71, 73, figs. 4*).—This is the third of a series of papers dealing with avocados and other fruits of Mexico (E. S. R., 40, p. 246).

Recent investigations in orchard heating, I. G. McBeth and J. R. Allison (*Cal. Citrogr., 4 (1919), No. 3, pp. 51, 65, 67, figs. 5*).—Experiments were conducted by the authors in some lemon orchards at Whittier, Cal., to determine the exact time required to damage young lemons at a given temperature and a given humidity.

The results in general indicate that lemons are damaged more quickly by low temperatures under humid conditions than under conditions of low humidity. Small lemons will not be damaged by a temperature of 28° F. if surrounded by a dry atmosphere, unless exposed for many hours. An abundance of moisture is of value in protecting lemons from damage only when the condensation of atmospheric vapor into dew and the congealing of the dew into ice liberates sufficient heat to hold the temperature above the freezing point of the fruit.

Varieties of the Satsuma orange group in Japan, T. Tanaka (*U. S. Dept. Agr., Bur. Plant Indus., 1918, pp. 10, figs. 2*).—This discusses the origin of the Satsuma orange, and gives a general description of six strains of the Satsuma orange located by the author up to the end of 1912 after a thorough survey of Japanese citrus varieties.

Varieties of the Satsuma orange group in the United States, L. B. Scott (*U. S. Dept. Agr., Bur. Plant Indus., 1918, pp. 7*).—The author calls attention to the variations occurring among Satsuma oranges both in Japan, as observed by Tanaka in the above noted circular, and in the United States. Variations occurring in this country are described, and the importance of segregating those varieties which differ in the seasons of their maturity is pointed out.

Successful grapefruit production in California, A. D. Shamel (*Cal. Citrogr., 4 (1919), No. 3, pp. 50, 72, figs. 3*).—A popular discussion of factors involved in the successful production and marketing of grapefruit.

Roses and how to grow them, E. Beckett (*London: C. Arthur Pearson, Ltd., 1918, pp. 126, pl. 1*).—A popular handbook on rose culture under glass and in the open, including chapters on various classes of roses and lists of varieties recommended for various types of planting.

FORESTRY.

The forests of Buchanan County, Va., W. G. SCHWAB (*Va. Geol. Com., Off. State Forester Bul. 16 (1918), pp. 20, pls. 8*).—A survey of the forests and forest activities in Buchanan County, Va. The important phases discussed include distribution of species, forest types, distribution of forests, classes of forest, methods of lumbering in the past and at present, markets for lumber and minor products, stumpage values, forest fires, reproduction and rate of growth of young stands, the future of the forests, and the lumber industry.

The forests of Tazewell County, Va., W. G. SCHWAB (*Va. Geol. Com., Off. State Forester Bul. 18 (1917), pp. 14, pls. 7*).—A survey, similar to the above, of the forests and forest activities in Tazewell County, Va.

Effect of grazing upon western yellow pine reproduction in central Idaho, W. N. SPARHAWK (*U. S. Dept. Agr. Bul. 738 (1918), pp. 31, pls. 4*).—An intensive study was conducted on three sheep grazing allotments of the Payette National Forest in central Idaho during the years 1912 to 1914, inclusive. It is believed that the results here presented are applicable to the entire western yellow pine region in central Idaho.

The method of study is described, and data are given on the nature and amount of injuries caused by sheep grazing, sizes injured, season of injury, relation between amount of damage and intensity of grazing, cumulative effect of grazing, relation between amount of damage and amount and character of forage, comparison of the damage caused by sheep and other agencies, and valuation of damage. Consideration is also given to the benefits of sheep grazing to the forest and the management of grazing, both with reference to the proper utilization of the forage and the welfare of forest reproduction.

Marketing farm timber in South Carolina, G. N. LAMB (*Clemson Agr. Col. S. C., Ext. Bul. 41 (1918), pp. 48, figs. 5*).—This bulletin contains instructions for estimating and marketing timber and other products of farm woodlands.

[Report of the division of lands and forests] (*Ann. Rpt. Conserv. Com., N. Y., 8 (1918), pp. 97–140, pls. 6*).—A report for the calendar year 1918 relative to the administration and management of the State forest preserves and forest nurseries, parks, and reservations, including information relative to work in reforestation, the control of the white pine blister rust, and forest fire protection. A report is also given of lumber, cordwood, and other products obtained from the State forests during the calendar year 1917.

Annual return of statistics relating to forest administration in British India for the year 1916–17 (*Statis. Forest Admin. Brit. India, 1916–17, pp. 24, pl. 1*).—A statistical report relative to the administration and management of the State forests of British India during the year 1916–17. Data relative to area of forests under the control of the forest department, forest settlements, surveys, working plans, forest fires, planting operations, yields in major and minor forest products, principal exports, etc., are presented in tabular form. Comparative data on revenue and expenditures are given for the 25 years commencing 1892–93.

Annual report on the forestry department for the year ended March 31, 1918, R. FYFFE (*Ann. Rpt. Forestry Dept. Uganda, 1917–18, pp. 11*).—A progress report of the administration, development, and improvement of the Uganda Protectorate forest resources, including a financial statement for the year.

DISEASES OF PLANTS.

Some of the broader phytopathological problems in their relation to foreign seed and plant introduction, B. T. GALLOWAY (*Phytopathology, 8 (1918),* *No. 3, pp. 87–97*).—In a paper presented at the meeting of the Phytopathological Seminary at Washington, D. C., the author calls attention to some phases of plant disease problems that are considered as needing investigation. These relate especially to studies in plant hygiene and of crops in relation to their environment.

Pathological aspects of the Federal Fruit and Vegetable Inspection Service, C. L. Shear (*Phytopathology, 8 (1918), No. 4, pp. 155–160*).—Attention is called to some of the pathological problems, and the possibilities of service offered by and in connection with the recently established Food Inspection Service of the Bureau of Markets of the U. S. Department of Agriculture.

Immunity and disease in plants, E. J. Butler (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 10–28*).—The author distinguishes between avoidance, endurance, and resistance of disease by plants, and cites freely the illustrative literature, with discussion, indicating certain directions in which progress can be readily made by investigations.

Breeding for disease resistance in plants, W. A. Orton (*Amer. Jour. Bot., 5 (1918), No. 6, pp. 279–283*).—Besides giving a discussion of several plant diseases as to introduction, spread, injury, and prevention, the last being based primarily upon the development of resistant varieties by work along lines followed in the past as here reviewed, the author suggests practical measures involving cooperation on a large scale.

Plant disease investigations (*Kansas Sta. Rpt. 1917, pp. 30, 31*).—It is stated that marked freedom from stem rust (*Puccinia graminis tritici*) was observed in field and greenhouse tests with three varieties of hard winter wheat developed by the station. One of these, Kanred, showed only 10 per cent of rust and two commercial varieties only 5 per cent. All other varieties which proved susceptible in the same test showed as much as 85 per cent rust, and the quality of the seed was very poor.

An investigation on the control of corn smut showed that the various fungicides used reduced the amount of smut, but in almost every case the yield was likewise reduced. It has been found that infection from corn smut is local and that that through developing seedlings is a negligible factor.

Brief notes are given on the occurrence of a number of other cereal diseases, as well as on diseases of potatoes and tomatoes.

Report on the plant disease situation in Guam, W. H. Weston, Jr. (*Guam Sta. Rpt. 1917, pp. 45–62, pls. 2*).—An account is given of fungus diseases observed by the author during a brief visit to the island of Guam in 1918, the diseases being discussed under the various host plants.

Cultures of Æcidium tubulosum and Æ. passifloriicola, H. E. Thomas (*Phytopathology, 8 (1918), No. 4, pp. 163, 164*).—As a result of cultural tests, the author has been able to associate the telial forms of these fungi with their alternate hosts. This is believed to be the first time that cultural proof has been presented of the full life cycle of any tropical grass or sedge rust.

Field studies of Cercospora beticola, M. B. McKay and Venus W. Pool (*Phytopathology, 8 (1918), No. 3, pp. 119–136, figs. 2*).—Results are given of studies on artificial infections, sources of field infection, and the influence of different field and feeding practices on the development of the leaf spot of sugar beets due to *C. beticola*.

In addition to the sugar beet, garden beets, Swiss chard, mangel-wurzel, and *Martynia louisiana* are subject to attack by this fungus. It is claimed that primary infections on sugar beets may come from infected beet balls or from the débris of other hosts than the sugar beet, but the chief source of such infections is from the old beet top material left on the ground after the harvest of the preceding season.

The careful removal of infected beet tops after harvest is claimed to delay the appearance of the disease in nonrotated fields the following season and to materially reduce the injury therefrom. Treatment of infected beet seed with formaldehyde (15:1,000) for 7 minutes kills the fungus without injuring the germination of the seed, and plants grown from seed thus treated are said to attain greater development and productivity than those from untreated infected seed.

The organism is destroyed in its passage through the alimentary tract of animals, and also when infected beet tops are subjected to a temperature of 100° C. for 30 minutes or 110° for 15 minutes. The best method for preventing the spread of the disease through feeding practices is said to be the removal and storage of the beet tops in silos, as the organism does not survive the siloing process for even two weeks.

Sugar-beet fields should not only be rotated but should also be separated from nonrotated fields by at least 100 yds. to avoid the spread of the disease from one field to another. The organism is said to be spread to some extent by the air, insects, and irrigation water.

Perennial mycelium of Gymnosporangium blasdaleanum, J. S. Boyce (*Phytopathology, 8 (1918), No. 4, pp. 161, 162*).—Attention is called to the fact that originally the telial stage of *G. blasdaleanum* was considered as not deforming its host, but subsequent investigations have shown that it is capable of producing pronounced witches' brooms in the incense cedar (*Libocedrus decurrens*). In addition to the witches' brooms, the author describes spindle-shaped swellings found on the branches and on the trunks of trees of all sizes. These swellings are considered a result of a very decided increase in the development of the wood with a negligible increase in the bast. Mycelium was found in abundance in the browned areas of the wood in both the witches' brooms and the spindle-shaped swellings. No internal sori have been found within the swellings, and it is believed that the life of the fungus within these swellings is strictly vegetative.

The occurrence of Puccinia graminis tritici compacti in the southern United States, E. C. Stakman and G. R. Hoerner (*Phytopathology, 8 (1918), No. 4, pp. 141–149, figs. 2; abs. in 8 (1918), No. 2, p. 77*).—In a previous publication (E. S. R., 37, p. 749), a strain of *P. graminis* occurring on club wheat and grasses in the Pacific Northwest was described, and in the present paper the authors report that this strain has been found on wheat in southwestern Texas, in Louisiana, and in Alabama. This strain is considered identical with that occurring in the Pacific Northwest, and the fact that it is so constant on different hosts in widely separated localities is considered to indicate strongly that it is not merely a local variant form of *P. graminis tritici*. The geographic limits of the form described are imperfectly known, but it has been reported from the South and the Pacific Northwest and it may be much more widely spread, though it probably does not occur in the upper Mississippi Valley or the northern Great Plains.

Differences between the species of Tilletia on wheat, A. A. Potter and G. W. Coons (*Phytopathology, 8 (1918), No. 3, pp. 106–113, figs. 4; abs. in 8 (1918), No. 2, p. 72*).—The authors call attention to differences manifested by *T. lævis* and *T. tritici* on wheat, confirming the observations previously reported on the occurrence in southwestern Michigan of high and low types of the stinking smut (E. S. R., 4, p. 352).

The high smut is characterized by the production of culms from 2 to 4 in. shorter than normal, while the low form averages fully 1 ft. shorter than the height of healthy plants. The high form is said to be due to *T. lævis* and the shorter to *T. tritici*. Other differences between the manifestations of disease caused by these two species of smut are described, and it is thought that the dwarfing of the host by *T. tritici* probably contributes materially to the smut problem in the Palouse region of Washington and Idaho. Varietal resistance is believed to be a factor of considerable importance in respect to these diseases, some varieties being affected as much as 50 per cent. Attention is called to these two smuts in order that observations may be made which may confirm the authors' conclusions and also furnish more accurate data regarding their present distribution.

Resistance of Manitoba wheat to fungus diseases (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 17, pp. 530–534*).—This includes information bearing upon the practically complete resistance to smut of the wheat variety Manitoba.

Comparative smut resistance of Washington wheats, E. F. Gaines (*Jour. Amer. Soc. Agron., 10 (1918), No. 5, pp. 218–222*).—Observations on the comparative resistance to stinking smut of 13 varieties and strains of winter wheat, made at the Washington Experiment Station during 1915, 1916, and 1917, inclusive, showed marked differences between varieties, the reduction in yield ranging from 1.8 per cent for Turkey to 92.15 per cent for Hybrid 128 under conditions of maximum infection. The extreme differences noted are thought to point to two distinct factors which tend to control the resistance of wheat to smut, namely, the prevention of infection as indicated by the marked variations in the percentage of infected plants among the varieties studied and the prevention of smut-ball formation after infection, as evidenced by wide differences in yield of wheat produced by infected plants of the different varieties.

A possible new fungicide for wheat and barley smut, W. W. Mackie (*Science, n. ser., 48 (1918), No. 1247, pp. 515, 516*).—Formaldehyde, which is very effective for the treatment of seed wheat for stinking smut where soil infection does not occur, is said to be ineffective in the Pacific Coast States. In this region, copper sulphate is more widely used, and this, by adhering to the seed, usually prevents soil infection of the crop. As strong solutions of copper sulphate tend to lower the germination of the seed, the expedient of dipping the treated seed in lime solutions has been widely adopted, but this involves a double dipping and a considerable increase in the cost of the treatment.

In attempting to devise some other method of treatment, the author tested lime-sulphur dip, and the preliminary results with wheat and barley showed that rather dilute solutions of lime-sulphur are very effective against both the stinking smut of wheat and the covered smut of barley. A solution as strong as 1 part lime-sulphur to 1 part water had no apparent deleterious effect on the germination of seed wheat and barley.

The Alternaria leaf spot of cotton, R. C. Faulwetter (*Phytopathology, 8 (1918), No. 3, pp. 98–105, figs. 3*).—A report is given of a disease of cotton leaves said to be common in South Carolina and believed to be present in other cotton-growing States.

The lesions of the disease arise in and spread from earlier injuries in the leaf in the majority of instances. The spot is characterized at first by a pale green color, later becoming straw yellow and finally rusty brown, at which stage it has a brittle, papery texture and irregular, concentric zonations. The Alternaria spots are usually found growing from and finally surrounding spots caused by *Bacterium malvacearum* and also injuries caused by the red spider, but they are also present where no previous injury can be detected. The fungus causing the disease has not been definitely determined, but it is considered very similar to *A. tenuis*. Artificial inoculations have shown the fungus to be a weak parasite and able to infect healthy tissues only under the most favorable conditions.

Rhizoctonia in jute: The inhibiting effect of potash manuring, R. S. FINLOW (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 65–72*).—Indications having been noted that a connection may exist between the presence of Rhizoctonia and a lack of potash in the soil, the author has taken part in preliminary experimentation, which as here described is considered to show a highly beneficial effect ascribed to the potash content of the ash of water hyacinth.

Potato diseases.—I, Early blight or leaf curl, ETHEL M. DOIDGE (*So. African Fruit Grower, 4 (1917), No. 4, pp. 65–67, figs. 5*).—Experiments on early blight carried out for three years on an extensive scale on several varieties of potatoes at Groenkloof, near Pretoria, showed no very satisfactory results for either Bordeaux or Burgundy mixture. The better results were obtained with the former, the latter causing some injury to the plants, which showed considerable varietal differences as regards susceptibility.

Leaf roll of potato, BLANCHARD and PERRET (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 31, pp. 894, 895*).—This is a summary of a report on studies with potato leaf roll carried on since 1914 in the Department of the Loire.

Although the cause of the trouble has not been definitely established, it appears not to be due to parasitic agency but to physiological and other causes, probably being connected with too long a course of asexual reproduction and with too great a deficiency of nitrogenous factors in the soil. Certain varieties named appear to possess resistance to leaf roll. Copper treatments were without beneficial effect.

Determination of the factors inducing leaf roll of potatoes, particularly in northern climates, P. A. MURPHY and E. J. WORTLEY (*Phytopathology, 8 (1918), No. 4, pp. 150–154, fig. 1*).—The authors, in a first progress report on leaf roll, confirm the claim of Quanjer that leaf roll may be transmitted to healthy potato plants grown in proximity to diseased ones (E. S. R., 36, p. 847). The history of a number of potato plats in Prince Edward Island is given and the development of the disease in these plats is traced.

As a result of their investigations, it is claimed that it is impossible to rid stock of leaf roll by the selection of healthy potatoes, even when only a moderate amount of the disease is present and the work is carried on under conditions unfavorable to the production of the disease. It is recommended in case of collections of varieties of potatoes that they should be grown in rows separated from one another by at least 6 ft., and that the intervening space should be planted with some other hoed crop.

Sweet potato storage rots, L. L. HARTER, J. L. WEIMER, and J. M. R. ADAMS (*Jour. Agr. Research [U. S.], 15 (1918), No. 6, pp. 337–368, pls. 7*).—This article, which is a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, is an elaboration of a report previously published (E. S. R., 39, p. 854).

Seventeen fungi responsible for loss in sweet potatoes in storage are described at considerable length. Of these, *Rhizopus nigricans*, *Sphæronema fimbriatum*, *Diplodia tubericola*, *Diaporthe batatatis*, *Plenodomus destruens*, *Sclerotium bataticola*, and *Monilochætes infuscans* are said to be responsible for most of the loss, while under favorable storage conditions rots may be produced by *Mucor racemosus*, *Alternaria* sp., *Penicillium* sp., *Botrytis cinerea*, *Epicoccum* sp., *Gibberella saubinetii*, *Fusarium culmorum*, *F. acuminatum*, and *Trichoderma koningi*. Some of the organisms causing storage rots are also known to cause field diseases of sweet potatoes. These are *Sphæronema fimbriatum*, *Plenodomus destruens*, and *Monilochætes infuscans*.

Bacterial diseases of tomatoes in St. Vincent, W. Nowell (*Agr. News* [*Barbados*], *16* (*1917*), *No. 409, pp. 414, 415*).—The outstanding character of tomato wilt (ascribed to *Bacterium* (*Bacillus*) *solanacearum*) in St. Vincent is the wilting of the whole plant, usually suddenly, no preliminary discoloration having been observed. Other diagnostic phenomena are reported. The peanut is said to be attacked by the disease on infected soil.

While fruit inoculations with this organism were unsuccessful, injuries to fruits were observed to be followed by infection resulting in gas bubbles under the skin of the fruit. The whole content of the fruit, except the seeds, was finally reduced to slime and gas, this process being very rapid.

Winter injury to fruit trees, W. Paddock (*Agr. Student, 25* (*1918*), *No. 1, pp. 31, 32, fig. 1*).—As a result of the unusual cold during the winter of 1917–18, the mortality due to cold effects was very high among peach trees over six years old. Curious phenomena noted include live fruit buds on trees so injured by cold as to die before maturing fruit. Cherry, plum, pear, and apple trees were injured or killed, the older suffering more than the younger trees. Frost cankers in crotches, sometimes severely injuring the younger trees, appear to have been started by the cold weather.

Pear blight wind borne, F. L. Stevens, W. A. Ruth, and C. S. Spooner (*Science, n. ser., 48* (*1918*), *No. 1244, pp. 449, 450*).—In order to determine whether other agencies than insects play a part in the spread of pear blight, two pear trees were inclosed in wooden frames, the structures being covered with wire netting. Fully as abundant infection was observed on the screened trees as on others, but as the mesh of the wire netting was not sufficiently fine to keep out very small insects, the experiment was repeated in 1918 with cylinders of fine bolting cloth placed over portions of trees. Ten cylinders inclosed flowering wood and 40 were used to cover terminal growth. When examination was made at a later date, blighted flowers were found in two of the cages, the blight evidently having entered through the calyx, and a considerable number of blighted terminal shoots were found in other screens.

These observations are believed to indicate that insects are not of primary importance as carriers of pear blight, and the hypothesis is presented that wind is the chief agency of dissemination.

Pear-blight control in Rogue River Valley, Oreg., C. C. Cate (*Better Fruit, 13* (*1918*), *No. 3, pp. 5, 6, figs. 3*).—Pear blight (*Bacillus amylovorus*), appearing in the Rogue River Valley in 1907 and being mistaken at first for a sour sap phenomenon, is now known to attack all local varieties of apples, though the Winesaps are very resistant. Hold-over blight has been found to be due to infection of the root systems, influenced very largely by the presence of different insects, the control of which is regarded as important.

It was noted that the application of powdered sulphur formerly tried for crown gall had greatly reduced pear blight, also that measures controlling different insects had kept down the blight to a considerable degree. Recommendations include careful inspection, the use of from 1 to 3 lbs. of sulphur around the base of trees, tanglefoot bands, spraying with oil emulsion, nicotin and arsenate of lead, and cresol, and disinfection of all wounds made in pruning.

Control of peach leaf curl at Yanco experiment farm, W. J. Allen (*Agr. Gaz. N. S. Wales, 29* (*1918*), *No. 7, p. 490*).—Freshly prepared lime-sulphur applied to peach trees during the dormant period proved to be almost perfectly protective against leaf curl and also against rust. An application made at the time the buds were swelling permitted some development of leaf curl, and one made when the blossoms were in the pink stage permitted still more development of the disease.

Citrus canker eradication, I. B. P. EVANS (*So. African Fruit Grower, 4 (1918), No. 10, p. 192*).—The author states that, at the end of March, 1918, citrus canker had been found only in the Cape and Transvaal Provinces, which showed three and two outbreaks, respectively.

Buried coconut trunks and root diseases of rubber, F. W. SOUTH (*Agr. Bul. Fed. Malay States, 6 (1918), No. 6, p. 269*).—An account is given of the development of disease in rubber trees between the rows of which coconut trees had been buried some three years before. The rubber trees were affected with brown root disease (*Hymenochaete noxia*) and wet rot (*Poria hypolaterita*) working together or separately, the last named having attacked much of the buried wood. The disease was traceable down the roots of the rubber trees to the coconut logs. When the attack had not reached the collar, removal of the diseased roots saved the rubber trees.

The spraying of tea in northeast India, A. C. TUNSTALL (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 73–80*).—This is a general account of the conditions for the growing of the tea, with discussions of tea diseases and their control, including both devices and organization.

A number of ready-made preparations have been tested, and lime-sulphur solutions appear to be the most satisfactory on the whole, either as insecticides or fungicides.

Disease in forest trees caused by the larger fungi, E. CHEEL and J. B. CLELAND (*Forestry Com. N. S. Wales Bul. 12 (1918), pp. 12, pls. 20*).—Descriptions are given of injury to timber trees caused by a number of species of Armillaria, Pholiota, Polyporus, Polystictus, Fomes, Hexagona, and Trametes.

Notes on forest tree rusts, J. R. WEIR and E. E. HUBERT (*Phytopathology, 8 (1918), No. 3, pp. 114–118*).—Notes are given on a number of forest tree rusts, in which the different stages of the life history are described and also the presence of new hosts indicated.

Resistance in the American chestnut to the bark disease, A. H. GRAVES (*Science, n. ser., 48 (1918), No. 1252, pp. 652, 653*).—During an investigation on the American chestnut, looking toward immunity or resistance to the bark disease, the author discovered a considerable number of resistant trees in the vicinity of New York City. The evidence regarding the resistant quality of these trees is based on inoculation tests, the occurrence of the trees in a neighborhood long subject to the disease, the apparently long period the disease has been present in the trees as indicated by healed cankers and thrifty branches with diseased bases, peculiarities of the bark, and the natural grouping of the trees in well-defined areas which seem to point to genetic variation. A large number of nuts has been gathered from some of the trees and planted for further observation. If the resulting seedlings should substantiate the inference that the disease resistance is a heritable character, it is believed that by inbreeding and by crossbreeding with the resistant oriental species it will be possible to develop a resistant, if not an immune, strain of timber tree for the reforestation of the devastated chestnut woodlands of the United States.

Some observations on the development of Peridermium cerebrum, B. O. DODGE and J. F. ADAMS (*Mem. Torrey Bot. Club, 17 (1918), pp. 253–261, pls. 3, figs. 3*).—This is a study of *P. cerebrum* on *Pinus rigida* and *P. virginiana*, presenting points of interest which are discussed.

Infections have been accomplished with *Peridermium cerebrum* on *Quercus ilicifolia*, *Q. marilandica*, and *Q. heterophylla*.

Advance rot and latent defects in aeroplane timber, J. S. BOYCE (*Aerial Age, 7 (1918), No. 14, pp. 674, 675, 691*).—Popular descriptions are given of a number of the rots attacking the Sitka spruce, Douglas fir, and other timbers used in aeroplane construction.

Some new or little known hosts for wood-destroying fungi, II, A. S. Rhoads (*Phytopathology, 8 (1918), No. 4, pp. 164–167*).—In a previous article (E. S. R., 37, p. 846), the author recorded a number of unusual hosts for fungi usually confined to species of coniferous or dicotyledonous wood. In the present paper additional species of fungi on unreported hosts are cited.

Note upon the hydrogen-ion concentration necessary to inhibit the growth of four wood-destroying fungi, M. R. Meacham (*Science, n. ser., 48 (1918), No. 1246, pp. 499, 500, fig. 1*).—Due to the lack of definite information regarding the behavior of fungi toward varying degrees of hydrogen-ion concentration, the author conducted experiments with four wood-destroying fungi, *Lenzites sepiaria*, *Fomes roseus*, *Coniophora cerebella*, and *Merulius lacrymans*, the data obtained being presented in the present paper.

It appears that growth was not inhibited until a high hydrogen-ion concentration was reached, and that the four organisms responded in about the same way, though there were distinct variations among them. The most important facts regarding response to concentration are shown in the form of curves. Translating the data into terms of normality, the author states that the first critical point occurs at about N/350, and the limiting acidity at about N/50, hydrogen-ion concentration.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Control of ground squirrels by the fumigation method, G. R. Stewart and J. S. Burd (*California Sta. Bul. 302 (1918), pp. 207–224, figs. 3*).—Following a general discussion of carbon bisulphid as a fumigant, the authors report upon experiments with varying concentrations of the gas, the flow of the gas uphill, tests with other gases, and field fumigation.

The experiments clearly show that carbon bisulphid is an eminently satisfactory fumigant for ground squirrels. Twenty to 30 minutes' treatment with air containing 2 per cent of carbon bisulphid is sure to be fatal. The dosage of 1.5 to 2 oz. usual in the waste ball method corresponds to about 2 per cent gas in large burrows. Experiments with the artificial burrow, as well as Dixon's field observations in the San Joaquin Valley (E. S. R., 38, p. 456), demonstrated that the gas will not flow over elevations of 1 or 2 ft. and that exploding the gas will distribute it somewhat more but not sufficiently to make it rise over the usual irregularities. The results indicate that some form of apparatus to pump the gas is desirable and it appears that all that is necessary is a bellows or large-bored pump which will blow a strong stream of air through the tank which contains liquid carbon bisulphid.

Observations show that neither gasoline nor distillate are satisfactory materials for squirrel fumigation.

A list of 10 references to the literature is appended.

Laws relating to fur-bearing animals, 1918, D. E. Lantz (*U. S. Dept. Agr., Farmers' Bul. 1022 (1918), pp. 31*).—This is the annual summary of laws in the United States, Canada, and Newfoundland relating to trapping, open seasons, propagation, and bounties.

Wild animals [of the Yellowstone National Park], V. Bailey (*U. S. Dept. Int., Gen. Inform. Yellowstone Nat. Park, 1917, pp. 44–54; 1918, pp. 51–60*).—Brief accounts are given, under their respective orders, of the occurrence, numbers, and habitats of the wild animals found within the park.

Mutanda ornithologica, IV, H. C. Oberholser (*Proc. Biol. Soc. Wash., 31 (1918), pp. 125, 126*).—A continuation of the author's comments on the nomenclatorial alterations in the names of birds (E. S. R., 39, p. 655).

Notes on North American birds, IV–VII, H. C. OBERHOLSER (*Auk, 35 (1918), Nos. 1, pp. 62–65; 2, pp. 185–187; 4, pp. 463–467; 36 (1919), No. 1, pp. 81–85*).

Some notes on Connecticut birds, I. N. GABRIELSON (*Auk, 34 (1917), No. 4, pp. 461–465*).

Bird notes from Forrester Island, Alaska, G. WILLETT (*Condor, 20 (1918), No. 2, p. 85*).

A synopsis of the races of Bombycilla garrula, H. C. OBERHOLSER (*Auk, 34 (1917), No. 3, pp. 330–333*).

Description of a new Iole from the Anamba Islands, H. C. OBERHOLSER (*Proc. Biol Soc. Wash., 31 (1918), pp. 197, 198*).

Two new shrews from Oregon, H. H. T. JACKSON (*Proc. Biol. Soc. Wash., 31 (1918), pp. 127–130*).—Two new forms are here described, namely, *Sorex yaquinæ* and *S. obscurus permiliensis*.

The food of Australian birds, J. B. CLELAND ET AL. (*Dept. Agr. N. S. Wales, Sci. Bul. 15 (1918), pp. 112*).—In the present bulletin an analysis is made of all available data on the food of wild birds in Australia. It includes the results of examinations, made during the course of control work with the blowfly pest of sheep, of all birds in the sheep-breeding districts which might play a possible part. In order to meet all needs the information has been arranged in several ways, including (1) a short summary of the food of and a verdict on various birds or groups of birds, the most important being taken first, and (2) lists indicating the birds which feed on particular kinds of food of more or less economic importance.

Appendix 1 consists of a tabulated examination of the contents of the stomachs and crops of each species of bird examined, full details being given of the animal and vegetable food with remarks appended opposite the species amplifying these details. Appendixes 2 and 3 consist of tabulated examinations of the contents of stomachs and crops of the individual Australian birds, etc., examined, from which appendix 1 was compiled.

The English sparrow and starling were found to do much more harm than good, neither apparently playing any definite part in the control of the blowfly pest. The crow, while doing marked harm at times, is undoubtedly of decided value on other occasions, and by destroying dead carcasses tends to prevent the multiplication of blowflies. Of the large number of other species examined, with one or two notorious exceptions, the vast majority serve a more or less definitely useful purpose in maintaining the balance of nature as regards the various species of insects. Only a few, however, have been found to feed on blowflies, and these do so only occasionally and play no definite part in controlling this pest.

A note on the tracheal air sac in the ruddy duck, A. WETMORE (*Condor, 20 (1918), No. 1, pp. 19, 20*).

Maggot-infested birds, W. W. ARNOLD (*Auk, 36 (1919), No. 1, pp. 147, 148*).—This note relates to the infestation of the smaller birds, including yellow warblers, goldfinches, house finches, horned larks, vireos, and house sparrows, in the vicinity of Colorado Springs, Colo., by *Protocalliphora azurea*. "A few western meadowlarks have been brought to me, two specimens, fledglings, yielding 100 worms, their bodies presenting the appearance of having been struck by a load of shot. The largest number of these worm-infested creatures come from the homes of the house sparrow."

The wings of insects, J. H. COMSTOCK (*Ithaca, N. Y.: The Comstock Pub. Co., 1918, pp. XVIII+430, pls. 10, figs. 427*).—This work, which is based upon studies extending over a period of more than 30 years, deals with the subject under the headings of the genesis of the uniform terminology of the wings, the tracheation of the wings, more general features of the wings, paleontological data bearing on the development and the specialization of the wings, development of the wings, steps in the specialization of wings, etc. Chapters on the wings of each of the 20 orders of insects follow; also a chapter on the teaching of the uniform terminology of the wing veins of insects, a bibliography of 7 pages, and an index.

The locomotions of surface-feeding caterpillars are not tropisms, C. H. Turner (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 34 (1918), No. 3, pp. 137–148, figs. 3*).—The author concludes that there is nothing about the behavior of surface-feeding caterpillars which warrants the assumption that their locomotions are tropisms.

[Economic insects in Kansas] (*Kansas Sta. Rpt. 1917, pp. 15, 16, 19, 20, 27, 28*).—A brief statement is made of the work of the year with the Hessian fly, corn earworm, fruit insects, insects injurious to shade trees and staple crops, and termites.

In variety test work with regard to immunity to corn earworm injury, 25 varieties of corn were grown, of which Colby Bloody Butcher and Iowa Silvermine had the lowest percentage of ears injured and the highest yield. Experiments made with dust sprays indicate that the injury decreases with the increase in the number of applications, and that the dust gun is more effective than the cheesecloth bag in application.

Some of the principal insects affecting vegetables in Trinidad and Tobago, F. W. Urich (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 2, pp. 77–87, pls. 4*).—This paper calls attention to some of the principal pests of vegetables in Trinidad and Tobago and discusses control measures.

Fumigation of Cattleya orchids with hydrocyanic acid gas, E. R. Sasscer and H. F. Dietz (*Jour. Agr. Research [U. S.], 15 (1918), No. 5, pp. 263–268, pls. 2*).—Inspectors of the Federal Horticultural Board of the U. S. Department of Agriculture, in calling attention to the importance of fumigation all orchids imported, state that a total of 137 species of insects, including 41 species of scale, were collected on imported orchids, principally species of Cattleya, or in cases containing them, from August, 1912, to December, 1917. The experiments which they here report were conducted with a view to determining the possibility of killing insects by fumigation without removing the plants from the container and to determine the effect of fumigation on imported cattleyas at time of arrival. The conclusions drawn from these experiments, which are supported by data presented largely in tabular form, are as follows:

"Black areas appear on unfumigated as well as fumigated leaves which have been injured. Progressive yellowing occurs on both unfumigated and fumigated plants and depends on adverse treatment or age of the leaves. Fumigated plants lose their leaves more rapidly than do unfumigated plants when subjected to adverse treatment. Young leaves and shoots are not severely injured by the gas with a 1-oz. dosage, although a number of old devitalized leaves may fall. Fumigation is not responsible for dying of pseudobulbs, if excessive dosages are not used. Presence of water on Cattleya leaves does not increase burning from fumigation. Loss of a few old leaves does not render a plant valueless, as in a brief period they are replaced by new vigorous foliage. Where excessive dosages are not employed, orchids are apparently stimulated by hydrocyanic acid gas.

"Infested orchids at the time of arrival at the port of entry, if in a reasonably good condition, are not seriously affected by hydrocyanic-acid gas generated at the rate of 1 oz. to sodium cyanid per 100 cu. ft., and are not killed where a 4-oz. dosage is used. Insects which are not hermetically sealed in stems or pseudobulbs of cattleyas can be killed in the original cases with hydrocyanic acid gas, provided a preliminary 20-in. vacuum is given."

Experiments on cockroach control, E. V. WALTER (*Jour. Econ. Ent., 11 (1918), No. 5, pp. 424–429*).—"Traps may be used as means of control but can not be relied on as a method of extermination. Boric acid is a safe and economical material to use against the roaches as it is nonpoisonous to human beings and yet very effective against roaches. A mixture of equal parts of powdered borax and powdered sugar ground together is effective against cockroaches, is safe, and economical, although acting slower than boric acid. Cockroaches eat these substances in an effort to keep clean and not for any possible food value."

On a collection of Orthoptera (exclusive of the Locustidæ) made in central Peru by N. Iconnicoff and C. Schunke, A. N. CAUDELL (*Insecutor Inscitiæ Menstruus, 6 (1918), No. 1–3, pp. 70, pls. 2*).

Regarding Diapheromera veliei and Manomera blatchleyi, A. N. CAUDELL (*Ent. News, 29 (1918), No. 7, pp. 258–260*).

Thysanoptera of Florida, J. R. WATSON (*Fla. Buggist, 1–2 (1918), No. 4–1, pp. 53–55, 65–77*).—The author lists 52 species known to occur in Florida and gives keys for their separation. *Frankliniella floridana* from velvet beans at Gainesville, *Anthrothrips dozieri* from hop hornbeam (*Ostrya virginiana*), and *Cryptothrips citri* on citrus at Fruitland Park, Fla., are described as new.

Notes on their distribution and host plants are included, and a bibliography of 36 titles is appended.

Additional data on the distribution and food plants of Lygus, with descriptions of a new species and variety, H. H. KNIGHT (*Bul. Brooklyn Ent. Soc., 13 (1918), No. 2, pp. 42–45, fig. 1*).—This paper presents notes on the distribution and food plants of species of Lygus not included in the previous paper (E. S. R., 38, p. 461), and describes two forms new to science, namely, *Lygus (Neolygus) nyssæ* taken on sour-gum (*Nyssa* sp.) at Auburn and Le Roy, Ala., and *L. tiliæ heterophyllus* from *Tilia heterophylla* in Florida, Georgia, and Mississippi.

An outbreak of the cotton stainer on citrus, J. R. WATSON (*Fla. Buggist, 2 (1918), No. 2, pp. 88–90; Fla. Grower, 18 (1918), No. 25, p. 9*).—The author reports that citrus and avocado growers in some of the southern counties of Florida, where in order to escape the boll weevil cotton was raised in 1918, have had trouble with the cotton stainer. It punctures the rind of citrus and the fruit then drops from the tree and decays. The author concludes that cotton growing in citrus communities should be abandoned.

An extra molt in the nymphal stages of the chinch bug, H. YUASA (*Ent. News, 29 (1918), No. 6, pp. 233, 234*).—In work at the Kansas Experiment Station, the author has found an extra or fifth stage of the chinch bug to occur between either the first and second or second and third stages as described by Riley.

Leaf burn of the potato and its relation to the potato leaf-hopper, E. D. BALL (*Science, n. ser., 48 (1918), No. 1234, p. 194*).—There has been a remarkable epidemic of leaf burn on potatoes throughout the northern section of the United States, from Montana to New York and south at least to Iowa and Ohio. "The margins of the leaves of early varieties turned brown, the dead areas gradually widening until the leaves dried up and the whole field took on a burned appearance. In severe cases the stalks also withered and died."

In the potato sections of Wisconsin, all of which were affected, a careful study by the author showed that in every case the injury was directly proportioned to the number of apple leaf-hoppers present. In cage experiments in which large numbers of apple leaf-hoppers were used typical leaf burn was produced in four days.

Genera of the Eupterygidæ, W. L. McAtee (*Proc. Biol. Soc. Wash.,* 31 (*1918*), *pp. 109–124*).—This relates to a group of leaf hoppers.

The early stages of Corythucha pergandei, H. B. Weiss and E. L. Dickerson (*Ent. News, 29* (*1918*), *No. 6, pp. 205–209, fig. 1*).—The lacewing bug here considered is rather widely distributed in New Jersey, and has been found by the authors on alder (*Alnus glutinosa*) and in nurseries on birch (*Betula nigra, B. lutea,* and *B. populifolia*).

The life history and early stages of Corythucha parshleyi, H. B. Weiss and E. L. Dickerson (*Canad. Ent., 50* (*1918*), *No. 12, pp. 401–406*).—This lace-wing bug has been found in New Jersey on butternut (*Juglans cinerea*), walnut (*J. nigra*), and Japanese walnut (*J. sibboldiana*).

Psyllidæ of the vicinity of Washington, D. C., with description of a new species of Aphalara, W. L. McAtee (*Ent. News, 29* (*1918*), *No. 6, pp. 2*[illegible], *fig. 1*).

Practical results in spraying a commercial orchard for the green apple bug, W. H. Brittain (*Canad. Ent., 50* (*1918*), *No. 12, pp. 393–397*).—This is an account of demonstration control work in Nova Scotia during 1917 with *Lygus communis novascotiensis,* an account of which insect by the author has been previously noted (E. S. R., 37, p. 462).

The experimental data presented show that economically profitable results may be expected from control work. This consists in the application of black leaf 40, 1 pint to 100 gal. In the application made immediately before the blossoms opened it was combined with lime-sulphur and arsenate of lime. In the after-blossom application sodium sulphid (soluble sulphur) was used.

A preliminary report on the clover aphis and methods for its control, R. H. Smith (*Idaho Sta. Bul. 112* (*1918*), *pp. 3–15, figs. 5*).—This is a report of observations and experiments conducted largely during the year of 1918, a continuation of earlier work by Parks and by Burrill. A paper by Burrill has been noted (E. S. R., 39, p. 360).

The clover aphis (*Aphis bakeri*), which occurs throughout the United States, was first recorded from Colorado in 1895, in which year it was described (E. S. R., 7, p. 230). It was reported as doing serious damage in the Northwest in 1907. In Idaho it has been abundant on clover since 1913, the greatest trouble with honeydew being experienced in 1916, when it was estimated that 90 per cent of all red clover and alsike clover seed marketed in the State was sticky.

The author considers $1,500,000 to be a conservative estimate of the loss caused by the clover aphis in Idaho during the past four years. The clover aphis has been an important factor in reducing the acreage of red clover and alsike clover 75 and 90 per cent, respectively, during 1917 and 1918.

"All clover aphids found in clover fields are 'agamic' females that give birth to living young at the rate of 4 or 5 per day. During the fall some of the aphids leave clover plants and fly to apple, pear, quince, ornamental crab, and hawthorn trees. Here they give birth to certain small aphids which deposit eggs on the small branches of these trees. The eggs hatch in the following spring.

"In Idaho the clover aphis has been found to feed only on red, alsike, and to a limited extent, on white clovers. When the clover aphids are present in small numbers they will be found under the 'stipules' of the clover leaves. The aphis injures clover plants by stunting their growth, by causing them to ripen prematurely, by killing flowering branches, by blighting seeds, by covering the seeds with honeydew, and injuring the marketing quality.

"Weather conditions are of much importance in the natural control of the clover aphis. A fungus parasite caused the wholesale destruction of the clover aphis in June, 1918.

"Close pasturing of red clover and alsike fields during fall, winter, and early spring is the most effective control for the clover aphis that can at present be recommended. Grazing during spring and early summer, or close grazing after the hay crop has been removed, will greatly aid in preventing the aphis from becoming injurious to the red clover seed crop. The aphis can be destroyed by completely submerging clover fields. Aphids can be largely prevented from laying their eggs on apple and pear trees in the fall by the close grazing of the clover cover crops in apple and pear orchards during the early part of September. Volunteer clover plants serve as hibernating places for overwintering aphids, and may prove to be important sources of infestation for nearby clover fields. Such plants and scattered patches of clover should be grazed close or destroyed. Spraying promises to be an effective control for the clover aphis in alsike clover fields."

The tobacco aphis, G. M. HENRY (*Trop. Agr.* [*Ceylon*], *51* (*1918, No. 1, pp. 51, 52, figs. 3*)).—The author records a widespread outbreak of an aphid on tobacco in Jaffna and Mullaittivu during February and March, 1918, the outbreak in Jaffna having been first observed in October, 1917. In some places the crop had to be entirely replanted. A tobacco wash that gave satisfactory control consisted of 1 lb. of tobacco refuse boiled in 6 gal. of water in which 1 lb. of soap was dissolved.

A new genus and species of aphid, H. F. WILSON and J. J. DAVIS (*Ent. News, 30* (*1919*), *No. 2, pp. 39, 40*).—An aphid collected on choke cherry (*Prunus serotina*) at Portage, Madison, and Prairie du Chien, Wis., is described as *Asiphonaphis pruni* n. g. and n. sp.

The Coccidæ of Cuba, J. S. HOUSER (*Ann. Ent. Soc. Amer., 11* (*1918*), *No. 2, pp. 157–172, pl. 1*).—The author reports upon studies of 368 lots of material examined which yielded 36 species and 8 subspecies, of which one species, namely, *Aspidiotus fabernii*, and a subspecies, *A. subsimilis anonæ*, are described as new.

A note on the life cycle and fertility of the body louse (Pediculus corporis), R. H. HUTCHINSON (*Jour. Econ. Ent., 11* (*1918*), *No. 5, pp. 404–406*).—At a temperature of 30 to 33° C. eggs hatched in 7 days. The larvæ, when placed on a small piece of dark serge cloth in a pill box applied to the arm, required 3 days for the development of the first stage, 2 days for the second, and 3 days for the third, or a total of 8 days from emergence to adult. The period from deposition of the eggs to final molt was 15 days, and from egg to egg 16 days. A single female kept in the wristlet deposited 276 eggs within a period of 25 days, an average of 11 eggs per day and a maximum of 14 eggs in 24 hours.

Extended studies by Nuttall have previously been noted (E. S. R., 38, p. 765).

The effect of laundering upon lice (Pediculus corporis) and their eggs, W. MOORE (*Jour. Parasitology, 5* (*1918*), *No. 2, pp. 61–68*).—This is a report of studies conducted at the Minnesota Experiment Station at the suggestion and with the support of the medical division of the National Research Council.

"These experiments show the lethal temperature for lice is about 113° F. (45° C.) for 22 to 30 minute washings, and a slightly higher temperature (114.5°) proved effective in 15 minutes' time. . . .

"Considering the data presented, the following procedure is recommended for the laundering of woolen goods to destroy both lice and eggs: Infested garments to be washed at a temperature of 120°, not to fall below 115° during the washing period of 15 minutes, this treatment to destroy the active stages without the use of any special chemicals. Garments are then treated in the regular manner until perfectly dry, when they should be placed in the hot air tumbler at a temperature of 150 to 170° for 10 to 15 minutes, resulting in the destruction of the eggs. By this method it will be possible to launder woolens without shrinkage, and destroy the lice and eggs without the use of a special chemical."

The Angoumois grain moth, T. J. Headlee (*New Jersey Stas. Circ. 92* (*1917*), *pp. 4, figs. 2*).—A popular account.

The formation of the germ band in the egg of the holly tortrix moth, Eudemis naevana, L. H. Huie (*Proc. Roy. Soc. Edinb.*, *38* (*1917–18*), *No. 2, pp. 154–165, pls. 2*).—In the introduction to this report it is pointed out that investigations have been carried out on the embryology of about 18 species of Lepidoptera, but that thus far no account has been published on the embryology of the Tortricidæ, to which family *E. naevana* belongs. The paper includes a bibliography of 12 titles.

The importance of malaria to agriculture and studies on malarial soil, G. Rossi (*Soil Sci.*, *5* (*1918*), *No. 4, pp. 323–332*).—A contribution from the Institute of Agricultural Bacteriology of the Superior Royal School of Agriculture, Portici, near Naples, Italy.

The economic bearing on hover flies, D. Miller (*Jour. Agr.* [*New Zeal.*], *17* (*1918*), *No. 3, pp. 129–135, figs. 7*).—A discussion of the economic importance of syrphid flies.

Experimental work with fruit flies, W. W. Froggatt (*Agr. Gaz. N. S. Wales*, *29* (*1918*), *No. 8, pp. 579, 580*).—Preliminary tests have led to the conclusion that fruit flies (*Dacus tryoni* and *Ceratitis capitata*) can be trapped and poisoned with arsenical preparations, and various experiments are said to be under way.

Sprinkling sewage filter fly (Psychoda alternata), T. J. Headlee and C. S. Beckwith (*Jour. Econ. Ent.*, *11* (*1918*), *No. 5, pp. 395–401*).—The fact that this fly proves itself a serious nuisance wherever sprinkling filters utilized for the purification of fecal sewage are located within 0.75 mile or less of human habitation, by penetrating the houses and getting into food, etc., led to the investigation here reported. Accounts by others of related species have been previously noted (E. S. R., 29, p. 159; 32, p. 552).

Brief notes are first presented on the life history and habits of *P. alternata* and *P. cinerea*, the former being the principal species concerned. The eggs are deposited upon the surface of the stone in irregular masses of from 30 to 100, and at a temperature of 70° F. from 32 to 48 hours are required for their incubation. The larvæ are very much like mosquito wrigglers and seem to pass their existence in much the same way. Soon after hatching they make their way into the surface film, where they thrust their breathing tubes through the film itself. At a temperature of 70° the larval stage ranges from 9 to 15 days and the pupal stage requires from 20 to 48 hours.

Experimental control work has shown that both species can be destroyed by the simple process of submerging the sprinkling sewage filter for 24 hours with the ordinary sewage as delivered to the sprinkling filters, without in any way impairing the efficiency of the film upon which the activity and efficiency of the sprinkling sewage filter depends.

Simple treatment of manure to prevent fly breeding: The Panama method, H. P. Carter (*Proc. Med. Assoc. Isthmian Canal Zone*, *10* (*1917*), *pt. 1, pp. 79, 80, pls. 3*).—The measures for fly control used in Panama City are said to consist in thorough cleaning of the stables once a day and the carting of all the manure to a public dumping ground, where it is placed in an oblong pile and covered with inflammable material consisting of street sweepings, paper waste, and some rubbish. The surface is burned over and all the eggs and young larvæ thus destroyed. This method is extremely simple, no initial expense is incurred in installing concrete bins or pits or maggot traps, and the sale of the manure as fertilizer pays for the expense of the treatment, which without being offensive may be carried on close to the city where lot space is available. The present grounds for treatment in Panama are only 500 yds. distant from the hotel districts, where very few flies are noticeable.

A new muscoid genus from the Chiricahua Mountains, Ariz., C. H. T. Townsend (*Ent. News, 29 (1918), No. 5, pp. 177, 178*).—A new genus and species are described as *Chiricahuia cavicola*.

The anthomyid genus Pogonomyia, J. M. Aldrich (*Ent. News, 29 (1918), No. 5, pp. 179–185, fig. 1*).

The biology of Maine species of Altica, W. C. Woods (*Maine Sta. Bul. 273 (1918), pp. 149–204, pls. 2, figs. 2*).—Studies of four species of flea-beetles from Maine are reported upon in this bulletin of which three, which have been commonly classed as *Altica ignita* of Illiger, namely, *A. corni*, a black species occuring on dogwood; *A. rosæ*, a cupreous species occurring on the wild rose; and *A. ulmi*, a greenish or bluish form found on the elm, are described as new.

Studies have shown the life histories of these three to be very similar. They hibernate as adults which, coming out from their winter quarters in late spring, pair and deposit eggs on the leaves of their respective host plants in June and July. The larvæ which hatch from these eggs feed on the leaves, skeletonizing them. In all cases there are three larval instars averaging about 4 days each. When full grown the larvæ enter the ground, where they transform, spending about 5 days as prepupæ, and 9 days more as pupæ before emerging as adults. There is but one generation each year.

The blueberry flea-beetle (*A. torquata*), the fourth species, passes the winter in the egg stage. The larvæ hatch out in late May, feed on the opening buds of the blueberry and later on the flowers and foliage, and cause great damage when they are abundant. There are three larval instars, the larval life lasting about 12 days. The larvæ, when full fed, enter the soil to pupate, spending about 6 days as prepupæ and 10 or 11 days as pupæ before the adult beetles emerge. The adults feed freely all summer on the leaves of the blueberry but do not survive the winter. The eggs are deposited in July, probably on the ground at the base of the bushes, and these eggs pass the winter, hatching the following spring, there being but one generation each year.

Their control can be accomplished by spraying with arsenate of lead. A tachinid (*Celatoria spinosa*) was reared from the adults of two species, and a predacious bug (*Podisus modestus*) was found attacking the larva of one species. All are susceptible to fungus (*Sporotrichum globuliferum*) and bacterial diseases which doubtless play a large part in holding them in check.

Two other species of flea-beetles occur in Maine, namely, the alder flea-beetle (*A. bimarginata*), a detailed report of which by the author has been noted (E. S. R., 39, p. 64), and the lesser grape flea-beetle which is closely related to *A. ignita*.

Notes on Chalepus rubra in New Jersey, A. S. Nicolay and H. B. Weiss (*Canad. Ent., 50 (1918), No. 12, pp. 398–400, pl. 1*).—This beetle has been found not uncommonly to mine the leaves of various species of oak in New Jersey.

The sweet potato weevil and its control, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 1020 (1919), pp. 24, figs. 13*).—This is a preliminary account of studies of the sweet potato weevil (*Cylas formicarius*), which pest seriously threatens the production of sweet potatoes in this country. This weevil has become permanently established in Texas, Louisiana, and Florida, and during the last few years has destroyed a large part of the crop.

Its food consists of the sweet potato and other species of Ipomoea, including the goat's foot morning glory (*I. pes-capræ*), and more rarely a wild moonvine or moonflower (*Calonyction aculeata*).

"The beetles injure the sweet potato by feeding on the leaves, vines, stalks, and roots or 'tubers.' The female weevil lays her eggs in the vines, and in the stalks or crowns, near the ground, as also in the roots in the field, and continues to work and breed in the roots in storage. The larvæ on hatching tunnel through the vines to the roots, the vines die, and frequently the roots become badly riddled and filled with excreta, imparting such a bitter taste that even swine will not eat them. . . . Within a short time, if the insects are numerous, the roots are completely destroyed, and breeding continues almost indefinitely after decay has become advanced, until finally the roots become either too moist or too dry and hard to permit further weevil development.

"One form of injury is accompanied by the first-appearing weevils. After feeding on the leaves, stems, and vines enough eggs are deposited at the base of the vine to girdle it more or less completely, thus impairing its vitality before it is old enough to bear roots. Many weevils undergo transformation within the base of the vine before the roots have attained much growth."

But few instances of its flight have been recorded and present knowledge indicates that its spread can scarcely be effected by flight, its spread being possible through commercial movement of its food plants. The weevil is more or less active throughout the year in the Gulf States. "In the field the beetles assume greater activity as soon as the young slips begin to appear in the seed bed. They feed first on the leaves and stalks of young plants, eating irregular holes in the leaves and making excavations in the stalks, which are particularly conspicuous near the surface of the ground. After the stalks reach sufficient size and begin to become woody, the eggs are deposited on the roots just below the earth line. The usual course taken by the female is to follow the vine to the roots and to deposit the eggs there. . . . The young larvæ eat into the flesh of the potato, leaving an irregular mine or burrow lined with excrement. They burrow and feed throughout the root until their full growth is reached, then construct a more or less oval cavity at the end of the burrow, usually 0.25 to 0.5 in. of the surface of the root, and there transform to pupæ." Upwards of 300 eggs may be deposited. From 4 to 8 days are required for the hatching of the egg, 2 to 4 weeks for the larval, and 8 days for the pupal stages, a total of from about 30 to 42 days for completion of the life cycle.

Control measures considered include clean culture, crop rotation, planting the new crop remote from the seed bed, disinfection of the roots, spraying with arsenicals, and quarantine. It is pointed out that it can be eradicated in limited regions where it has not yet secured a firm foothold, and then by quarantine can be kept out of the uninfested territory.

The pea sitonid, N. A. Kemner (*K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 5, pp. 450–453, figs. 5; Centralanst. Jordbruksförsök Flygbl. 63 (1917), pp. 4, figs. 5*).—A brief illustrated article on *Sitona lineatus*.

Beekeeping in Florida, F. Stirling (*Fla. Buggist, 1–2 (1918), No. 4–1, pp. 49–52*).—A brief discussion.

Beekeeping in war time, W. Herrod-Hempsall (*New York: Charles Scribner's Sons, 1918, pp. 32*).—A practical booklet on up-to-date methods of beekeeping.

Beekeeping in British Guiana, P. M. De Weever (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), No. 3, pp. 86–96*).—In referring to the enemies of bees in British Guiana, the author states that the Yakman ant (*Eciton burchelli*), the attacks of which occur in the evening after a shower, is the most dreaded. The so-called tarantula spider (*Avicularia avicularia*) attacks the colony after nightfall.

New genera and species of Encyrtinæ from California parasitic in mealybugs, P. H. TIMBERLAKE (*Univ. Cal. Pubs. Ent., 1 (1918), No. 8, pp. 347–367, figs. 7*).—Three new genera and six new species are described by the author, namely, *Acerophagus fasciipennis* n. sp., reared from early larval stages of *Pseudococcus crawii* at Uplands; *A. pallidus* n. sp., reared from *P. yerbasantæ*, Sespe Cañon; *Stemmatosteres apterus* n. g. and n. sp., reared from *P. timberlakei* from Millbrae; *Pseudococcobius fumipennis* n. sp., reared from *P. solani* at Uplands; *Pseudococcobius clauseni* n. sp., reared from *Erium* sp. on cactus at Riverside; and *Tanaomastix claripennis* n. sp., reared from *P. ryani* at Pasadena. The genus Cirrhencyrtus is erected for *Pseudococcobius ehrhorni* Timberlake and Tanaomastix for *Paraleptomastix abnormis* Girault.

An interesting habit of a wax moth parasite, S. A. GRAHAM (*Ann. Ent. Soc. Amer., 11 (1918), No. 2, pp. 175–180, pl. 1, figs. 2*).—This is a report of studies of the pteromalid parasite *Dibrachys clisiocampæ*, heretofore recorded as a parasite of the forest tent caterpillar, and now recorded for the first time as a parasite of the bee moth (*Galleria mellonella*).

During the course of investigations at the Minnesota Experiment Station the author reared this parasite from the bee moth in large numbers. Its ovipositor is thrust into the larva of the bee moth repeatedly and, when in the course of 6 to 24 hours the larva thus stabbed becomes sluggish and finally dies, eggs are deposited on the surface of the body, usually in the wrinkles in the skin. In from 3 to 7 days the larvæ hatch out and fasten themselves to the body of the host, where they feed from 2 to 4 weeks and even longer. From 14 to 25 days are required for the completion of the pupal stage, the life cycle from egg to adult varying from 31 to 59 days.

Notes on a new mite attacking valley cottonwood, P. J. O'GARA (*Jour. Econ. Ent., 11 (1918), No. 5, p. 430, pl. 1*).—The author records the occurrence of what may prove to be a new species of Eriophyes on poplar (*Populus wislizeni*) in the vicinity of El Paso, Tex.

Studies on the iguana tick, Amblyomma dissimile, in Panama, L. H. DUNN (*Jour. Parasitology, 5 (1918), No. 1, pp. 1–10*).—This is a report of biological studies of *A. dissimile* in the Canal Zone.

The biology of Amblyomma dissimile, with an account of its power of reproducing parthenogenetically, G. E. BODKIN (*Parasitology, 11 (1918), No. 1, pp. 10–17, pls. 2, fig. 1*).—A report of studies conducted by the Government economic biologist of British Guiana.

On the life cycle of the fowl cestode, Davainea cesticillus, J. E. ACKERT (*Jour. Parasitology, 5 (1918), No. 1, pp. 41–43, pl. 1*).—Working at the Kansas Experiment Station, the author has demonstrated experimentally that *D. cesticillus* may be transmitted by the house fly.

FOODS—HUMAN NUTRITION.

Place of milk and vegetables in the diet, H. C. SHERMAN (*Amer. Med., n. ser., 13 (1918), No. 6, pp. 361–369, figs. 3*).—This article aims to teach a higher appreciation of milk and vegetables as food, pointing out that both are rich in calcium and green vegetables also in fat-soluble A. The author suggests as a general guide that as much money should be spent for milk as for meat, and that as much might well be spent for fruit and vegetables together as for meat.

An investigation of the methods employed for cooking vegetables, wi special reference to the losses incurred.—I, Dried legumes, HELEN MAS (*Biochem. Jour., 12 (1918), No. 3, pp. 231–247, fig. 1*).—Data are reported the losses incurred and the time required for cooking dried vegetables un various conditions, and methods based upon the results of the investigation suggested for cooking dried legumes on a large scale. The method conside preferable is to soak the legumes for not less than four hours in water co taining 1 per cent sodium bicarbonate, and then to cook them either in steamer or by simple boiling for about one hour in water containing 0.25 p cent salt.

The wild foods of Great Britain, where to find them and how to cook th L. C. R. CAMERON (*London: George Routledge & Sons, Ltd., 1917, pp. XV+ pls. 2, figs. 25*).—The author's list includes 260 different kinds of wild fo including game, fish, pot herbs, salad plants, edible fungi, etc.

The digestibility of bread made from two parts of wheat and one part oats, barley, maize, or rice, E. I. SPRIGGS and A. B. WEIR (*Lancet [Lond 1917, II, No. 19, pp. 724–726*).—The question was studied by using these bre as part of an ordinary mixed diet.

The results show certain differences in the percentage absorption of nitrog which varied from 81 per cent in the case of barley bread to about 90 per ce in the case of white bread, rice bread, and a war bread. The variations in absorption of carbohydrate and fat were smaller, but they appear to neutrali the effect of the nitrogen variations, for when the proportions of the total fo values assimilated in each experiment are compared they are almost identic the lowest being 95 per cent for barley bread, and the highest 96.3 per cent f rice bread. From these data the authors draw the following conclusions:

"If properly prepared and baked, palatable breads can be made from a mi ture of one-third of oatmeal, barley flour, maize flour, or rice flour, and tw thirds of wheat flour. Experiments showed that each of these breads, wh taken with a mixed diet, was, for the time of the observation and for this su ject, as nourishing as the bread made from white wheaten flour."

A study of yeast bread with substitute flours, ELIZABETH SPRAGUE (*Jo Home Econ., 10 (1918), No. 6, pp. 272–279, figs. 6*).—These experiments were signed to check the results previously obtained in a preliminary study, wh seemed to indicate that while breads containing 33⅓ per cent of substitu were possible with some flours, only 25 per cent was advisable in general the quality of the bread, as regards texture and lightness, was to be kept all like normal bread. The results reported in this paper show the proporti which have been used to produce breads of good normal quality, faults wh may occur, and some tentative explanations as to their cause.

"Ropy" bread, J. M. BEATTIE and F. C. LEWIS (*Lancet [London], 1917, No. 6, pp. 211, 212*).—The condition of "ropiness" in bread is caused by specific organism of the group *Bacillus mesentericus*, which the authors, foll ing the proposal of Vogel, call *B. viscosus-panis*. The source of infection is b lieved to be the flour, but actual development takes place in the bread o when the organism is present in considerable numbers.

Since the causal organism has been found in the husk of the grain as w as in the flour, infection is said to be more likely to occur where the flo contains a large proportion of husk. The development of the organism greatly favored by moisture and warmth. The use of acids in the process baking is not advocated, the procedure recommended being the elimination the organism from the flour by improved milling methods.

Wheat saving recipes, KATHERINE JENSEN and JULIA O. NEWTON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 5, pp. 16*).—A compilation of recipes illustrating the use of substitutes for wheat and sugar.

Milling grain sorghums (*Kansas Sta. Rpt. 1917, p. 24*).—Approximately 20 milling tests and 75 baking tests made with Kafir corn indicated that a sufficiently satisfactory product can be obtained by blending from 20 to 25 per cent of Kafir corn meal with a good, strong wheat flour. A somewhat coarse meal, rather than a fine flour, was found to produce the best results.

Changes in the food supply and their relation to nutrition, L. B. MENDEL (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 10, pp. 112–126*).—A discussion of the factors which influence the supply and availability of food.

Commercial stocks of grain, flour, and miscellaneous food products in the United States, on December 1, 1918 (*U. S. Dept. Agr., Food Surveys, 2 (1918), No. 15, pp. 8*).—The usual data are reported in tabular form.

Comparative statistics on foodstuffs and fuel for five years as shown in a budget of the annual cost of living of a family of five persons (*Olympia, Wash.: State Bur. of Labor, 1918, pp. 3*).—These statistics were collected in the State of Washington during the years 1914–1918, inclusive.

The home economy handbook, [C. R. PRATT] (*Author, 1917, pp. 48, fig. 1*).—The author states that the secret of food economy is to select those foods which provide the proper amounts of repair and fuel materials at the least cost. He emphasizes the use of cheap protein and cheap fuel foods, and gives recipes illustrating their uses. As an economy in the preparation of foods, the fireless cooker is advocated and described.

Economy in the kitchen, J. F. BREAZEALE (*New York: Frye Pub. Co., 1918, pp. 114, figs. 10*).—The author discusses a satisfactory kitchen and outlines a plan therefor. The canning problem and other widely related material is also considered.

Feeding the family, MARY S. ROSE (*New York: The Macmillan Co., 1916, pp. XVII+449, pls. 15, figs. 3*).—This handbook for instructors in home economics is also adapted for the use of people who need a working knowledge of personal hygiene including simple, rational, well-founded rules for eating. The food requirements of persons of different ages are presented and family dietaries are calculated. By means of the large number of carefully worked out tables it is possible to find, not only the weight, but also the volume of common foods that it requires to furnish a definite amount of nourishment. In the chapter entitled Food for Children from Eight to Twelve Years Old, the author emphasizes the fact that youth is the time to cultivate respect for all natural foods as a means to physical and mental efficiency, and painstakingly suggests how this may be accomplished. The appendix summarizes data regarding food composition, dietary recipes with computed food values, and other useful information.

Food supply in families of limited means, M. M. DAVIS, JR. (*Boston: League for Prev. Work, 1917, pp. 24*).—This is a study of present facts of the food problem in Boston families by six welfare agencies. Two hundred families were investigated, mostly residents of Boston and representatives of the city's chief nationalities. The results indicated that 100 of these families received an adequate amount of energy, 35 were on the border line, and 68 were inadequately fed. Too large an amount of money was spent in all cases for meat and too little for milk, fruits, and vegetables. This has led to a deficiency of mineral material, which is specially unfortunate in view of the large number of young children in the families.

In conclusion the report recommends that the general public needs to be more fully awakened to the serious effect of present food prices upon the nutrition of families of small means, particularly families in which there are many small children. Present food conditions also obviously demand of all charitable societies which administer material relief that they revise and study carefully the money standards of income which they are providing.

A dietary for miners, S. H. Brockunier (*Engin. and Min. Jour., 105 (1918), No. 14, pp. 627–630*).—A discussion of methods of feeding employees at mining camps. Economy in the purchase of food and efficiency in purchasing and preparation is recommended. Calculations showing the food requirements of miners, tables presenting a balanced ration designed to be in accordance with the best dietetic theory and conforming to actual experience in mining camps, the preparation of lunch buckets, weights and prewar costs, and suggestions for war economies and conservation are included.

A further study of the diets of laboring class families in Glasgow in war time, Margaret I. H. Ferguson (*Proc. Roy. Soc. Edinb., 38 (1917–18), No. 1, pp. 40–47*).—The diets of eight of the families previously reported (E. S. R., 38, p. 267) were studied for the third time in November, 1917. The income of the families varied from 31 to 90s. per week. In two of the families the energy value had increased over the last study; six families showed an increase in protein consumption, the average over the whole being 6.3 gm.; five showed an increased use of fat, averaging 7 gm. per man per day. No less than 86 per cent of the energy was obtained from the rationed foods, while in 1915 they yielded only 75 per cent.

An inquiry into the composition of dietaries, with special reference to the dietaries of munition workers, Dunluce and M. Greenwood (*Nat. Health Ins. Med. Research Committee* [*Gt. Brit.*], *Spec. Rpt. Ser., No. 13 (1918), pp. 48*).—This report is based upon information collected in 1917 in English boarding houses for munition workers. The report contains an introductory section in which the modern experimental work on dietetics is reviewed and dietary standards are discussed. This is followed by sections on the statistics of working-class diets collected before the war, statistics of working-class diets in war time, the war-time dietaries of Germans, and the voluntary ration. A more detailed discussion is given in the appendix of the scientific study of "bioenergetics," statistical evidence respecting working-class dietaries, and also includes an article, by Miss E. M. Chrystal, on Food in Hostels.

The food ration of the soldier, M. Bornand (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 7 (1916), No. 1–2, pp. 14–36*).—This is a compilation of data on the standard war rations of different countries, with particular reference to that of the Swiss Army. The value in army feeding of canned soups, vegetables, and meat; alcoholic beverages; and purified drinking water is discussed.

Malnutrition among school children (*Med. Rec.* [*N. Y.*], *93 (1918), No. 8, pp. 311–318*).—Malnutrition is deemed one of the most potent factors hindering the normal course of the child's development. Statistics are cited to show that for the first nine months of the year 1917 in New York City 9.9 per cent of the school children were undernourished. The causes of malnutrition were divided into two groups, external and intrinsic. The first group includes unpropitious environment, poverty, ignorance, and bad domestic management. The second includes digestive, respiratory, and circulatory disablements, as well as those arising from bad heredity. Various agencies dealing with the problem of malnutrition are discussed, and recommendations are made.

A food poisoning outbreak at Brighton, W. G. Savage and D. Forbes (*Jour. Hyg.* [*Cambridge*], *17 (1918), No. 4, pp. 460–470*).—A food poisoning outbreak at the Royal Sussex County Hospital is described which is considered to be due to fish infected from a carrier of organisms, evidently of the Gaertner group but of slightly abnormal characteristics.

Vitamins and nutrition, H. STEENBOCK (*Sci. Mo.*, *7 (1918), No. 2, pp. 179–188, figs. 9*).—This article discusses the vitamins, shows when physiological disturbances are to be expected if the diet is deficient in them, and what, with our present mode of living, is the probability of a deficiency.

The author concludes that it is sufficient to say that both vitamins are indispensible in the diet, but that for normal nutrition, if the individual has the opportunity to select his foods as he desires, lack of vitamins should give no greater cause for concern than lack of suitable proteins or salts.

Vitamins and symbiotes, H. BIERRY and P. PORTIER (*Compt. Rend. Acad. Sci.* [*Paris*], *166 (1918), No. 23, pp. 963–966; abs. in Chem. Abs., 12 (1918), No. 19, p. 2001*).—The author points out the similarity between vitamins and symbiotes in occurrence and temperature of destruction, and reports experiments made upon rats and pigeons in which deficiency symptoms were cured by subcutaneous or intraperitoneal inoculation of cultures of living symbiotes.

The known and the unknown with regard to the etiology and prevention of beri-beri, E. B. VEDDER (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 10, pp. 22–29*).—A discussion involving the relation of diet to beri-beri.

[Diet in pellagra], J. GOLDBERGER (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 10, pp. 3–22*).—A résumé of some of the studies of the United States Public Health Service relating to the causation and to a method of preventing pellagra.

Chemical analyses of the stomach contents from 100 pellagrins, M. H. GIVENS (*Amer. Jour. Med. Sci., 155 (1918), No. 2, pp. 221–232*).—This is a continuation of the studies of Hunter, Givens, and Lewis previously noted (E. S. R., 35, p. 666). Data from 100 more cases are presented and summarized as follows:

"No definite relation can be found between the absence of pepsin and free hydrochloric acid, and sex, age, duration of pellagra, and clinical symptoms. The gastric secretion of children is disturbed along the same general line as that of adults. Free hydrochloric acid and pepsin do not seem to be absent as often in children as in adults. Although the tendency is for acid and pepsin to disappear hand in hand, such is not always the case. It is believed that pepsin and free acid are present more often than has been expected."

Pathogenesis of infantile scurvy: An hypothesis, H. J. GERSTENBERGER (*Amer. Jour. Med. Sci., 155 (1918), No. 2, pp. 253–268; abs. in Physiol. Abs., 3 (1918), No. 4–5, pp. 259, 260*).—The author outlines the etiology and clinical picture of scurvy and proposes the following theory of its pathogenesis:

(1) All of the known symptoms of scurvy may be explained on the common basis of a primary or secondary interference with one or more of the normal functions of calcium alone or in conjunction with its physiological anion. (2) In infant scurvy this defunctioning of calcium is caused by a substance produced through a break in the metabolism of carbohydrates, whatever their original source may be. (3) The break in carbohydrate metabolism occurs, as already suggested by Funk (E. S. R., 31, p. 463) and others, as a result of the absence, inactivity, relative insufficiency, or inadequacy of some physiochemical substance or vitamin essential to the establishment and performance of normal carbohydrate metabolism. (4) The defunctioning substance is possibly oxalic acid or some other agent having a strong affinity for calcium, and after combining with calcium, it is soluble with great difficulty.

This hypothesis is discussed in detail, with many references to the literature on the subject of scurvy.

Infantile scurvy, A. F. HESS (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 10, pp. 48–51*).—The author cites investigations which led to the conclusion that a diet of pasteurized milk induces scurvy in infants unless some antiscorbutic food, as orange juice or potato water, is also given.

The antiscorbutic factors in lemon juice, A. Harden and S. S. Zilva (*Biochem. Jour., 12 (1918), No. 3, pp. 259–269, figs. 5*).—The liquid obtained after precipitation of the citric and other organic acids from lemon juice has been found by the authors to contain the greater part, if not the whole, of the antiscorbutic content of the lemon juice. The potency of the treated juice was lessened by storing in the cold for about a fortnight, and was increased by evaporation to dryness in an acid medium.

Potent doses of the treated juice when given subcutaneously failed to arrest the progress of scurvy in guinea pigs, and the administration of very concentrated doses previous to depriving guinea pigs of the antiscorbutic factor did not prevent or delay the onset of scurvy.

The effect of alcoholic intoxication on catalase, W. E. Burge (*Amer. Jour. Physiol., 45 (1917), No. 1, pp. 57–61, fig. 1*).—The introduction of alcohol into the stomach of dogs was found to increase greatly the catalase of the blood, while the introduction of alcohol directly into the vascular system decreased the catalase of the blood. This decrease is considered to be due to the destruction of the catalase by the alcohol, and leads to the assumption that in so far as the absorption of alcohol from the alimentary tract produces an increase in the catalase of the blood, resulting presumably in an increase in oxidation, just so far alcohol exerts a stimulating effect, while in so far as the accumulation of alcohol in blood in prolonged intoxication or its introduction directly into the blood destroys catalase, just so far alcohol exerts a depressing effect.

Reason for the helpful effect of alcoholic beverages in diabetes, states of depression, and convalescence, W. E. Burge (*Science, n. ser., 48 (1918), No. 1239, pp. 327, 328*).—The administration of alcohol to normal dogs and to dogs rendered diabetic by the removal of the pancreas led to an increase in the catalase of the blood. It is also stated that the blood from the liver was richer in catalase by from 10 to 15 per cent than the blood from any other part of the body.

The conclusion is drawn that "the administration of alcohol to diabetics is helpful because it stimulates the liver to an increased output of catalase, which is carried by the blood to the tissues, where it facilitates the oxidative processes with resulting increased oxidation of sugar and decreased acidosis."

The rôle of catalase in "shock," W. E. Burge and A. J. Neill (*Amer. Jour. Physiol., 45 (1918), No. 3, pp. 286–293, figs. 2*).—Essentially the data noted in the above article and from another source (E. S. R., 38, p. 870).

The mode of action of food in increasing oxidation, W. E. Burge, A. J. Neill, and R. Ashman (*Amer. Jour. Physiol., 45 (1918), No. 4, pp. 500–506, figs. 2*).—Continuing the investigations on catalase, the effect of ingestion of food on the catalase content of the blood and tissues was determined by experiments upon dogs. The results indicate that food increases the catalase of the blood and hence of the tissues parallel with the increase produced in oxidation.

To explain this increase in catalase, alcohol was used as a stimulant to catalase activity in normal dogs and in dogs in which the liver, pancreas, spleen, or other organs had been extirpated. From the results obtained it is concluded that alcohol, and probably food in a like manner, increases the catalase of the blood by stimulating the pancreas, the spleen, the gastric and intestinal glands, and particularly the liver, to an increased output of catalase and in this way causes an increase in oxidation.

Further study on the effect of food in increasing oxidation, W. E. BURGE and A. J. NEILL (*Amer. Jour. Physiol., 47 (1918), No. 1, pp. 13–24, figs. 6*).—Continuing the work noted above, observations on the effect of the ingestion of the ordinary food materials (fruits and beverages) on the production of catalase are reported.

The experiments confirm the conclusions that the increase in oxidation following the ingestion of food is due to the increase in catalase produced by the stimulation of the digestive glands, particularly the liver, to an increased output of this enzym. The glycerin radical of the fat molecule appears to be responsible for the stimulating effect of the fats; the end products of protein digestion, presumably the amino acids, for the stimulating effect of meat; and the simple sugars for the stimulating effect of the starchy foods.

Creatinuria.—I, Exogenous origin of urinary creatin, H. STEENBOCK and E. G. GROSS (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 265–289; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 1, p. 70*).—The work of various investigators on creatin is reviewed and some of the factors are presented which the authors believe to be responsible for the apparent anomalies shown in the appearance and disappearance of creatin in urine under different dietary conditions. Data obtained from experiments with pigs are reported, from which the following conclusions are drawn:

Creatin in the urine of the pig may or may not be produced by fasting, and it may or may not be present in the urine on the rations customarily employed in animal husbandry practice. Creatinuria obtained during fasting may be reduced by carbohydrate feeding or by the administration of alkali, but both treatments applied simultaneously need not necessarily prevent it. Acid administration, resulting in a slight acidosis, may or may not increase the creatin, but protein feeding if sufficiently intensive will always produce creatinuria, or if it be already present will increase it in degree.

The theory advanced in explanation of these results and those of other investigators is that, in one form or another, creatinuria is etiologically related to protein metabolism whether of exogenous or endogenous origin, and that in addition, in a manner as yet unknown, it is related to the creatin stored in the muscles and other tissues. As a possible mechanism for the formation of creatin, it is suggested that some of the arginin may be split into components, leaving the guanidin group intact. Further cleavage would result in the formation by one of two possible methods of guanidin acetic acid, the methylation of which would form creatin.

The theory is discussed in detail with a view to correlating the observations hitherto made on creatin excretion.

ANIMAL PRODUCTION.

Net energy values of alfalfa hay and of starch, H. P. ARMSBY and J. A. FRIES (*Jour. Agr. Research [U. S.], 15 (1918), No. 5, pp. 269–286*).—Seven respiration calorimeter experiments with a pure-bred Shorthorn steer 1 year and 10 months old were made at the Pennsylvania Institute of Animal Nutrition in cooperation with the Bureau of Animal Industry of the U. S. Department of Agriculture to determine the net energy value of alfalfa hay by a comparison of the several periods in which different amounts of it were fed, and to determine similarly the net energy value of a mixture of alfalfa hay and starch in the proportion of 2.5:1. From the data thus derived the net energy value of the starch was computed. The data given in detail in tabular form included the following subjects: Composition and net energy content of the dry matter of the feeding stuffs, percentage digestibility, influence of starch on the digestibility of the hay, average daily urinary and gaseous cretion, average daily gains of protein and fat, methane production, metab able energy, heat emission and production, and the net energy values per gram of dry matter. The experiments are briefly compared as to met and results with similar work by Kellner.

"The digestibility of the rations, the losses in the urine, and the ext the methane fermentation showed a distinct increase as the total amou the ration was reduced. The greater loss of energy in the urine and met on the lighter rations more than compensated for the smaller losses in feces, so that the proportion of the total energy metabolizable was some less than on the heavier rations.

"The metabolizable energy of the starch was 10 per cent greater than average computed from five experiments by Kellner, the difference being chiefly to smaller losses in the feces. Starch caused the usual depressi digestibility.

"The average heat increment caused by the consumption of alfalfa hay 999 calories per kilogram of dry matter, as compared with 981 calories f for the same hay in the previous year and with an average of 1,169 calori six previous experiments on three different samples.

"The average heat increment for the starch was 1,692 calories per kil of dry matter, as compared with 1,248 calories computed from Kell experiments. The net energy value of the starch was about 9 per cent l than that computed from Kellner's experiments, only 49 per cent as comp with 59 per cent of the metabolizable energy being utilized by the animal."

[Feeding value of Para grass], C. W. Edwards (*Guam. Sta. Rpt. 1917,* *10, 11, 12*).—Seven native cows and a grade heifer were divided into two the first kept on Para pasture and the second on native pasture. During spring (dry season) all of the first group gained in weight and all of the s lost. The initial weight of the first lot was considerably less than that second. In a similar comparison with two lots of six 3-months-old pig lot on native pasture gained an average of 29.3 lbs. during three mont the spring and the lot on Para grass 41 lbs. during the same period. T was no disparity in initial weights.

In an experiment comparing alfalfa hay with the much cheaper Para as feed for horses, it was found that the latter could be used as sole forage maintenance ration for horses doing light work.

Experiments with bolly refuse, C. T. Dowell and W. G. Fried (*Oklahoma Sta. Bul. 121 (1918) pp. 8*).—"Bollies" is a term that has bee plied to unopened or partly opened cotton bolls gathered at the end of picking season and sold to ginners who put them through a cracking mac and then gin them. The refuse, consisting of the burr and some ung cotton, has been used as a fuel and, in recent years, as a feeding stuff. two 18-months-old steers, the authors have studied the digestibility of bolly refuse, both when fed alone and with the addition of alfalfa meal cottonseed meal. The digestion coefficients were all low, but the refuse se a satisfactory roughage as the steers gained somewhat in weight.

It is pointed out that the feeding value of bolly refuse would depend upo percentage of seed and unginned cotton, both of which varied consid in samples of refuse secured from different sources.

Analyses of the bolly refuse, and the cottonseed, cottonseed cake, an derived from "bollies" are reported, as well as the composition of the as

The composition of some Indian feeding stuffs, Jatindra Nath Sen (*Research Inst. Pusa Bul. 70 (1917), pp. 60+IV*).—This is a combined li analyses completed in the laboratory of the imperial agricultural chemist. Entries are made under the botanical name of the plant from which the products analyzed were derived. In most cases the percentage of albuminoid nitrogen is given in addition to the total nitrogen, and the percentage of sand and silica separated from the soluble mineral matter. The nutritive ratio and the food units for each item have been computed.

Studies of inheritance and evolution in Orthoptera, II, III, R. K. NABOURS (*Jour. Genetics, 7 (1917), No. 1, pp. 1–54, pls. 2; abs. in Anat. Rec., 11 (1917), No. 6, pp. 500, 501*).—These papers report the continuation of breeding experiments with grasshoppers of the genus Paratettix, previously noted (E. S. R., 31, p. 58).

The experiments deal with a variety of color markings on the pronota and in the femora of the jumping legs. Fourteen patterns are considered to form a group of multiple allelomorphs, and are held to be typical of one class of characters "allelomorphic to each other, never to an absence." Another character producing a melanic pattern is recognized and considered typical of a second class of characters "allelomorphic only to their absences, never to each other or any other characters." The possibility that a multiple allelomorph might be the result of linkage of two or more factors is considered in Part III.

Studies of inheritance and evolution in Orthoptera.—IV, Multiple allelomorphism and inheritance of color patterns in Tettigidea, A. W. BELLAMY (*Jour. Genetics, 7 (1917), No. 1, pp. 55–70, pl. 1*).—Breeding results with over 3,000 grasshoppers of the genus Tettigidea are given an interpretation similar to the one adopted by Nabours.

Inheritance studies of color and horn characteristics, J. W. GOWEN (*Maine Sta. Bul. 272 (1918), pp. 127–148, figs. 4*).—This is an abstract of the paper previously noted (E. S. R., 40, p. 73).

Ovarian transplantation in Rouen and Peking ducks, R. KALTENBACH (*Ztschr. Induktive Abstam. u. Vererbungslehre, 17 (1917), No. 3, pp. 251–253, fig. 1*).—The author reports an unsuccessful attempt at ovarian transplantation in birds, which like attempts of other investigators (E. S. R., 25, p. 867), resulted in absorption of the engrafted ovaries. A new technique prevented the regeneration of the original ovary found in much previous work. The method involves the destruction of the ovary in situ by the cautious application of formalin. Ducks sprayed in this way with or without implantation of a new ovary developed drake feathering at the next molt.

Baby beef production, W. H. PEW and J. M. EVVARD (*Iowa Sta. Bul. 181 (1918), pp. 289–311, figs. 4*).—A certain number of corn belt farmers, in spite of the high price of land, labor, and feed, have found it profitable to raise cattle for the purpose of producing baby beef. The results from November, 1913, to November, 1916, are reported of a cooperative study by the station of one of these farms with respect to the methods, costs, and profits of this part of the business.

The breeding herd, 75 to 90 head, culled out each year, consisted of home-grown cows and heifers, all Hereford grades of good type. The bulls were mostly from the pure-bred herd maintained on this farm. The females were bred to calve not later than May each spring, the bulls, 3 to 5 in number, usually being kept with the whole herd from the end of June to the beginning of September. Calves ran with their dams until late November. After weaning they were dehorned and the bulls castrated. Those intended for baby beef then started their feeding.

Heifer calves designed for the breeding herd were carried through their first winter in the dry lot with the baby beeves and liberally fed. Usually they were bred to calve as 2-year-olds, but if poorly developed the breeding was postponed

12 months. The older heifers and the breeding cows were put on winter rations about November 21 each year and continued until April or the middle of May, according to circumstances. For the first six or eight weeks they were pastured in clover and timothy aftermath and run in corn stalks. Additional feed in the form of corn silage, rough discolored alfalfa, and clover-timothy hay was allowed toward the end of the winter.

The prices charged, regarded as constant for the three seasons, were meadow aftermath 75 cts. per acre, corn stalks 50 cts. per acre, alfalfa $10 per ton, mixed hay $8 per ton, and corn silage $4 per ton. In the first winter the average daily cost was 7.8 cts. per cow, in the second 6.8 cts., and in the third 6.8 cts. Silage feeding was begun comparatively early the first season.

During the rest of the year the cows were on blue grass pasture. In 1914 the pasture was severely dried up, and corn silage was added to the ration of nursing stock. Pasture land was valued at $110 to $150 per acre, which was $50 to $90 less than land used for crops. During the two summers that no silage was fed, the daily costs per head for pasture were 6.3 and 5.9 cts., respectively.

During the most typical year (1915–16), an average cow used 0.54 acre of meadow aftermath, 1.68 acres of corn stalks, 0.3 ton of timothy hay, 1.03 tons of silage, 0.61 ton of alfalfa, 2 acres of blue grass pasture (182 days for cow and calf), and 15.6 lbs. of salt.

As summer advanced calves were gradually given a certain amount of grain (shelled corn and whole oats 1:1). By weaning time they were on full feed. The average daily consumption throughout this period was about 3.25 lbs. per calf. At weaning, their average weight in different years varied from 412 to 416 lbs. The following table gives the estimated cost of producing a calf and shows the advantages of home-grown calves over feeders purchased on the range:

Cost of a calf at weaning and its market value.

Items of cost.	1914	1915	1916
Year's maintenance of cow	$37.87	$33.64	$33.06
Bull service	2.00	2.06	2.00
Calf feed while in creep	3.94	3.89	3.76
Mortality risk in calves	3.95	3.95	2.98
Labor on calves	1.05	.85	1.21
Gross cost at weaning	48.81	44.39	43.01
Net production cost (gross cost less manure)	33.81	29.39	28.01
Market value (considering weight)	35.36	33.99	37.08
Profit on home growns	1.55	4.60	9.08

Besides feed cost, the charges for cows' maintenance given here include labor, interest, taxes, veterinary charges, mortality, risk, depreciation, and upkeep. An accurate time record was kept of all operations. Losses from death of calves and the failure of cows or heifers to produce calves are distributed among the remaining calves under the item mortality risk. A direct rental of 5 per cent of the value of the pasture land is included under maintenance of cow. The valuations of the calves at weaning time used to determine the profit are based on actual market quotations, but the calves themselves could have readily been sold at an advance over the market.

The net cost of carrying the heifers destined for breeding purposes from weaning to the age of 18 months was in the successive years $23.21, $35.55, and $25.43, respectively. The greatest expense occurred in the winter when the heifers were in the feed lot. This cost was only a few dollars less each year than the net cost and was considerably higher in the case of the 1914 heifers than of the others. The only other important item of expense, the summer pasture, was more than covered by credits for manure and pork.

During the years covered by this report the costs of actually making baby beef out of the home-grown steers and heifers not kept for breeding were rendered abnormal because most of the animals were fitted for the show ring. However, about 200 calves purchased on the open market were also fed each year and some of the details of their management are given. Of those secured in 1913, most were disposed of in June, 1914, after seven months' feeding. About 50 were held over on pasture during the summer and sold in December. It was found that heavy gains during the finishing period did not compensate for the diminished returns on pasture. The calves purchased in 1915 were fed in dry lot exclusively for over a year and topped the Chicago market at $12.50 per hundredweight.

From the available data, and using 1917–18 prices, it is concluded that the cost of raising a calf to weaning would be about $38 and the net cost, including labor and overhead charges of a year's feeding, about $175. The net profit would be somewhat more than $19, but nearly $12 of this is profit in rearing the calf. The profit of the feeding operation would thus be about $7.50 per head.

Cattle feeding investigations (*Kansas Sta. Rpt. 1917, pp. 28, 29, 39, 40*).—Eighty-four grade Hereford calves from the Fort Hays substation were divided into six lots and full-fed for the production of yearling beef. Four lots were used to compare good sweet clover hay and green, brown, and black alfalfa hay. The concentrates used were shelled corn and oil meal. The black alfalfa had been stacked immediately after cutting without being cured. It was charged at $5 per ton, whereas the price of the other hays was put at $15.

The black-alfalfa lot was given almost twice as much hay as the other lots but ate somewhat less grain. The gain averaged lowest and was the most expensive of any lot. The green-alfalfa hay lot made slightly better and more economical gains than the brown-alfalfa lot. The lot fed sweet clover hay made about the same gains as the green-alfalfa hay lot, but these were cheaper.

The two remaining lots were used to compare ground corn, barley, and linseed meal with shelled corn and linseed meal when the roughage consisted of brown alfalfa and silage in both cases. The corn and barley lot made the fastest gains of any of the six lots, but next to the black-alfalfa lot these were the most expensive. The other lot made rather low but cheap gains.

Progress is reported on a project at the Fort Hays substation concerning the development of breeding heifers. During the second winter the group of 40 grade Herefords bred to calve at 3 years made better gains than the group that calved the succeeding spring as 2-year-olds. In both groups the lots receiving corn and cottonseed cake in addition to roughness averaged somewhat less than twice the gain of lots fed only alfalfa hay silage and wheat straw, but at somewhat more than twice the cost. In the case of 2-year-olds, the grain-fed lot had less trouble in calving.

Limiting the grain ration for fattening cattle, W. H. Pew, J. M. Evvard, and R. Dunn (*Iowa Sta. Bul. 182 (1918), pp. 313–344, figs. 11*).—This is a report of a two-year feeding trial to determine primarily whether the usual corn-grain ration for fattening steers could profitably be reduced and an increased amount of corn silage substituted. In 1915–16 five lots of five 2-year-olds, mostly showing Hereford characteristics, were used, and in 1916–17 four lots of eight steers each were included in this phase of the work. Much care was taken to secure uniformity in the lots, not only the weights and general appearance being considered but also certain individual body measurements and the dispositions of the animals. Lot 1 of each year, after getting on full feed, had shelled corn present at all times in a self-feeder. The other lots were fed by hand twice daily in predetermined amounts, one lot (lot 2) each year being full-fed and the others receiving 75, 50, and 25 per cent, respectively, of the amount of shelled corn received by lot 2. In the second year the 75 per cent lot was omitted. Each lot was given as much silage twice daily as it would eat. Linseed meal (old process) was fed mixed with the silage in uniform amounts to each lot, in the first winter at the rate of 2 lbs. per steer daily and the second winter 2.5 lbs. Alfalfa hay was fed each evening, the amount being the same for each lot and determined by the appetite of the lot consuming the least.

Four hogs followed each lot of cattle, and in addition there was a check lot each year of four hogs that were self-fed on shelled corn and meat meal tankage in separate feeders. The other hogs received limited amounts of corn and tankage in addition to the "pick-up." The difference between the check and an experimental lot was used to compute the amount of feed saved by the hogs per 100 lbs. of gain on the steers. The first set of hogs was replaced in 90 days by a new set.

Some of the results are assembled in the following table:

Results of full and limited grain ration for steers (120 days).

Lot No.	Method of feeding.	Average daily consumption. Corn.	Average daily consumption. Silage.	Average daily gain.	Corn saved by hogs per 100 pounds gain on steers.	Cost per pound of gain, crediting feed saved by hogs.
	1915–16.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Cents.*
1	Self-fed	15.47	30.65	2.98	31.47	13.15
2	Hand-fed	15.58	28.75	2.94	15.23	13.46
3	.....do	11.67	39.90	2.80	23.02	13.02
4	.....do	7.79	51.47	3.02	5.19	11.54
5	.....do	3.87	53.85	2.56	8.46	11.70
	1916–17.					
1	Self-fed	14.83	34.29	3.50	41.73	11.15
2	Hand-fed	13.36	34.11	3.17	28.04	11.88
3	.....do	6.68	44.88	2.83	19.48	10.98
4	.....do	3.34	50.72	2.81	6.21	10.04

In computing the costs corn was put at 90 cts. per bushel and silage at $6.50 per ton.

In spite of their greater gain in weight, a general better condition in the full-fed steers, and the larger amount of "pick-up" available for the hogs following them, the limited grain lots, especially the 25 per cent, made distinctly the cheaper gains. This is shown not only by the cost per pound of gain but by the estimated margins which the authors give, based on market conditions at the time the experiments ended. Full feeding is advised only where a large premium is being paid for well-finished cattle.

Comparing self-feeding and full hand-feeding, the results are thought to be somewhat in favor of the former method.

Each year the experiment was continued beyond the initial four months' period. In 1915–16 the limited feeding lots were put on full grain ration for 40 days, while the next year a fifth month of continued limited feeding was tried. Complete data are provided for comparison of the results of the extended period with those of the shorter period, but no definite conclusions are drawn as to the advantages of either. The margin of selling price over feed cost is generally increased by longer feeding.

In the second year a lot of eight steers similar to the other lots received alfalfa as its sole roughage but was fed a full corn ration and was otherwise treated like lot 2. It made greater gains than the silage fed lot, but with alfalfa at $18 per ton it was less profitable.

In this year also another lot of eight steers was fed exactly like lot 2 but in a concrete instead of a dirt yard. Results show slight differences in favor of the concrete yard.

[Pasturing alfalfa and harvesting corn on irrigated fields with hogs and sheep], B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1917, pp. 14–21, fig. 1*).—In two six-year rotations, a three-year stand of alfalfa is pastured each year with hogs which receive in addition 2 lbs. corn daily per 100 lbs. live weight. The hogs are later turned into the corn plats of the same rotation. A progress report is presented of five years' results with one rotation and three years' with the other. In the case of the former, the average gain per acre, made by hogs while on alfalfa with corn supplement, was 1,725 lbs. for 117 days. The grain fed per acre averaged 4,795 lbs., and the grain per pound of gain was 2.9 lbs. While the hogs were on corn, the average gain per acre was 538 lbs. for 21 days. Based on the estimated yield, this represents an average consumption of 4.7 lbs. of corn per pound of gain.

A summary is given in the subjoined table of the first year's results of a cooperative investigation with the Bureau of Animal Industry of this Department concerning the pasturing of pigs from May 28 to September 25 on alfalfa supplemented with various grains to the extent of 2 per cent of the live weight daily. After 44 days the original pigs in those lots receiving supplements were replaced by much lighter spring pigs.

Pasturing pigs on alfalfa supplemented by grain.

Supplemental ration.	Time on pasture.	Carrying capacity per acre.	Total gain per acre.	Grain fed per acre.	Grain per pound of gain.
	Days.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
None	115	1,305	117	....	....
Barley	119	1,961	1,785	4,552	2.55
Shorts	119	1,987	1,903	4,552	2.39
Corn	119	1,945	1,741	4,504	2.39

It would appear that there is little difference in the results that could be attributed to particular supplements. Which should be chosen at any particular time depends on market prices.

In another six-year rotation, the alfalfa after three years' growth is pastured with ewes and their lambs, which later are used to harvest the corn and consume beet tops from the beet crop in the same rotation. In 1917 the lambs made fully as good gains as the hogs, and in addition they seemed to clean up the field of corn more thoroughly.

Because of the supposed danger from bloat, sheep have not been commonly pastured on alfalfa. Tests of this pasture have been conducted for three years at the Belle Fourche Farm with no indication of bloat or other ill effects. Tests show that a well irrigated alfalfa field divided into two parts for alternate pasturing has a carrying capacity with sheep of 1,300 to 1,400 lbs. per acre.

[Importance of mineral nutrients in swine feeding] (*Kansas Sta. Rpt. 1917, pp. 13–15*).—Ninety Duroc-Jersey pigs were divided into 15 lots and fed corn meal with various unspecified ash and protein supplements. Bone ash was a valuable addition to all rations tried, except those containing tankage, where it proved detrimental. A ration of corn meal and alfalfa pasture did not supply all the mineral required for young fattening pigs.

Six pregnant Duroc-Jersey sows fed corn only and three fed a similar low ash ration composed of ground corn, wheat gluten, and blood meal produced small litters of poorly developed pigs, half of which were dead in 30 days. The sows were generally in poor condition, and two died about five weeks after farrowing. Two control lots, comprising three sows each, were fed a mixture of ground corn 70, shorts 24, and tankage 6 per cent with or without extra mineral matter, and produced healthier pigs that grew more vigorously and showed a lower death rate.

Some vital problems of the poultry feeder, H. R. Lewis (*New Jersey Stas. Hints to Poultrymen, 7 (1918), No. 3, pp. 4*).—The supply, cost, and quality of poultry feed are discussed, the planning of rations is considered, and methods of feeding, including suggestions regarding the quantity of grain to be fed laying hens during each month of the year, are outlined.

[Marketing of poultry] (*Kansas Sta. Rpt. 1917, p. 26*).—A large number of fowls were dressed by different methods and shipped to a town about 50 miles distant. From there they were returned to the bacteriology department for examination. The results indicate that it is not feasible in Kansas to ship poultry by parcel post during the summer. Attempts to use preservatives, such as cane sugar, sodium nitrate, and sodium chlorid, were not successful because of the foreign flavors added with these substances.

[Incubation and brooding tests in Guam], C. W. Edwards (*Guam Sta. Rpt. 1917, pp. 13–16*).—The hatching percentage secured in the station poultry plant was low during the season of 1917. In a test setting during which the concrete floor under the incubator was sprinkled twice daily, the percentage of fertile eggs hatched increased slightly. The percentage of dead germs in eggs held more than 10 days was very high.

A comparison was made of heated and unheated brooders. During the season of cool nights (December and January), a lower chick mortality and more rapid growth occurred in the brooder artificially heated. Later during the warm season (after February 15), results from the fireless and kerosene brooders were equally satisfactory.

Accuracy in commercial grading of opened eggs, M. K. Jenkins and N. Hendrickson (*U. S. Dept. Agr. Bul. 391 (1918), pp. 27, pls. 5, figs. 3*).—In connection with the previous work of the Bureau of Chemistry on the quality of liquid eggs used in making frozen or dried egg products (E. S. R., 35, p. 173), it was noted that comparatively high-grade stock might have a high bacterial count under conditions which could not be accounted for on the grounds of carelessness in opening or during subsequent treatment. Apparently there were some infected eggs among those that went to make up breaking-stock eggs of a type which is not readily detected by ordinary grading out of the shell.

To investigate this problem a study was made of 2,052 individual eggs, representing 29 samples secured from eastern commission houses. All the eggs had been passed as fit for human food by commercial candlers. Each egg was opened separately under aseptic conditions and a portion removed for bacterial examination. Of the whole lot only 13.5 per cent had more than 100 organisms per cubic centimeter, and only 2.8 per cent contained members of the *Bacillus coli* group.

When the eggs were classified according to the condition of shell, it was found that the percentage of infection (both general and *B. coli*) progressively increased through the following series: Clean whole eggs, dirty whole eggs, clean cracked eggs, dirty cracked eggs, clean leaking eggs, and dirty leaking eggs, 39.1 per cent of the last class being infected. The percentage of eggs infected also increased with the physical breakdown of the yolk, but a large number of "soft eggs" were practically sterile, an indication that the initial stage of deterioration can not, in most cases, be ascribed to bacteria.

After being removed from the shell, each egg was graded according to its appearance and odor, and when necessary, taste, after the manner adopted by the more progressive of the frozen and dried egg concerns. Of the total, 8.3 per cent are in this way classed as bad. Of those graded good, 12 per cent contained bacteria and 2.2 per cent *B. coli*, the average count being low. Although certain eggs whose condition can not be detected by the senses are carriers of bacteria, it is very seldom that such eggs, when mixed with sterile eggs in the manufacture of commercial products, would increase the bacterial count to a considerable degree. Of the eggs graded bad over one-half were rejected on account of their odor; those called musty being practically sterile, whereas most of the others were heavily infected. No cause of mustiness was discovered.

Eggs rejected on account of physical appearance include mixed rots, white rots, eggs with green whites, adherent yolks, and a small percentage of the border-line cases known as soft eggs. The number of eggs in any one class was small, and the conditions as to infection were variable.

Fur farming, S. VALIQUETTE (*Com. Conserv. Canada Rpt., 7 (1916), pp. 75–77, fig. 1*).—The author reports an unsuccessful attempt to raise mink in captivity for its fur.

DAIRY FARMING—DAIRYING.

The mineral metabolism of the milch cow; third paper, E. B. FORBES, J. O. HALVERSON, L. E. MORGAN, ET AL. (*Ohio Sta. Bul. 330 (1918), pp. 89–134*).—In the earlier papers of this series (E. S. R., 37, p. 169) it was shown, among other things, that cows at the height of milk flow draw upon their skeletons for the mineral constituents (particularly calcium) of their milk, and that they are unable to utilize extensively for this purpose the mineral nutrients in the ration even when these are augmented by considerable quantities of steamed bone flour or of calcium carbonate. The present paper shows that this condition is not altered when more soluble calcium preparations are used as supplements to the basal ration.

As in the earlier work, the experimental subjects were six Holstein cows somewhat above the average in production, but not record breakers, and all in the early part of their lactation. Each cow was fed during two experimental periods of 20 days each, separated by a 10-day interval during which the rations for the second period were being adjusted to individual peculiarities. In 4 of the 12 periods it was necessary to decrease the number of days because of irregular behavior of the animals. The basal ration in period 1 was composed of corn meal (11 lbs. daily), cottonseed meal (2 lbs), linseed oil meal (2 lbs.), wheat bran (1 lb.), and alfalfa hay (16 lbs.). Its nutritive ratio averaged 1:5.72. In the second period the alfalfa allowance was increased to 18 lbs. daily on account of the hunger of the cows, and this, with a change in the chemical composition of the alfalfa, narrowed the ration to 1:4.5. Three of the cows had nothing added to the basal ration during the first period, but received calcium lactate (from 2 to 4 oz. per head daily according to individual tolerance) in addition during the second period. The other three cows were given 2.5 oz. of precipitated bone flour per head daily in period 1 and about 1.5 oz. of calcium chlorid during period 2. The rations thus possessed the characteristics of high-class milk-producing rations, except for the absence of succulent feeds such as silage and roots. The average daily milk yield per cow during the first period was 47.2 lbs. and during the second period 49.9 lbs., The complete analytical results, with special reference to the paths of outgo, are given in 16 tables, each cow being treated separately.

"The most important fact developed by these data is that, irrespective of conditions and in spite of large intake of calcium, this element was eliminated in quantities greater than were contained in the feed. There is but slight evidence that the precipitated bone flour was utilized and no evidence that the calcium lactate or the calcium chlorid was utilized. There is no evidence, therefore, that the limited utilization of calcium by milk-producing cows is due to the limited solubility of the calcium compounds of the ration. It is worthy of note, also, that the cows were markedly irresponsive to the intake of magnesium and phosphorus with which calcium is combined in the skeleton, and that the balances for these elements remained almost invariably negative in spite of the presence in the rations of amounts of the same very much greater than were utilized. The fact that the heavily-milking cow loses calcium at the same time that she receives a readily assimilable supply greatly in excess of the amount utilized shows that the calcium stores of the body (the skeletal stores) are more readily accessible for use in milk production than is the calcium of the ration. The cow can store fat and protein in considerable quantities in spite of heavy milk production, but her capacity to assimilate mineral matter, especially calcium, appears to be of a distinctly lower and more definitely limited order. . . .

"In general, the differences in the utilization of the mineral nutrients caused by changes in the ration were in harmony with the nature of the change; that is, an increase in the intake of an element was usually followed by an increased storage or decreased loss of this nutrient, but the response was usually so slight in comparison with the extent of the change of intake that it became apparent that the mineral metabolism of the well-fed, heavily-milking cow is not intimately and directly dependent upon the mineral nutrients of the ration, but that its character is determined under normal conditions, first, by the inherited impulse to secrete milk, second, by the mineral nutrient reserves of the animal body, and only third by the food supply."

Both sulphur and nitrogen, which are consumed almost wholly in chemical combinations in the protein of the ration, had negative balances in period 1. In the second period there was a marked increase in the intake of both, nitrogen balances becoming positive and the sulphur balances, although reduced, remaining negative. In these rations, therefore, an amount of protein sufficient to provide for nitrogen storage failed to furnish enough sulphur to maintain equilibrium of this element.

In part 2 of this bulletin the authors discuss results of the three years' experimental work. The importance of leguminous feed and the possibility that sterility of high milk producing cows may be due to disturbances in mineral metabolism are again emphasized.

[Pasture grass for dairy cattle on the Belle Fourche Reclamation Project experiment farm], B. Aune (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1917, pp. 21–24, fig. 1*).—The economical feeding of dairy stock on reclamation projects involves the use of grass pasture. These irrigated pastures are of a permanent nature and while the first cost is somewhat high, the subsequent expense is not great. Notes are given on the carrying capacity of several mixtures.

Four mixtures were seeded in 1915 and pastured with two cows in 1916 and 1917. Three of these were rather elaborate, consisting of from 11 to 14 kinds of grasses. The fourth, composed of 20 lbs. of brome grass, 12 lbs. of slender wheat grass, and 3 lbs. of alfalfa per acre, maintained the cows somewhat longer than the others during the first year and much longer in the second.

However, a tendency to bloat was encountered, due, it is thought, to the alfalfa. A new series of plats was sown with four simpler mixtures in 1916 and pastured the next spring with five Holstein heifers 6 to 12 months old. The most satisfactory proved to be a mixture of equal parts of brome grass, tall oat grass, and sweet clover, 18 lbs. to the acre.

Rotation of dairy farm crops, C. E. THORNE (*Mo. Bul. Ohio Sta., 4 (1919), No. 1, pp. 3–8*).—The benefits of systematic rotation of crops are set forth, and suggestions made with reference to the requirements on dairy farms.

The soy bean is suggested as deserving greater attention from the dairyman than it has received, since it is perhaps better adapted for use with corn in the silo than any other legume and has practically the same climatic and seasonal range as corn. It is also pointed out that, because of the lime and phosphorus in milk, dairying is more exhaustive of soil fertility than any other form of live-stock husbandry, and that the drain must be met by restoration of these elements in the form of purchased feeds or fertilizers.

Influence of the Brown Swiss breed in improving the mountain cattle of Roumania, N. FILIP (*De l'Influence de la Race Brune de Suisse sur l'Amélioration des Animaux Bovins de Montagne en Roumanie. Inaug. Diss., Univ. Bern [1914], pp. 35, figs. 3*).—The mountain cattle form one of the four races of Roumanian cattle. The cows are small in size, about 117 cm. (3.8 ft.) high at the withers, and produce on an average 1,200 liters of 4.5 per cent milk during a lactation period of seven months. In general appearance they resemble Jerseys.

The author reports that Brown Swiss were first imported in 1896. Crossbreds show increased height, increased length of body, and increased girth, and resemble in general color and conformation the Brown Swiss. Cows imported from Switzerland produce about 3,000 liters of milk annually, but pure-bred Swiss born in the mountainous districts of Roumania where feeding conditions are not ideal give on an average 1,785 liters. The average of Swiss grades is little, if at all, lower than this. All these data are based on rather few numbers.

California State dairy cow competition, 1916–1918, F. W. WOLL (*California Sta. Bul. 301 (1918), pp. 153–204, figs. 20*).—A considerable part of this bulletin consists of lists of prizes and prize winners and other details of purely local interest. Ten-month records were completed for 246 cows, 130 of which were grades. The competition was conducted as in the original announcement (E. S. R., 35, p. 674), except that it was impossible to secure complete feeding records owing to war conditions and labor shortage. However, statements from a number of prize winners as to methods of feeding their herds are included. An appendix gives the age, breeding, pounds of milk, amount and percentage of butter fat, and the butter fat credit of each individual entrant, and a table shows the average change in production with advance of lactation. The high production of certain grade herds that had long been members of a cow testing association indicates the value of the persistent culling which these associations tend to bring about.

How to determine the cost of milk (*Mo. Bul. Ohio Sta., 3 (1918), No. 12, pp. 363–366; 4 (1919), No. 1, pp. 17–21, fig. 1*).—This is an outline of cost accounting designed for the use of the individual dairy farmer and is followed by a summary of costs of milk production on 33 Ohio farms. In these summaries all charges, except feed and labor, are given as percentages of the value of a cow (assumed not pure-bred). These total 27.8 per cent and, with the annual charge for horse labor per cow, roughly balance the value of a calf and the 10 tons of manure that the cow is assumed to produce yearly. On the average a cow was on pasture 187 days a year, but received additional feed during this time. The cost of 100 lbs. of milk is computed on the assumption that the cow is dependent solely on pasture for five months, beginning May 15, and is on full feed for the seven months beginning October 15.

From the data at hand for these Ohio herds, it was found that during winter the items not offset by credits required to produce 100 lbs. of milk are 44 lbs. of grain, 159 lbs. of silage, 43 lbs. of hay, 31 lbs. of stover, 22 lbs. of bedding, and 4.7 hours of labor and management. During pasture season the charges are 6.1 days of pasture and 3.1 hours of labor.

A scale is suggested for monthly deviations from average prices which gives a uniform percentage from November to April of 123. The results are compared with the formulas and sliding scales proposed by F. A. Pearson and G. F. Warren.

Concerning milk costs and prices, F. W. Rader (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 9, pp. 125–128*).—A discussion of the author's figures for cost of milk production in western Washington (E. S. R., 39, p. 784) in the light of criticisms from distributors and condensing interests summarized by W. A. Linklater (E. S. R., 40, p. 97).

The examination of milk for public health purposes, J. Race (*New York: John Wiley & Sons, 1918, pp. VI+224, figs. 4*).—This handbook, by the city bacteriologist and food examiner for Ottawa, Ontario, includes considerably more than the routine methods of chemical and bacteriological examination required of officials charged with enforcing pure food laws, and aims to be of general use to students. In the section on chemistry, in addition to the official methods for the determination of fats and total solids and the detection of preservatives, alternative procedures are outlined. Selected methods are given for the determination of lactose, total proteins, caseinogen, albumin, mineral constituents, total acidity, refractive index, etc., to aid in the correct diagnosis of sophistication. The section on bacteriological examination includes a general survey of sources of infection, an outline of methods of enumeration, and a discussion of the possibility of detecting excremental and pathogenic forms. Details of the standard methods of the American Public Health Association are given in some instances. Many of the illustrative tables are summaries of the author's unpublished investigations.

It is pointed out that average counts may be misleading if deviations from the mean are large or the number of variants is small. In these cases the median would be a better indication of the quality of the supply, but it is best to group the results into classes having a comparatively small range of bacterial counts.

An appendix gives the composition of certain culture media and tables for computing specific gravity.

The significance of the colon count in raw milk, S. H. Ayers and P. W. Clemmer (*U. S. Dept. Agr. Bul. 739 (1918), pp. 35, pls. 3, fig. 1*).—This is a study of the significance of the colon count as an index of cleanliness in milk production, based upon an examination of the literature on the subject and a series of bacteriological studies under controlled conditions.

The colon count as at present determined by plating methods does not discriminate between the *Bacillus coli* and *B. ærogenes* types of organisms. Since the first was found to be mostly of fecal and the latter of nonfecal origin, the colon count is not a direct measure of manurial contamination. Using the Clark-Lubs method (E. S. R., 34, p. 186), the authors found only 4 cultures of *B. ærogenes* among 1,160 cultures isolated from 20 samples of fresh cow feces, but found this type common in the air of barns and very generally introduced into the milk by dirty utensils.

It appears impossible to produce milk under commercial conditions without the presence of colon organisms. In milk from a clean barn, clean cows, and sterilized utensils, 6.9 per cent of the samples showed colon organisms. With utensils sterilized but barn and cows dirty, the percentage was only increased to 10.7. Under the same dirty conditions but with utensils not sterilized but washed in hot water one hour after milking, rinsed, and allowed to stand inverted until the next milking, the percentage of infected samples was 28.6. Finally, with dirty cows, dirty barn, and utensils held eight hours after milking and then washed in hot water containing washing powder, but not sterilized, the percentage was 71.4.

In the 254 samples used to investigate the influence of these diverse conditions, there was only one colon count for fresh milk of over 2,000 per cubic centimeter, which leads the authors to believe that this figure is the maximum number of colon organisms that can be introduced into milk during milking, except perhaps under very abnormal circumstances. Higher counts than this indicate that the sample of milk has been held for a period of time at a relatively high temperature, thereby allowing the original colon flora to multiply.

A study of the action of bacteria on milk proteins, G. Spitzer and H. M. Weeter (*Proc. Ind. Acad. Sci., 1917, pp. 91–96*).—Sterile milk was inoculated with pure cultures of 11 different kinds of bacteria that occur frequently in milk, cream, and butter. Changes in acidity (expressed as percentage of lactic acid), ammonia, amid nitrogen, and lactose content of the medium were determined at intervals until the sixteenth day.

The acidity developed was not uniformly in proportion to the lose of lactose or to the gain in ammonia. The *Bacillus lactis acidi* culture was markedly different from the others. It developed its maximum acidity by the fourth day and maintained it unchanged throughout the period of observation. This increase in acidity was over three times that produced by any other organism during the 16 days. This culture showed almost the lowest ammonia and amid nitrogen production, and a smaller loss of lactose than that found in any cultures producing appreciable increased acidity except *B. mycoides*. The group composed of *B. proteus*, *B. fluorescens putidus*, *B. coli*, and *B. butyricus*, which caused either a decrease or no essential change in acidity, averaged distinctly lower gains in ammonia and amid nitrogen and a smaller loss of lactose than the six other organisms (*B. mycoides*, *B. viscosus*, *B. megatherium*, *B. mesentericus*, *B. subtilis*, and *B. liquefaciens*) that caused moderate increases in acidity.

Experiments of this type are being continued.

A pocket card for the easy calculation of milk mixtures, J. P. C. Griffith (*Jour. Amer. Med. Assoc., 71 (1918), No. 6, pp. 441, 442, figs. 2*).—The card described contains a table giving approximate percentage composition of different layers of milk, and directions for finding the amount of any layer to be used to give percentages desired and for determining the percentages present in any milk mixture already in use. On the reverse side of the card is a table of the amounts to be employed in making various 20-oz. milk mixtures and the caloric values resulting. Attention is drawn to the fact that the commercial pasteurizing of milk interferes greatly with the making of milk mixtures from the different layers.

Butter fat losses in creameries, R. M. Washburn, A. C. Dahlberg, J. Sorenson, and M. P. Mortensen (*Minnesota Sta. Bul. 177 (1918), pp. 3–12*).—This is an attempt to determine what part of the observed differences between actual and calculated overrun is due to fat losses occurring mechanically in the plant fixtures and what part to errors either inherent in the Babcock test or resulting from faulty manipulation of the test in commercial practice. The observations were made during 43 working days at the Minnesota State creamery.

Preliminary studies, some details of which are given, convinced the authors that the Babcock test for milk and cream, carried out with care, gave results sufficiently accurate for their purpose. Deviations from standard practice, however, in conducting the test were not found wise. Errors in sampling even the sweet and not very rich cream handled in the creamery were found to be a far greater source of inaccuracy than the trifling errors of the Babcock method.

An endeavor was made to determine accurately the fat loss at every stage of manufacture under normal operating conditions. The weight cans, vats, flash pasteurizer, pipes, pump, etc., after the usual rinsing, were thoroughly scrubbed with hot water, which was then weighed and quickly sampled. The butter wash-water and the hot churn wash-water were both weighed into the churn and sampled as soon as used. Wash-waters were all tested by the Babcock method (skim milk bottles). Both gravimetric and Babcock tests were applied to the skim milk and buttermilk. Butter samples were taken from at least 10 different places in the churn and given gravimetric analyses. The details of the unavoidable mechanical losses are given in the subjoined table:

Loss of butter fat in the mechanical process of the manufacture of butter.

Source of loss.	Average daily loss.	Total fat in milk used.
	Pounds.	*Per cent.*
Milk weigh can, vat, heater	0.38	0.13
Cream forewarmer, flash pasteurizer, and cooler	1.25	.23
Cream ripener	.15	.07
Butter wash-water	.14	.03
Churn wash-water	.61	.14
Total for whole-milk creamery	2.53	.60
Total for hand-separator creamery	2.15	.47

As this mechanical loss is practically independent of the volume of product handled, the percentage loss in a large creamery is small, but careless work would greatly increase it.

The chief cause of unaccountable losses of butter fat was the fact that the Babcock method gave only about one-third of the true amount of fat in skim milk and buttermilk, as is shown in the following tabulation:

Failure of Babcock test to account satisfactorily for fat losses in skim milk and buttermilk.

Disposition of fat.	Babcock method.	Gravimetric method.
	Per cent.	*Per cent.*
Fat lost in skim milk	0.49	1.64
Fat lost in buttermilk	.29	.93
Fat lost mechanically	.60	.60
Fat recovered in butter	96.72	96.72
Fat not accounted for	1.90	.11

Percentage losses in skim milk and buttermilk would not be affected by the size of the creamery. In a whole-milk creamery the losses from all sources are estimated as 3.17 per cent, and in a hand-separator creamery (losses in skim milk, milk weigh can, vat, and heater deducted) the percentage of loss would be 1.4.

It is also shown that the drip method of sampling milk, by which the samples are caught by means of a pet cock placed in the pipe leading from the heater to the separator is accurate enough to make possible the determination of daily overrun without the necessity of a daily analysis of the milk furnished by each patron. The average error of 43 samples was 0.39 per cent.

Centrifugal recovery of cheese from buttermilk, A. E. Perkins (*Mo. Bul. Ohio Sta., 3 (1918), No. 12, pp. 367–370*).—This article reports the successful use of a centrifuge for separating the curd in the manufacture of cottage cheese from buttermilk on a large scale at an Ohio creamery. The machine is a modification of that used in laundries for drying garments and has a bowl capacity of 12.5 gal.

[Dried milk powder] (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 116 (1918), pp. VI+184, pl. 1, figs. 16; abs. in Pub. Health Rpts. [U. S.], 33 (1918), No. 26, pp. 1052–1055; Amer. Food Jour., 13 (1918), No. 10, pp. 577, 578; Chem. Abs., 12 (1918), No. 22, pp. 2388, 2389*).—Three papers are presented.

I. *Upon an inquiry as to dried milks, with special reference to their use in infant feeding*, by F. J. H. Coutts (pp. 1–138).—This report includes a history of dried milk and methods of preparation and distribution, its physical and chemical characteristics and bacteriology, and its use in infant feeding.

As a result of the inquiry, the author concludes that dried milk is a valuable food and one which possesses certain special advantages which are likely to lead to its use being greatly extended in the future. Among these advantages are portability, keeping properties, freedom from bacteria, convenience, and freedom from waste. For infant feeding, dried milk of recent manufacture and made of a good quality of cow's milk is considered a safe substitute when breast feeding is impossible. An extensive bibliography is appended.

II. *Some investigations bearing on the nutritive value of dried milk*, by G. Winfield (pp. 139–156).—This report is based partly on observations made at infant welfare centers and partly on feeding experiments made on animals. The growth curves of children fed on dried milk resemble closely the average growth curve of breast-fed children. Teething and walking began at normal ages and no greater liability to rickets or scurvy was shown.

These results, combined with those of feeding experiments on rats, led to the conclusion that "cow's milk during the process of desiccation loses none of the characters which are necessary for the support of normal growth in infants."

III. *On the examination of milk powders at the Government laboratory*, by J. J. Dobbie (pp. 157–184).—This report presents in detail the methods of examination and the results obtained in the analyses of a large number of commercial samples of dried milk, carried out under the direction of G. Stubbs.

Dried and condensed milk, Balland (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 12, pp. 363–365*).—Analyses of condensed and dried milk from different countries are reported.

Fermented milk, B. W. Hammer and A. J. Hauser (*Iowa Sta. Circ. 54 (1918), pp. 4*).—The manufacture and use of buttermilk, kefir whey, kefir, and lactade are briefly described.

VETERINARY MEDICINE.

Reports of the live stock sanitary commissioner of the State of Maine on contagious diseases of animals, 1916 and 1917, B. Bearce (*Rpt. Live Stock Sanit. Comr. Me., 1916, pp. 106, pls. 12; 1917, pp. 26*).—These reports deal with the work of the years 1916 and 1917 with infectious diseases of live stock. Particular attention was given to the work of eradication of bovine tuberculosis in cooperation with the U. S. Department of Agriculture.

Annual report of the State veterinarian of Nebraska for the year 1918, J. S. ANDERSON (*Ann. Rpt. State Vet. Nebr., 1918, pp. 163*).—This report includes an account of the occurrence of and work with infectious diseases of live stock during the year.

Report of the civil veterinary department, Assam, for the year 1917–18, W. HARRIS (*Rpt. Civ. Vet. Dept. Assam, 1917–18, pp. 2+14+2*).—The usual annual report (E. S. R., 38, p. 180.)

Eradication of disease from the farm, H. J. WASHBURN (*Hoard's Dairyman, 1918, Dec. 27, pp. 772, 773, 778, 779, figs. 5*).

Specific fats as factors in immune processes, C. C. WARDEN (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 504–521*).—This is a continuation of work previously noted (E. S. R., 39, p. 80).

Experimental evidence is given that the fat complexes characteristic of certain bacteria and other cells, obtained either from the cells or assembled artificially, are capable of replacing the cells themselves in the production of specific antibodies in the blood of rabbits injected with them. The relation of fats to antibody causation is discussed in detail.

The author considers that the specificity of the antibodies obtained by the injection of cells probably depends in part or wholly on the configuration of the fats constituting the bulk of the cell surfaces.

The coagulation of the blood and anaphylactic shock, H. A. BULGER (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 522–532*).—The relation of anaphylaxis to the coagulation of the blood was studied by means of determining the effect of anaphylactic shock on coagulation time, and the prothrombin and antithrombin factors of coagulation of the blood of cats, rabbits, dogs, and guinea pigs. The following conclusions were drawn:

"The changes in the coagulability of the blood during anaphylactic shock are due to changes in that stage of the coagulation process at which thrombin is formed through the interaction of prothrombin, calcium, thromboplastin, and antithrombin (?). These changes are probably due to variations in thromboplastin. Antithrombin changes are not great. In some animals there may be an increase in antithrombin, which would aid in retarding the coagulation of the blood. There is no increase in antithrombin in rabbits. There was a marked increase in the rate of fibrinolysis after anaphylactic and peptone shock."

On the mode of action in vitro and the preparation of hemolytic antibodies, A. K. BALLS and J. H. KORNS (*Jour. Immunol., 3 (1918), No. 5, pp. 375–387*).—The work reported was undertaken to study the mechanism of amboceptor action in vitro and to ascertain if possible what part of the red blood cells is responsible for their antigenic property. The results are summarized as follows:

"In vitro, as hemolysis proceeds, the total amount of amboceptor is constant, but the stroma of the laked red cells increasing in amount become less and less saturated with amboceptor, and so split off less of it by dissociation, thus causing the velocity of hemolysis to decrease. In vivo the stroma produce specific hemolytic and agglutinative bodies of high titer. Since little protein is injected, the toxicity seems to be nil.

"Alcohol and ether extracts, as well as 0.85 and 5 per cent salt solution extracts, of the stroma do not bind amboceptor in vitro. The extract of stroma with alkaline physiological salt solution does bind amboceptor in vitro, and on injection causes the development of specific hemolysins but not of agglutinins. This alkaline extract contains nucleo-protein, but not simple albumin or globulin. It also contains lipoids, but these probably are not essential to its antigenic function.

"The presence or absence of the anaphylactic reaction is not a certain criterion for specificity when nucleo-proteins are used as antigens."

A synthetic medium for the direct enumeration of organisms of the colon-aerogenes group, S. H. Ayers and P. Rupp (*Jour. Bact., 3 (1918), No. 5, pp. 433–436*).—In the course of investigations carried on by the Dairy Division of the U. S. Department of Agriculture, the authors have devised a simple synthetic medium in which there is a single source of nitrogen, namely, sodium ammonium phosphate, and a single source of carbon, namely, lactose. This medium consists of two solutions: (1) Sodium ammonium phosphate 0.4 per cent, acid potassium phosphate 0.2 per cent, lactose 1 per cent, dissolved in distilled water; and (2) a filtered solution of agar in distilled water 3 per cent. "Mix solution 1 and 2 in equal proportions while hot and put up in definite amounts of 100 cc. or more in flasks or bottles, and then sterilize. The 3 per cent agar solution is made up separately and kept in stock merely for convenience. Agar can be added directly to solution 1 at the time of preparation if desired, using 1.5 per cent. A slight precipitate may appear upon sterilization, but this does not interfere with the count and may not appear on the plate."

The advantages of this medium include (1) apparent accuracy in the direct enumeration of bacteria of the colon-aerogenes group, (2) constancy of composition, (3) simplicity of preparation, and (4) cheapness.

Standardization of blackleg vaccine, L. W. Goss and J. P. Scott (*Jour. Amer. Vet. Med. Assoc., 54 (1918), No. 3, pp. 234–243*).—Data are presented showing that by injecting into horses cultures of *Bacillus chauvæi* a serum can be made which will protect guinea pigs from blackleg when they are injected with 0.5 cc. of culture virus (10 mld.) after having received 0.02 cc. of the serum 15 hours previous to the injection of the virus. It was found that the pathogenic properties of *B. chauvæi* cultures are greatly reduced by washing.

Aggressins and filtrates in quantities of from 2 to 5 cc. produced an active immunity in 11 days which protected 50 per cent of the guinea pigs when given 5 mld. of culture virus. Blackleg aggressins and filtrates have an aggressive action which seems to neutralize the protective action of serum.

The authors state in conclusion that the laboratory standardization of antiblackleg serum is a comparatively simple procedure, but that the standardization of aggressin and filtrate is somewhat more difficult, as the highest active immunity which can be produced in guinea pigs is of a low degree. The neutralization of the serum by the aggressin or filtrate is considered to give a method by which the value of the product may be measured.

The preventive and curative treatment of gas gangrene by mixed serums, F. Ivens (*Brit. Med. Jour., No. 3016 (1918), pp. 425–427; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 22, pp. 1861, 1862*).—Case reports of the treatment of gas gangrene by mixed serums are given, from which the following conclusions are drawn:

The administration of a powerful antigangrenous serum is of real value in preventing the incidence of gas gangrene, not replacing but assisting surgical treatment. Employed as a curative agent in cases of advanced infection, it is a disintoxicating agent of great value if used in sufficient quantities. The polyvalent serum of Leclainche and Vallée (E. S. R., 35, p. 882) has a marked influence on the after-history of cases with coincident streptococcal infections. The dilution of the serum by normal saline solution and its subcutaneous administration have made anaphylactic phenomena extremely rare. In cases where the special microbe can be isolated, or in blood infections, the appropriate serum can be used with advantage on account of the length of time necessary for these examinations. It is, however, considered wiser to give the mixture, especially in cases where sporulated bacilli are present in the original bacteriological preparations.

The clinical pathology of mustard gas (dichlorethylsulphid) poisoning, G. R. Herrmann (*Jour. Lab. and Clin. Med., 4 (1918), No. 2, pp. 1–30, figs. 2*).—"Mild cases of mustard gas burns of the skin show no changes in the blood or urine. Moderately severe and severe cases of mustard gas burns of the skin with some involvement of the upper respiratory tract show after the first week definite changes in urine, blood urea, and blood. The urinary changes consist in a diminution of the urinary output, increased concentration and acidity, albuminuria, and diminished urea and chlorid output. In the sediment there may be found casts, renal epithelium, red blood cells, and an increased numbers of leucocytes. Under the forced fluids prompt improvement occurs.

"Coincident with these urinary changes the blood urea is found to be high, but approaches normal with the improvement in the urinary condition when fluids are forced.

"The blood shows a slight secondary anemia with a well-marked polymorphonuclear leucocytosis, a definite eosinophilia, and the appearance of myelocytes and young forms of leucocytes. The blood platelets were usually increased. No evidence of hemolysis was found. These changes indicate a disturbance in the white cell formation rather than in the red blood cell group. No leucopenia was noted at any time. The leucocytosis reached its height coincidently with the height of the secondary infection, and fell with the improvement of the infection.

"The temperature, pulse, and respiration charts show in the severe cases an initial period of shock. With the development of the necrosis and the secondary infection there is a corresponding febrile reaction. The bacteriologic examination of the infected skin lesions and furuncles showed constantly the presence of *Staphylococcus pyogenes aureus*. In the one bronchial cast obtained streptococci were present.

"We believe that the changes in the blood and urine may be interpreted as dependent upon the secondary infection and due, in part, possibly to the absorption of toxic products from the necrotic skin, rather than to any direct toxic action of mustard gas."

On quinin in animal tissues and liquids, with methods for its estimation, W. Ramsden, I. J. Lipkin, and E. Whitley (*Ann. Trop. Med. and Par., 12 (1918), No. 2, pp. 223–258, figs. 2*).—"Delicate methods are described for the estimation and detection of quinin in animal tissues and liquids. Quinin does not normally suffer change in putrefying urine or feces. Quinin introduced into an animal in large doses accumulates in most of the tissues at very much higher concentrations than in the blood. Of the quinin present in the blood, more than three-fourths is in the serum (plasma ?). Normal red corpuscles take up very little quinin.

"After intraperitoneal injections the suprarenal glands take up quinin at much higher concentration than any other tissue examined; the kidneys probably come next in the series. The healthy human kidney excretes quinin at much higher concentration than that at which it is present in the contemporaneous blood. During an attack of blackwater fever it appears to lose this power. The liver of rabbits, guinea pigs, and oxen rapidly attacks quinin postmortem and presumably during life. The properties of the active agent suggest that it is an enzym. The product or products presumably represent normal metabolites of quinin in the living body.

"Experiments directed to ascertain whether quinotoxin is a normal metabolite have shown that (a) it is attacked by liver extracts; (b) when ingested by mouth it produces alimentary disturbances, but some is absorbed and some at least is excreted unchanged in urine; (c) any antimalarial action which it may exert is so slight in comparison with that of quinin as to be negligible.

"A given dose of quinin gives rise in different men to very different amounts of quinin in the blood. The excretion period of quinin by the urine differs greatly in different men—ranging from 41 hours (after a single dose by mouth) to 7.5 days (after the last of a succession of large doses). About 90 per cent of the quinin injected intravenously disappears from the blood within one minute. There is a striking association between symptoms of quinin intoxication and high concentrations of quinin in the blood. When quinin is administered in a succession of large doses, an abnormally large proportion (from 90 to 93 per cent of that ingested) is metabolized.

"Quinin may fail to effect a radical cure of malaria even when it has reached and maintained for some time a concentration in the blood so high as to be barely tolerable to the patient."

Diet and renal activity in tartrate nephritis, W. Salant and A. M. Swanson (*Proc. Soc. Expt. Biol. and Med., 15 (1917), No. 1, pp. 8, 9*).

The bearing of cutaneous hypersensitiveness on the pathogenicity of the Bacillus abortus bovinus, E. C. Fleischner and K. F. Meyer (*Amer. Jour. Diseases Children, 16 (1918), No. 4, pp. 268–273*).—Experimental evidence is given to prove that in guinea pigs infection with *B. abortus bovinus* and with the tubercle bacillus always produces cutaneous hypersensitiveness. In infants infection with the tubercle bacillus, with few exceptions, gives marked cutaneous hypersensitiveness, while in the serums of 75 infants fed on milk with a high *Bacillus abortus* content cutaneous hypersensitiveness was not present. The constant absence of this phenomenon in infants is considered to indicate that *B. abortus bovinus* is not pathogenic for infants.

Spirilla associated with disease of the fetal membranes in cattle (infectious abortion), T. Smith (*Jour. Expt. Med., 28 (1918), No. 6, pp. 701–719, pls. 2*).—"Spirilla of identical morphological and cultural characters have been isolated in pure cultures from the fetuses of 14 cases of abortion. The condition of the fetus is much the same whether spirilla or the bacilli of abortion are present. This condition is probably due in both cases to interference with the placental circulation. The injurious action of the etiological factor when spirilla are present is limited to the fetal membranes, more particularly the chorion. Definite lesions of the fetus were not detected. The spirilla gain access to the digestive and respiratory organs of the fetus when the latter swallows the amniotic fluid. More rarely they are disseminated through the body, probably through the circulation. The spirilla will grow in certain culture media only under reduced oxygen tension, readily secured by sealing the ordinary culture tubes with sealing wax. Laboratory animals (mammals) are refractory. The precise relation of the spirillum to the pathologic process remains to be more definitely formulated. Since the spirillum was first isolated, 27 cases have been found associated with *Bacillus abortus* and 14 with the spirillum. In none was a mixed infection with both organisms detected. The spirillum has been isolated only from the second or succeeding pregnancies."

A table here presented summarizes the data collected thus far. "It gives by number the male, and shows that the spirillum is not associated with any one bull. The spirillum has been found in fetuses of various ages. The distribution of spirilla as shown by cultures is given. The guinea pig inoculations are shown to be uniformly negative as regards *B. abortus*."

Louping-ill, S. Stockman (*Jour. Compar. Path. and Ther., 31 (1918), No. 3, pp. 137–193, figs. 10*).—This is a detailed report of investigations carried on in continuation of those previously noted (E. S. R., 37, p. 277), the results of which have led to the conclusion that *Ixodes ricinus* transmits the infection.

"The juice of certain edematous lymph glands and the blood from sheep affected with louping-ill when inoculated into other sheep can cause a disease which may be fatal or may amount only to an indisposition. This disease is characterized by high temperature, in some cases by coma, nervous tremblings or twitchings, or even paralysis, by an absence of macroscopic lesions capable of explaining the symptoms, and by the presence of microscopic lesions in the brain and cord of varying degree but referable to a pathological condition describable as myelo-encephalitis and similar to what are found in cases of naturally contracted louping-ill.

"Notwithstanding the first apparently negative results obtained with ticks (*I. ricinus*) in various stages which had in a previous stage fed on sheep affected with louping-ill in the field [E. S. R., 37, p. 277], it follows from the later results obtained that larvæ from females which as adults engorged on affected sheep can give rise to a highly febrile and sometimes fatal disease in other sheep, when put to feed upon them in very large numbers, and that adults fed as nymphs on affected sheep may have the same effect. It is possible that the apparently negative results recorded in the first article arose owing to the circumstances that only a small proportion of ticks become carriers of infection, but it is also probable that neglecting to take temperatures explains some of the apparently negative results.

"The blood and the juice of edematous lymph glands from cases arising from experimental inoculation and from infestation by ticks can cause similar symptoms and lesions when inoculated to other sheep in series. Ticks allowed to engorge on these experimental cases during the reaction can, after molting to their next stage, cause the disease in other sheep upon which they are put to feed.

"The infective agent, whatever it is, can be transmitted from the female ticks through the eggs to the next generation of larvæ; but, although the positive results so far have been obtained with larvæ and adults, it does not follow conclusively from the results available that the ticks in their nymphal stage can not also transmit the disease.

"Since the disease can be transmitted to sheep in series by inoculation, it follows that the infecting agent is not a toxin, but a living agent, capable of reproducing itself to some extent in the tissues of the animal into which it is inoculated. It also follows almost certainly from the fact of ticks transmitting the infection that the infective agent is a protozoan parasite. Some of the mononuclear leucocytes in edematous glands and in the blood stream when treated by Geimsa's stain show in their protoplasm chromatin bodies which have some of the characteristics of protozoan parasites, including their staining reaction. It is not claimed, however, that a final statement can be made that these chromatin bodies are parasites, and the causal agent of louping-ill. Awaiting the results of further research on this special question, it is allowable to summarize the evidence in favor of the parasite view being correct: (1) The disease is tick-borne. (2) Inoculation with the fluids and organs of sheep containing the bodies reproduces the disease. (3) The bodies stain after the manner of such parasites. (4) The causal agent is apparently not ultramicroscopic and the bodies are the only abnormal objects observable under the microscope in materials which convey the disease by inoculation. (5) The virulent material, if perfectly fresh, is sterile as regards bacteria (the infective agent appears to be retained by bacterial filters, which is evidence that it is not ultramicroscopic).

"The blood of a sheep which has recovered from the disease produced by inoculation does not continue to be infective by inoculation to others as in the case of piroplasmosis (redwater), and it is therefore unlikely that ticks can infect themselves from such animals. The same is true of material taken from a chronic case of louping-ill contracted by natural infection.

"A sheep which has passed through a reaction following upon inoculation is protected to a very considerable extent against the effects of a subsequent inoculation, just as a sheep recovered from louping-ill in the field is highly resistant to further attacks. A small number of sheep which had been inoculated at the laboratory with blood survived exposure in the following season on louping-ill infected pasture, while 4 out of 12 other sheep not so inoculated and exposed on the same pasture died of typical louping-ill. The blood of healthy sheep when inoculated in large amount to other sheep does not cause a reaction.

"The disease which has been produced experimentally by larval ticks (*I. ricinus*) from females off sheep affected with louping-ill and by adults which had fed as nymphs on infected sheep, and by the inoculation of gland juice and blood from such sheep, is, in fact, louping-ill. To conclude otherwise would involve the following further conclusions which are very difficult of acceptance: (a) That the experimentally produced cases with conclusive symptoms and lesions described in part 1, . . . must be disregarded; (b) that there is a disease of sheep other than louping-ill, characterized by similar microscopic lesions and by similar varying symptoms which is tick-borne and inoculable, and that sheep suffering from acute and typical louping-ill in the field are invariably attacked at the same time by this other disease, since inoculation of their gland juice or blood constantly produces it."

The transfusion of tuberculous sheep with the blood of normal and immunized sheep, including a study of sheep tuberculosis controlled by the complement fixation test, E. MAYER and D. J. HURLEY (*Amer. Rev. Tuberculosis, 2 (1918), No. 10, pp. 604–614*).—Transfusion of tuberculous sheep with normal and with immune blood was conducted for the purpose of determining the value of blood transfusion in the treatment of tuberculosis. In both cases the animals outlived the control, although the condition of the animal receiving the immune blood was much better than that of the one receiving normal blood.

The authors are of the opinion that, while the results are in no way conclusive, normal blood on repeated transfusion is of slight value, while blood containing antibodies is possibly of considerable value in the treatment of tuberculosis.

Immunization against swine erysipelas in 1917, F. BÜRKI (*Schweiz. Arch. Tierheilk., 60 (1918), No. 6, pp. 272–275*).—In the practice of the author, successful immunization against erysipelas consists of (1) simultaneous immunization of healthy stock, (2) therapeutic inoculation of stock sick with urticaria (diamond-skin disease), whereby sick and apparently healthy swine receive the same amount of serum, and (3) therapeutic inoculation of stock affected with the acute form of the disease, followed by simultaneous immunization.

The effect of "ground glass" on the gastrointestinal tract of dogs, J. S. SIMMONS and W. C. VON GLAHN (*Jour. Amer. Med. Assoc., 71 (1918), No. 26, pp. 2127, 2128*).—"The ingestion of ground or powdered glass has no toxic effect and produces no lesion, either gross or microscopic, on the gastrointestinal tract of dogs."

RURAL ENGINEERING.

Durability of cement draintile and concrete in alkali soils (*Engin. and Contract., 49 (1918), No. 7, pp. 170–172*).—This paper summarizes the results of a third year's tests made under the auspices of the U. S. Bureau of Standards.

With reference to concrete, no definite conclusions are as yet drawn as to its ultimate resistance to the action of alkali in the soils and waters on the irrigation projects, except to indicate that materials of good quality and proper workmanship are of the greatest importance.

"The following conclusions may be drawn for the use of cement draintile exposed to soils or waters containing alkali salts in quantities of 0.1 per cent or more: The use of cement tile in soils containing alkali salts in large quantities is experimental. Porous tile due to the use of lean mixtures or relatively dry consistencies are subject to disintegration. Some dense tile are under certain conditions subject to surface disintegration. Disintegration is manifested by physical disruption caused by the expansion resulting from the crystallization of salts in the pores and by softening, resulting from chemical action of the solutions with the constituents of the cement. While results obtained will not permit of a definite statement as to the relative effect of the various constituents of the salts, indications are that the greater the quantity of sulphate and magnesium present and the greater the total concentration of salts the greater will be the disintegrating effect.

"Tile made by the process commonly used, which allows the removal of forms immediately after casting, are subject to disintegration where exposed to soils or waters containing 0.1 per cent or more alkali salts similar in composition to those encountered in this investigation. The hand-tamped tile of plastic consistency as made in this investigation are not equal in quality to machine-made tile of the same mixture, and they do not resist alkali action as well.

"Steam-cured tile show no greater resistance to alkali action than tile which are cured by systematic sprinkling with water. Tile made of sand cement have less resistance to alkali action than the tile made of Portland cement of the same proportions. The tar coating as used is not effective in preventing the absorption of alkali salts from the soil. The cement-grout coating is not effective in preventing the absorption of alkali salts from the soil. No advantage is found in introducing ferrous sulphate into the cement mixture.

"If cement draintile are to be used in alkali soils or waters containing 0.1 per cent or more of salts similar in composition to those encountered in this investigation, they should be made of good quality aggregate in proportions of not less than 1 part Portland cement to 3 parts aggregate. The consistency should preferably be quaking, which has proved the most resistant of all mixtures used. This is wetter than that generally used in commercial tile plants and will probably require the retention of the tile in the molds for several hours, unless some means are found to hasten the hardening of the cement."

Report of the committee on irrigation of the American Society of Agricultural Engineers for the year 1917, O. W. ISRAELSEN and H. E. MURDOCK (*Trans. Amer. Soc. Agr. Engin., 11 (1917), pp. 181–191; Reclam. Rec. [U. S.], 9 (1918), No. 4, pp. 170–174*).—This report deals with economy in the use of irrigation water, and summarizes answers to a questionnaire relating to the subject.

The activated sludge experiments at Pasadena, Cal. (*Engin. and Contract., 49 (1918), No. 2, pp. 36, 37, figs. 5*).—In these experiments the plant consisted of an aerating tank, one sludge re-aerating tank, two settling tanks, and one sludge sump. From the results of a period of operation extending from March 17 until June 27 it was found that with a 4-hour aeration period, using 1 cu. ft. of air per gallon of sewage treated per minute and using between 10 per cent and 20 per cent of activated sludge with a settling period of 30 minutes, an effluent was produced which would remain in the incubator at 37° C. for 10 days with a bacterial reduction of 96 to 99.6 per cent. Poor results were obtained when the aeration period was cut down to 2 hours.

Economic highway transportation, R. C. Barnett (*Good Roads, n. ser., 15 (1918), No. 19, pp. 241–245, figs. 5*).—A large amount of tabular and graphic data on different types of highway transportation in relation to the roadbed, based on conditions in Missouri, is given.

Traffic laws in relation to highway construction and maintenance, W. A. McLean (*Good Roads, n. ser., 15 (1918), No. 7, pp. 97, 98, 105*).—This is a paper presented at the fifteenth annual convention of the American Road Builders' Association, St. Louis, Mo., February, 1918, in which traffic laws are summarized to show their relation to highway engineering.

The efficiency of the motor truck in terms of cost per ton-mile, R. E. Chamberlain (*Good Roads, n. ser., 15 (1918), No. 8, pp. 111, 112*).—This is a paper presented at the fifteenth annual convention of the American Road Builders' Association at St. Louis, Mo., February, 1918, in which data on the economic use of motor trucks for highway transportation are given.

Improved roller curtain for commercial poultry house, G. R. Shoup (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 9, pp. 130–133, fig. 1*).—The device illustrated is a roller curtain of muslin which resembles, in general, that used for roller awnings, except that it is anchored at all heights and can not flap in the wind. A curtain 200 ft. long and 6 ft. wide can be handled by one windlass. The curtain can be partly elevated to secure ventilation on quiet winter nights and can be entirely rolled up out of the dust in summer, thus removing two disadvantages of the muslin-front poultry house.

RURAL ECONOMICS.

Rural problems, A. W. Ashby (*In The Industrial Outlook. London: Chatto & Windus, 1917, pp. 207–254*).—The author includes in his discussion of rural problems the intensification of production, the increasing of the cultivated area by reclaiming land and by afforestation of rough grazing and sport lands, the supply of labor for production, and the conditions of the agricultural classes. He recommends that from the point of view of economy of production and standard of living and intelligence, the small holding has a place only in the market-garden industry. The large industrial farm is open to criticism also, but has many advantages.

The points developed in the discussion of condition of the agricultural classes are that (1) the most satisfactory method of raising wages would be by mutual action on the part of the laborers; (2) improvement of housing conditions should come through the industry itself; (3) a business policy founded on exact knowledge is needed on all estates; and (4) education in management of land and of cultivation, in farm accounting and marketing, and the improvement of elementary education are fundamental to all rural problems.

The chapter has appended a bibliography on 12 aspects of the rural problem.

The rural problem, A. W. Ashby (*London: The Athenæum [1917], pp. 40*).—This treatise is similar to that noted above, adding a somewhat more detailed discussion of village life, the rural school, the village club, and the rural church. It contains the bibliography noted.

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Mercantile and agricultural economics, C. S. DUNCAN (*Jour. Polit. Econ., 26 (1918), No. 8, pp. 769–806*).—The author discusses in detail the relationship of the home and the farm to show the difference between the farm as a business and other kinds of business, also the differences between the principles employed by agricultural economists in caring for raw materials and in analyzing the farm income. He condemns certain conclusions which disparage the farmer's labor income, failing to take into consideration both tangible and intangible total returns.

Farm management investigations (*Kansas Sta. Rpt. 1917, p. 20*).—The indications from records of farm business on 633 Kansas farms for 1915 and from detailed records of farm operations and transactions obtained from three farms in the same State are briefly summarized. Stock-share leasing was found to be the most profitable and satisfactory system of tenancy.

Summary of farm management survey (*Iowa Sta. Rpt. 1917, pp. 28, 29*).—The results of a farm management survey made in the summer of 1916, including 832 farms in Warren County, Iowa, are summarized. "Of the 832 farms studied, 41 per cent were operated by owners, 36 per cent by tenants, 23 per cent by those who owned part and rented some additional land. The average size farm was 156 acres and the value per acre $117. . . . The higher the price of land, the larger percentage of the farms are usually operated by tenants.

"After deducting operating expenses and 5 per cent interest on the capital invested in the farm, the average owner received $212 as pay for his year's labor, whereas the average tenant, after deducting operating expenses and rent paid to the landlord, received $725 for his labor. . . . Until we reach a group of farms 406 acres in size, where the labor income decreases, there is apparently a limit to the size of farm which can be efficiently operated. The fact that only 54 out of 832 farms fall in this group indicates that such farms are not profitable, on the average. . . .

"In studying over the records, it has been found that those who stocked their pastures most heavily were making labor incomes more than twice as large as those farmers who stocked their pastures the lightest. . . . The highest priced land in Warren County seems to be the cheapest from the standpoint of making money."

Labor costs and seasonal distribution of labor on irrigated crops in Utah Valley, L. G. CONNOR (*Utah Sta. Bul. 165 (1918), pp. 3–24, figs. 3*).—This bulletin presents in tabular form the results of a detailed study made in 1915 in cooperation with the Office of Farm Management of the U. S. Department of Agriculture, principally in Utah Lake Valley, Utah, and is supplementary to a study of farm management and farm profits in the Provo area previously noted (E. S. R., 38, p. 493). Local farm practices in regard to small fruits and tree fruits, general field crops, and canning crops, considered in the order in which they are harvested, are described.

"The growers estimate that from December 1 until April 1 weather conditions permit about half of the total number of days to be used for outside work, such as hauling, etc. . . . When field work starts, about March 1, not over half the time is available. . . . Two-thirds of the time in May, three-fourths in June, and four-fifths in July, August, and September are available for field work. In October three-fourths and in November two-thirds of the time are also available. In the winter season (December 1 to March 1) about 46 days are available for outside work, such as hauling manure. . . . From March 1 to May 1, the planting period for this area, there are 61 days, of which about 35 are available for field work. From May 1 to July 1, the crop working period, about 42 days are available, and 50 during July and August. . . .

From September 1 to November 1, when the greater part of the harvesting is accomplished, about 42 days are available for field work and in November are 20 more available days."

Fourteen tables showing labor requirments per acre for various crops and three summary tables, two of which comprise the man-labor and horse-labor requirements, respectively, of farm crops by periods and one the man and horse labor requirements in live-stock enterprises, are given.

Farm allotments and farm laborers' allotments in the Durham State land settlement (*Berkeley, Cal.: State Land Settlement Bd., 1918, pp. 10, pl. 1*).—This offers information regarding soil, water supply, improvements, prices of land and terms of payment, capital necessary, general requirements of the land settlement act, etc., with reference to the Durham State land settlement, Durham, Butte County, Cal.

When they come home, F. K. LANE (*Nation's Business, 6 (1918), No. 9, pp. 22, 23, fig. 1*).—This article discusses the plan to absorb labor released by disbanded armies and dislocated war workers through the development of arid lands, especially in the Colorado Basin, the drainage of the Mississippi Delta, and the reclamation of cut-over pine lands in the South.

City troops take a food salient, E. V. WILCOX (*Nation's Business, 6 (1918), No. 10, pp. 16, 17, 38, figs. 2*).—It is estimated that 500,000 persons responded in 1918 to the plan of the U. S. Department of Agriculture for city men to volunteer as harvest hands. The movement is said to have solved the labor problem in many cases and to have established a better understanding between the farmer and the city man. The Department is endeavoring to make this improvement permanent through the development of organization, cooperation, and community interest.

Proceedings of the eighty-sixth annual meeting of the New York State Agricultural Society (*N. Y. Dept. Farms and Markets, Div. Agr. Bul. 105 (1918), pp. 227, pls. 32*).—The program of this meeting included addresses on some defects in the New York laws as to cooperative associations, a report of the Million Acre Wheat Committee, and a statement of the Patriotic Farmers' Fund, which has made short-term loans to farmers and from which was planned to make loans for the purchase of sheep and swine.

A credit statement for short-term farm loans, J. I. FALCONER (*Agr. Col. Ext. Circ. [Ohio State Univ.], 4 (1918), No. 82, pp. 4*).—This is a blank for an agricultural credit statement and a detailed statement and business record.

The cattle-loan company, F. M. LARMER (*Jour. Polit. Econ., 26 (1918), No. 8, pp. 807–831*).—The points developed in this treatise are types and location of cattle-loan companies, types of cattle loans, the credit analysis made by the cattle-loan company, the marketing of cattle paper, the correlation of cattle-loan companies and allied banks, the economic services of cattle-loan companies, and the future of cattle-loan companies.

Agricultural credit in Spain (*U. S. Dept. Com., Com. Rpts., No. 264 (1918), pp. 555–559*).—This article reviews briefly the function of the "pósitos," or granaries, and gives the text of the proposed law for the reorganization of agricultural credit.

Agricultural cooperation and the collective rent system in Italy, P. DUMONT (*Vie Agr. et Rurale, 8 (1918), No. 41, pp. 261–264*).—This article is an account of two principal types of collective holdings in Italy, those under a central management and those divided into small individual holdings, as well as of the details of organization of agricultural cooperative societies. A representative balance sheet of one of the improvements under this system in Parma for 1917 is given. The methods of cultivation described have effected higher agricultural wages, a decrease in the amount of fallow land and an increase in production, and larger incomes for proprietors.

The marketing of Canadian grain under war conditions, W. R. Bawlf (*Winnipeg, Canada: Winnipeg Grain Ex., 1918, pp. 12, fig. 1*).—The author declares that the order-in-council which increases the power of the Board of Grain Supervisors is acceptable to the grain trade as increasing its chances for survival and maintaining the principle of Canadian autonomy in Canadian commerce. Under the former system, it is stated, marketing of western wheat was practically in the hands of representatives of the Allies and grain firms were being thrown out of business altogether.

Cereal and seed prices for 1919 (*Bul. Soc. Agr. France, 1918, Sept., pp. 203–205*).—These pages contain a brief correspondence between the president of the Society of French Agriculturists and the Minister of Agriculture, with the decree which fixed the maximum prices for the 1919 harvest of cereals.

Cost of producing the 1918 cotton crop, W. B. Yeary et al. (*Austin, Tex.: Dept. Agr., 1918, pp. 4*).—The data in this report were compiled from results of records returned by several hundred farmers in all parts of the State. On the basis of 160 lbs. of lint cotton per acre and $70 per ton for the seed, the cost per pound of lint is estimated at 35 cts.

County marketing schemes (*Jour. Bd. Agr. [London], 25 (1918), No. 4, pp. 454, 455*).—This notice shows 46 counties in England and Wales where systematized marketing is in full swing. Great elasticity is shown in the arrangement of marketing schemes.

Manual of laws pertaining to the Department of Farms and Markets (*N. Y. Dept. Farms and Markets, Div. Agr. Bul. 108 (1918), pp. 278*).—This bulletin supplements the data previously noted (E. S. R., 36, p. 688).

[Transportation in the Belgian Kongo], F. Fallon (In *L'Agriculture au Congo Belge. London: Belg. Min. Colon., Dir. Agr. [1917], pp. 66–72, figs. 6*).—Information is given with regard to the routes into the Belgian Kongo, means of access, and the cost of transportation of agricultural products.

The Colonial Congress of Agriculture at Paris, 1918, G. Regelsperger (*Rev. Gén. Sci., 29 (1918), No. 15–16, pp. 475–480*).—This article reviews the reports of some of the important lines of agricultural investigation made at the Colonial Congress of Agriculture held in Paris, May 21 to 25, 1918.

The rural church serving the community, E. L. Earp (*New York: The Abingdon Press, 1918, pp. 144*).—The book offers specific suggestions for making a social survey of a rural church community, contains an analysis of the social-center parish plan, and emphasizes the need for cooperation between spheres of influence and between denominations, or for consent to the survival of the church fittest to work on a community basis. The author calls attention to the need for cooperative denominational overhead intervention in definite rural programs, outlines the training of rural ministers, discusses the local institutions that are responsible as parts of the rural social machinery, and concludes with a summary of what has been achieved and what should be stressed in the next decade. A bibliography is appended.

Juvenile delinquency in rural New York, Kate H. Claghorn (*U. S. Dept. Labor, Children's Bur. Pub. 32 (1918), pp. 197*).—This study was made of the amount, nature, and proportion of various classes of delinquency in 21 rural communities of the State, emphasizing mainly the investigation of community surroundings, home influences, and methods of treatment of the juvenile delinquents. Recommendations are made for treatment and prevention.

Recommendations for treatment include taking cases of juvenile delinquents out of the hands of local justices and putting them in the charge of a division of the juvenile court working on a circuit or giving them over to referees appointed to hear cases in different parts of the county, also a provision for a probation officer in every rural section, the elimination of commitment of children to institutions, raising the age limit of juvenile delinquents from 16 to 18 years, especially for rural children, since they mature at a later age than do city children, the abolition of the office of justice of the peace, the prosecution of adults, and the establishment of advisory boards of citizens. The school, church, village, and family are in turn discussed as important preventive agents.

Part 2 consists of descriptions of 21 communities and of the cases of juvenile delinquency found in them.

Monthly Crop Report (*U. S. Dept. Agr., Mo. Crop Rpt., 4 (1918), No. 12, pp. 145–164, fig. 1*).—Together with the usual data on estimated farm value of important products November 15, average prices received by producers, and range of prices at important markets, this report contains the crop summary for 1918, including comparisons with 1917 and the average from 1912 to 1916; statistics for major and minor crops 1916 to 1918; aggregate crop-value comparisons; a graphic representation of the relative distribution of aggregate crop values in the United States, 1910 to 1914, by crops and by geographical divisions; data with reference to the wages of male farm labor; acreage, yields, and monthly prices of a large number of crops for a period of years; special articles on the December 1 wheat condition, December cotton report, and trend of prices; also crop notes for Bulgaria, Switzerland, Spain, and Austria-Hungary.

Cotton production in the United States, 1917 (*Bur. of the Census* [*U. S.*], *Cotton Prod. U. S., 1917, pp. 39*).—Statistics similar to those previously noted (E. S. R., 37, p. 441) on the production of cotton are continued to date.

[Agricultural conditions on the Belle Fourche reclamation project in 1917], B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Bellė Fourche Expt. Farm, 1917, pp. 3, 6–9*).—"The area from which crops were harvested on the project in 1917 was 50,026 acres, included in 825 farms, an increase of 3,117 acres and 23 farms over 1916. The total irrigable area of the 825 farms reported in 1917 was 67,826 acres. There was a slight decrease in the acreage of corn and wheat and some increase in the acreage of sugar beets."

Tables based on data obtained from the U. S. Reclamation Service are given regarding (1) acreage, yields, and farm values of the crops produced in 1917, with a summary of similar information for the years 1913 to 1917, inclusive; (2) the live stock on hand January 1 and December 31, 1917, with a summary of similar data for the years 1913 to 1917, inclusive; and (3) carload lots of live stock shipped from and received at four shipping points on this project in 1916 and 1917.

"The average yield per acre of all crops has remained rather low, owing chiefly to the fact that every year large areas of new land are broken up and planted. Much of this new land is poorly farmed and the yields secured are low, so that the average for the project is reduced."

A decrease is shown in the number of beef cattle and of hogs. "The total number of carloads of all stock shipped out from the four project towns in 1917 was 1,843, an increase of 550 carloads over 1916. During the same period 203 cars were shipped in, showing a decrease of 229 cars as compared with 1916."

[Agriculture in the Virgin Islands of the United States], E. F. HARTLEY (*Bur. of the Census* [*U. S.*], *Census Virgin Isl., U. S., 1917, pp. 41–43, 113–130, pls. 4*).—Census data are given as to the rural and urban population, the number, area, and value of farms, the values of live stock and crops, farm tenure, farm expenses, age of farmers, terms of occupancy of farms, farms and farm property, and live stock not on farms.

[Agricultural statistics of Trinidad and Tobago], W. G. Freeman (*Rpt. Dept. Agr. Trinidad and Tobago, 1916, pp. 4–7*).—This contains statistics regarding the principal agricultural exports in 1916, and notes the registering of the first agricultural credit society under the new ordinance going into operation in 1916 and the progress of agricultural education.

A study of the native agricultural-pastoral colonies, A. C. Muello (*Bol. Min. Agr. [Argentina], 22 (1917), No. 2, pp. 172–205, figs. 5*).—This article describes the geographical features, with data as to the rainfall and temperature of the colonies in the region of the Teuco and Vermejo Rivers in northern Argentina. It contains estimates of the cost of production of important crops, and reports on the means of communication and the local government.

The war and Brazilian foodstuffs (*U. S. Dept. Com., Com. Rpts., No. 256 (1918), pp. 419–425*).—This is a report, with statistics, on the production and exportation of vegetable foodstuffs from Brazil, showing the development of several new crops which, at prevailing prices, were more profitable than coffee.

British agriculture as a business proposition, J. H. Guy (*Jour. Bd. Agr. [London], 25 (1918), No. 4, pp. 402–416*).—An American lecturer suggests, as three basic conditions for success, that capital combined with expert management shall operate (1) to turn over the capital of the farming industry more frequently; (2) to control its purchasing and distributing machinery so that it can pass on its fair and reasonable costs to the consumer; and (3) to cease paying profits to interlopers who may intrude between the factory and the farm and the farm and the consumer. Tables are given to emphasize the author's conclusions.

Ireland as a food supplier of Great Britain (*Jour. Bd. Agr. [London], 25 (1918), No. 4, pp. 444–448; Dublin: Dept. Agr. Tech. Instr. Ireland, 1918, pp. 4*).—Statistics are given as to the value of foodstuffs imported into Great Britain from Ireland from 1912 to 1916 and the quantities of foodstuffs imported, comparing the average of the Irish supply for the prewar years 1912 and 1913 with the average of the two years 1916 and 1917, and comparing the average of the supply from all other countries for the same prewar years with that of 1916. Notes on the importance of Ireland as an essential food base for Great Britain and on the regulation of exports and imports between Ireland and Great Britain are included.

Agricultural and live stock statistics of Finland (*Statis. Årsbók Finland, n. ser., 14 (1916), pp. 122–189, 687–692*).—In addition to information previously noted (E. S. R., 30, p. 692), which is continued to date, new tables are inserted on capital invested and net returns on rural improvements, number of rented farms by governments in 1912, and economic status of the cooperative dairies 1905 to 1915.

[Agriculture in the Belgian Kongo], F. Fallon (In *L'Agriculture au Congo Belge. London: Belg. Min. Colon., Dir. Agr. [1917], pp. 42–57, figs. 9*).—This section of the publication contains reports on the labor situation from different districts of the colony, and statistics as to the estimated cost of clearing, the capital necessary to start a plantation in Katanga, the net cost of different kinds of houses in some of the colonies, and the net cost of production of important crops.

[Agricultural laws in the Belgian Kongo], F. Fallon (In *L'Agriculture au Congo Belge. London: Belg. Min. Colon., Dir. Agr. [1917], pp. 73–76*).—This chapter deals with legislation relating to agriculture.

[**Agricultural statistics of Australia**], G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust., Prod. Bul. 11* (*1918*), *pp. 9–68*).—This report continues the information previously noted (E. S. R., 27, p. 595).

AGRICULTURAL EDUCATION.

Some fundamental problems in forestry education, H. WINKENWERDER (*Jour. Forestry, 16* (*1918*), *No. 6, pp. 641–652*).—The principal conclusions in this discussion are summarized by the author as follows:

"(1) The legitimate field of the forest schools includes all the work in lumbering, logging engineering, wood preservation, all phases of products work; in fact, all work pertaining to trees, forests, and forestry that ties in better and can be handled more advantageously in connection with the forest-school curriculum than that of other university departments.

"(2) The colleges of engineering and agriculture and the departments of botany, chemistry, physics, etc. that have tried to enter these fields have made a comparative failure of it unless the work was handled by persons properly trained in forestry." Institutions like Cornell and California universities where the work in forestry, though grouped under the college of agriculture, has been organized as distinct departments or divisions under the direction of foresters of recognized high professional standing are not included in this category.

"(3) Taken collectively, the forest schools are not properly fulfilling all their functions unless they offer the same opportunities for specialization in the so-called 'allied fields,' under conditions making for the same high standard of instruction, as in silvicultural practice and forest management.

"(4) If the forest schools will train their students so as to cover the field as outlined in (1) above, there is no danger of overcrowding the profession for many years to come. In fact, there is a crying need for specialists along various lines which will take many years to fill.

"(5) The term 'forestry' has been too closely hedged in by its literal meaning. The technical specialists of high standard developed in the minor fields by the Forest Service and the forest schools are a distinct product of the development of forestry in this country and worthy of being recognized as professional foresters.

"(6) The graduate schools of forestry have not as yet reached the same standard as those of recognized high standing in other professions, and they will not until a clear differentiation between the undergraduate and graduate work has been established." The author finds some indications of such differentiations. Thus, for example, Harvard University is making a specialty of the lumber business, and furthermore has in the Arnold Arboretum no competition in the form of a graduate laboratory for the study of dendrology. Yale University has in the past furnished the majority of forest-school teachers, and is now taking up tropical forestry as a specialty. The College of Forestry of the University of Washington has for some time been specializing in logging engineering and wood preservation.

Interdependence of forest conservation and forestry education, J. W. TOUMEY (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 350–361*).—This address has been previously noted (E. S. R., 34, p. 308; 36, p. 96).

Agricultural education and research (*Rpt. Bd. Agr. Scot., 5* (*1916*), *pp. XII–XVIII; 6* (*1917*), *pp. XIV–XIX*).—These reports deal, respectively, with the progress in 1916 and 1917 of agricultural education and research work under the control of the Board of Agriculture of Scotland.

Plans to meet the provisions of the Smith-Hughes Act for vocational education submitted by the State Board of Control for Arizona and approved by the Federal Board for Vocational Education (*Phoenix, Ariz.: State Bd. Control. Vocat. Ed.* [*1918*], *pp. 8*).—An outline of the general plans is given.

State and Federal aid for vocational education under the Smith-Hughes Act (*Bul. State Bd. Control Vocat. Ed.* [*Ariz*], *No. 1* (*1918*), *pp. 68*).—This bulletin contains a statement of the State plans in detail for vocational education in Arizona under the Smith-Hughes Act, together with outlines of suggested courses of study in agriculture, home economics, and the trades and industries, and a list of books on home economics.

Vocational education (*Cal. State Bd. Ed. Bul. 23* (*1917*), *pp. 26*).—This edition (E. S. R., 38, p. 194) contains the general regulations as approved by the Federal Board for Vocational Education.

Documents relating to vocational education (*Cal. State Bd. Ed. Bul. 23-A* (*1918*), *pp. 36*).—In this bulletin are presented the requirements for teachers of vocational subjects and plans for the training of vocational teachers and for the supervision of vocational courses in agriculture under the provisions of the Federal and State vocational education acts, and the plan adopted outlining the standards and policies in administering these acts.

Proposals for vocational education in accordance with the provisions of the Smith-Hughes Act (*State Bd. Ed. Conn. Bul. 45* [*1917*], *pp. 20*).—This bulletin contains the plans proposed for the vocational education work in Connecticut.

Agriculture in schools of secondary grade: Conditions or approval in conformity with the Federal act for vocational education and the regulations of the Federal Board (*State Bd. Ed. Conn. Bul. 43* [*1917*], *pp. 8*).—The conditions of approval of these schools by the State Board of Education are set forth.

A brief description of the course in agriculture in high schools approved by the State Board of Education under the provisions of the Federal act for vocational education known as the Smith-Hughes Act, T. H. Eaton (*State Bd. Ed. Conn. Bul. 70* [*1917*], *pp. 6*).—The course extends over four years and provides for 16 units, of which 8 are credited to the vocational studies and practice work, and 8 to approved related and academic subjects. The first year is devoted to the study of animal husbandry, the second to plant husbandry, the third to farm machinery and buildings, and the fourth to farm management.

Plans for vocational education in Delaware, A. R. Spaid (*State Bd. Ed.* [*Del.*], *Bul. 6* (*1917*), *pp. 26*).—This is an outline of the plans for the administration and supervision of vocational education in Delaware under the provisions of the Smith-Hughes Act, approved by the Federal Board for Vocational Education.

Plans and aims for vocational school work in Georgia (*Ga. State Vocat. Bd.* [*Bul.*], *1* (*1917*), *pp. 32*).—The main features of the plans approved by the Federal Board for Vocational Education are submitted.

Courses of study for vocational schools (*Ga. State Vocat. Bd.* [*Bul.*] *2* (*1918*), *pp. 27*).—Outlines are given of the (1) teacher training courses in agricultural education at the University of Georgia, in trades and industries, and home economics, approved by the State and Federal boards; (2) courses in vocational agriculture for Georgia high schools and suggestive class schedules for the first two years in agriculture; (3) a vocational home economics course for Georgia schools; (4) a type of strictly vocational home-making course; (5) vocational home-making courses in evening schools; and (6) types of unit trade courses in the trades and industries for Georgia schools.

Plans for vocational education in Indiana under the Smith-Hughes Act, 1917–18 (*Ind. State Bd. Ed., Ed. Bul. 34* [*1917*], *pp. 64*).—This is a detailed statement of the plans, under the Smith-Hughes Act, for vocational education.

Federal and State law, administrative boards and officers, and approved plans, of the State for vocational education, 1917–18 ([*Iowa State Bd. Vocat. Ed.*], *Vocat. Ed. Bul. 1* [*1917*], *pp. 29*).—The texts of the Federal and State laws for the promotion of vocational education and plans for the administration of these acts are given.

Vocational education (*Topeka, Kans.: State Dept. Ed., 1918, pp. 31*).—This bulletin presents the detailed plan for the cooperation of the Kansas State Board of Education with the Federal Board for Vocational Education for 1917–18.

Vocational education, W. D. Ross (*Topeka, Kans.: State Dept. Ed., 1918, pp. 4*).—This is a circular of information relating to the operation of the Smith-Hughes Act in Kansas.

State Board for Vocational Education: Statement of plans and policies (*Bul. Ky. Dept. Ed., 2* (*1918*), *No. 1, pp. 37*).—Kentucky's plans for administering the Smith-Hughes Act, as approved by the Federal Board for Vocational Education, are given in this bulletin.

Vocational education in the State of Maine (*Augusta, Me.: State Dept. Ed., 1918, pp. 24*).—This contains the minimum requirements and general regulations for all-day, part-time, and evening schools of agriculture, home economics, and the trades and industries in Maine under the Smith-Hughes Act.

The Michigan plan for vocational education under the Smith-Hughes law (*State Bd. Control Vocat. Ed.* [*Mich.*], *Vocat. Ed. Bul. 201* (*1917*), *pp. 40*).—This bulletin presents the plans approved by the Federal Board for Vocational Education for the development and conduct of vocational education in Michigan.

[General rules and regulations of the Michigan State Board of Control for vocational education] (*State Bd. Control Vocat. Ed.* [*Mich.*], *Vocat. Ed. Buls., 1917, Nos. 202, pp. 12; 203, pp. 11; 204, pp. 10; 1918, Nos. 205, 2. ed., pp. 19; 206, pp. 7; 207, pp. 16; 208, pp. 11*).—These bulletins deal with the general rules and regulations of the Michigan board concerning the establishment and maintenance of vocational education under the Smith-Hughes and Tufts laws, and with general suggestions of the board concerning courses of study, equipment, textbooks, and management.

Vocational agriculture for teacher training classes in Michigan (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 19* (*1917*), *pp. 64, figs. 3*).—The purpose of this bulletin is to serve as a guide in the training of agricultural teachers. It includes an outline of a course of study conforming to the recommendation of the Department of Public Instruction for a six-year high school, syllabi on the several subjects to be taught, and suggestions on methods of presenting them, including classroom and laboratory work, field trips, and home projects. References to literature and lists of equipment are included.

Vocational education in Mississippi under the provisions of the Federal law known as the Smith-Hughes Act (*Miss. Dept. Pub. Ed. Bul. 11, Vocat. Ser. 1* (*1918*), *pp. 53*).—This bulletin presents initial and tentative plans approved by the Federal Board for Vocational Education for work in Mississippi under the Smith-Hughes Act.

Standards and regulations of the State Board of Education for the establishment of Federal and State aided vocational schools (*Missouri State Bd. Ed., Vocat. Ed. Bul. 1* (*1917*), *pp. 24*).—The plans for vocational education work in Missouri are described.

Suggestions to school authorities concerning the organization of Federal and State aided vocational schools, departments and classes under the Smith-Hughes Act (*Missouri State Bd. Ed., Vocat. Ed. Bul. 2 (1918), pp. 15*).—This bulletin contains suggestions concerning (1) curricula and courses of study in vocational agriculture, (2) project work in agriculture, including the common essentials of all project work and an outline of a type farm crop project, and (3) the construction and equipment of the school shop. A suggested curriculum for the all-day two-year trade or industrial school, and suggested two-year courses in vocational home economics, including one for cities of more than 25,000 inhabitants, are outlined.

The management of the soil, C. R. Jackson and Mrs. L. S. Daugherty (*Albion, Idaho, and Cameron, Mo.: Authors, 1918, pp. XII+83, figs. 42*).—The authors, having come to the conclusion from several years of experience that it is not feasible to try to teach general agriculture in the time allotted to it in most secondary schools, are preparing a series of short courses in agriculture each giving the underlying principles of a special phase of agriculture. This first course deals with the formation, agricultural types of soils, the importance of water, soil management, and factors of soil fertility. Suggested exercises, problems and experiments, a brief list of simple apparatus and materials for soil exercises, and a list of reference books and bulletins are included.

Household arts: Teachers' manual and course of study for grades seven to ten, inclusive (*Bul. Bd. Ed. Mass., No. 29 (1916), pp. IX+[3]+154, fig. 1*).—This manual and course of study for the seventh and eighth grades and the first two years of the high school was prepared by a committee of the household arts department of the Framingham Normal School. Courses are outlined in clothing, foods, management, child nursing, housing, accounting, and illness, together with general directions concerning rooms and equipment and the time allotment for each course. The units of study are the project and the topic. Suggestions are also offered on various general administrative problems, e. g., the selection of teachers, time allotment, cost per unit of instruction, short units, organization of the work in large and small schools, the school luncheon, the disposal of other products, and credit for admission to higher educational institutions. A list of books for reference reading is included.

The agricultural college and the working farmer, K. L. Butterfield (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 382–389*).—This paper has been previously noted (E. S. R., 34, p. 308).

Agricultural extension work in the United States, C. B. Smith (*Agr. Gaz. Canada, 5 (1918), No. 9, pp. 907–910*).—This address on the organization of agricultural extension work in the United States was given at a conference of Ontario agricultural representatives.

Boys' and girls' clubs (*Agr. Gaz. Canada, 5 (1918), No. 9, pp. 896–902, fig. 1*).—This is a series of brief articles, by provincial agricultural officials, indicating to some extent the character and nature of boys' and girls' club activities, fostered under the Agricultural Instruction Act of Canada, in Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia.

MISCELLANEOUS.

Report of the Guam Agricultural Experiment Station, 1917 (*Guam Sta. Rpt. 1917, pp. 62, pls. 7*).—This contains reports of the animal husbandman in charge and the agronomist and horticulturist, and a special report on the plant disease situation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Annual Report of Iowa Station, 1917 (*Iowa Sta. Rpt. 1917, pp. 37*).—This contains the organization list and a report by the director on the work of the station, including a financial statement for the fiscal year ended June 30, 1917. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of Kansas Station, 1917 (*Kansas Sta. Rpt. 1917, pp. 50*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, and a report of the director summarizing the work and publications of the station. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Agricultural Experiment Station (*Mo. Bul. Ohio Sta., 3 (1918), No. 12, pp. 351–382, figs. 6; 4 (1919), No. 1, pp. 32, figs. 10*).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 12.—Growing Clover for Soil Improvement, by F. E. Bear; How Much Manure May Be Produced on a Farm? by C. G. Williams; Weather Conditions During the Season of 1918, by C. A. Patton; and Are There Barberry Bushes on Your Farm? by D. C. Babcock.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 9, pp. 121–136, figs. 4*).—This contains brief articles on the following subjects: Poultry Diseases, by W. T. Johnson; Concerning Milk Costs and Prices, by F. W. Rader (see p. 376); Home-grown Seed, by E. B. Stookey (see p. 340); Improved Roller Curtain for Commercial Poultry House, by G. R. Shoup (see p.); Controlling Aphis on Farm Crops by the Use of Ladybugs, by A. Frank; and Propagation by Hardwood Cuttings, by L. Y. Leonard (see p. 340).

NOTES.

Connecticut State Station.—Lieut. C. B. Morison has resumed his work as chemist.

Nebraska University and Station.—An animal pathology and hygiene laboratory is under construction. This will be a two-story building about 50 by 80 ft. The unit now being built will contain laboratories and classrooms, and two other units will ultimately furnish hospital facilities and quarters for a large number of small animals for laboratory work.

Dean E. A. Burnett has been given leave of absence for educational work with the Y. M. C. A. Overseas Educational Campaign. During his absence W. W. Burr, who has been appointed assistant director of the station, will serve as acting dean and director.

E. R. Davis and J. W. Rovner, assistant professors of animal husbandry and dairy husbandry, resigned March 1, the former to operate a farm and the latter to take up graduate work in medicine. W. H. Brokaw has been appointed director of the agricultural extension service vice C. E. Gunnels, whose resignation has been previously noted.

Frank W. Judson and John R. Webster, of Omaha, have been elected regents of the university vice Frank L. Haller and Victor G. Lyford.

Nevada University and Station.—A large number of feeding experiments conducted during the summer and autumn with various plants have demonstrated the poisonous character of several plants not heretofore known to be dangerous. The problem of handling sheep and cattle on the public domain range to avoid losses from poisonous plants is concluded to be much more complicated than it first appeared.

A new board of control has been elected consisting of A. E. Cheney, chairman, Miles B. North, and Mrs. W. H. Hood, all of Reno; Walter E. Pratt, of Goldfield; and B. F. Curler, of Elko.

North Carolina Station.—A series of spraying experiments of much interest was recently completed. These experiments demonstrated that homemade Bordeaux mixture plus an insecticide will control potato blight and beetles to a better degree than other mixtures which have been used, an increased yield over the check plat of 50 per cent being obtained. Experiments have been conducted both in the mountains on the one-crop, and in the eastern truck region on the two-crop system. It is announced that the results have been widely disseminated and adopted by potato growers.

Work recently completed in the mountains of western North Carolina showing the advantage of winter pasturing of beef cattle is reported to have greatly encouraged the raising of beef cattle in that section. Many farmers are now taking steps to secure pure-bred stock, and legislation is being sought prohibiting the roaming at large of scrub sires and otherwise encouraging the greater use of pure-bred sires.

Clemson College.—Guy West Wilson has been appointed associate professor of botany and plant pathology.

American Association for the Advancement of Agricultural Teaching.—The ninth annual meeting of this association was held in Baltimore, Md., January 7. G. A. Works, president of the association, discussed briefly some of the problems that confronted it, stressing those arising from the operations of the Smith-Hughes Act.

The general theme for the meeting was the training of teachers for vocational agriculture, with special prominence being given to the emergency teacher training courses. W. F. Lusk described the emergency courses conducted in the New York State College of Agriculture. The requirements for admission to these courses were ample farm experience, successful teaching experience, at least two years of educational preparation beyond the high school, and exemption or deferred classification under the Selective Service Act. Each course extended over a period of nine weeks, including the week of the annual conference of agricultural instructors held at the college. A rather extensive program of studies was given covering the principal phases of agricultural subject matter, based essentially on the subject matter of the corresponding high school course, with some attention to the problems of teaching. Two general weaknesses of those taking this course were brought out, one growing out of their limited agricultural information and the other a tendency to adhere to academic rather than the vocational standards of teaching. For those men who are now teaching, a further course for the coming summer is planned which will bear directly upon subject matter omitted in their previous training.

Verde Peterson continued the discussion by outlining briefly the emergency summer course conducted at Clemson College. Men taking this course were required to have been reared on a farm, to be college graduates with several years of successful teaching experience, and in most cases to have studied and taught some elementary agriculture. A six-weeks' course was given in soils and fertilizers, field crops, materials and methods for teaching agriculture, and principles of agricultural education. Agricultural college graduates who had been teaching most of one year took four weeks of this course, chiefly in soils and crops. The plans for the coming summer include a similar course in animal husbandry to prepare for the second year's teaching work.

The emergency training course at the Georgia State College of Agriculture, discussed by J. T. Wheeler, extended over a period of three months covering the entire field of agriculture. Requirements for admission to this course were at least a four-year high school course, farm experience equal to being reared on the farm, and successful teaching experience.

Dean Alfred Vivian reported that two distinct plans were tried at Ohio State University. One group of men were agricultural college graduates, but without any methods training. These men were given three weeks' training in methods with uniformly successful results. Another group were graduates of arts colleges and had taken some work in agriculture. This group was given an eight weeks' course in farm crops and horticulture and a course in vocational agricultural methods. The results of the work of this group have not been as successful as the first because of the failure to grasp the vocational idea of teaching.

In the general discussion that followed it seemed to be the consensus of opinion that these emergency courses in teacher training would need to be continued for some time to meet the increasing demands for vocational teachers, and until the agricultural colleges could furnish through their regular courses an adequate supply of trained teachers.

R. W. Stimson considered the problem of teacher training in service. He discussed the type of man who could make good as an agricultural teacher and the type of man who is needed as the itinerant teacher trainer, and also the program of teacher training itself, which he said is the project method of teaching teachers how to teach agriculture while they are teaching. He gave a description of this plan as worked out in Massachusetts.

J. T. Wheeler, in a paper on Improvement of Teachers in Service, discussed the purpose or aim, the organization of subject content, outlines of a suggestive plan, and supervision and stimulation of improvement work. He defined the aim of improvement of teachers in service as to bring to the teacher a realization of his problems of instruction, to get him interested in solving these problems, to arouse a community interest and spirit in his work, and to inspire him to a high professional attitude.

C. D. Jarvis, of the U. S. Bureau of Education, took up the Organization of Teacher Training in Agriculture. The basis of this paper was a questionnaire sent to the instructors in teacher training in all the colleges of agriculture and to the officer in charge of the agriculture work in ten State departments, and dealt with facilities for practice teaching, teacher training while in service, certification of teachers, and relationship between teacher training and other educatonal activities of the State.

The first year under the Smith-Hughes Act was reviewed by L. S. Hawkins of the Federal Board for Vocational Education. Information was presented as to the number and type of schools together with funds expended and available, as well as some of the problems confronting the vocational teaching system and the possibilities in future work under this act.

The standing committee on relation of general science to agriculture made a report based upon the study of 100 schools selected from all parts of the United States. The committee on relations of the association to the National Society for the Promotion of Vocational Education reported that satisfactory relations had been established, and that the association would be henceforth represented by a section in the meetings of the National Society. A progress report was presented by the committee on essential laboratory equipment for teaching agriculture in secondary schools.

Officers elected for the ensuing year were as follows: President, Dean Alfred Vivian; vice president, F. E. Heald; secretary-treasurer, Dr. C. D. Jarvis; and additional members of the executive committee, G. A. Works, R. D. Maltby, and W. G. Hummel.

New Journals.—*The Journal of General Physiology* is being published by the Rockefeller Institute for Medical Research, with Drs. Jacques Loeb and W. J. V. Osterhout as editors. Its field is announced as "the explanation of life phenomena on the basis of the physical and chemical constitution of living matter." The initial number contains the following articles: On the Dynamics of Photosynthesis, by W. J. V. Osterhout and A. R. C. Haas; A Method of Studying Respiration, by W. J. V. Osterhout; The Antagonism Between Thyroid and Parathyroid Glands, and Further Proof of the Existence of a Specific Tetany-Producing Substance in the Thymus Gland, both by E. Uhlenhuth; Difference in the Action of Radium on Green Plants in the Presence and Absence of Light, by C. Packard; Amphoteric Colloids, I, and The Law Controlling the Quantity of Regeneration in the Stem of *Bryophyllum calycinum*, both by J. Loeb; A Theory of the Mechanism of Disinfection, Hemolysis, and Similar Processes, by S. C. Brooks; Reversal of Reaction by Means of Strychnine in Planarians and Starfish, by A. R. Moore; Light and the Muscle Tonus of Insects: The Heliotropic Mechanism, by W. E. Garrey; and Lutear Cells and Hen-Feathering, by Alice M. Boring and T. H. Morgan.

The *Landswoman* is being published in London as the journal of the Land Army and the Women's Institutes. The initial number describes various phases of these enterprises.

The title of the *Journal of the American Association of Instructors and Investigators in Poultry Husbandry* has been changed to *Poultry Science*.

EXPERIMENT STATION RECORD.

CONTENTS OF VOL. 40, No. 5.

SUBJECT LIST OF ABSTRACTS.

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[1] On leave of absence for military service.

METEOROLOGY.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

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ECONOMIC ZOOLOGY—ENTOMOLOGY.

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LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

U. S. Department of Agriculture.

U. S. Department of Agriculture—Con.

U. S. Department of Agriculture—Con.

[1] Printed in scientific and technical publications outside the Department.

U. S. Department of Agriculture—Con.

EXPERIMENT STATION RECORD.

VOL. 40. APRIL, 1919. No. 5.

Gradually the men who have been out to war or on special war work are returning and taking up their accustomed places in the stations. The ranks are being filled again and the stations are settling down to normal conditions. But the experience of the war period will remain with the men and with the institutions. Neither can entirely escape its conscious or unconscious influence, for it introduced a new situation, brought a quickened sense of responsibility, and aroused a new idea of service. To a certain extent the return of the workers marks a new epoch for them and for their institutions.

The stations have been represented in nearly every branch of the military and civilian service. Many of their employees were in uniform, often with commissions, others in civilian posts, all largely selected for duties for which their special fitness qualified them. Many were assigned to the sanitary and chemical warfare services, the Ordnance Department, the Signal Corps, and other noncombatant branches. Others were enrolled in Red Cross work to aid in organizing production abroad or otherwise, and in Y. M. C. A. work of various kinds, including educational work toward the last. A considerable number were associated with the National Research Council, others held responsible positions in the State councils of defense, the Federal and State food administrations, on production committees, and the like.

As a whole, the representation was a large and varied one, including specialists in practically every branch of agricultural science. It made a noticeable impression on the ranks of the station forces, and a considerable share of those who remained at home were pressed into various activities not ordinarily in their field. The latter found that it was not necessary to associate themselves with some new organization or to go to some other locality or country in order to render useful service to the country in time of war and recovery from it. If they were alert and ready, there were important things to be done near-by; and the close association with the agricultural colleges around which so many war activities were organized gave exceptional opportunity for getting into these enterprises.

It was inevitable that the losses of personnel and the assignment of unusual duties should have its effect upon the regular work of the stations, but they could well afford to lend their forces temporarily for such a cause, and it is a matter of pride that they could take the part they did in addition to the regular contributions made in their particular field.

Those men who have been out from the stations on special war service have been brought into contact with organized effort on an extensive scale, and have seen the strength of union in accomplishing things that needed to be done quickly and effectively. They have taken part in team work and enterprises where the parts were coordinated. They have been doing hard things involving intensive application to a problem or an undertaking that must be accomplished. They have felt the impelling force of necessity and seen the remarkable things accomplished under it, even in research.

This is a new experience for research and for research workers. Men were brought together and set to work with definite ends in mind, and the individual was to an extent engulfed in the general undertaking. He learned to subordinate self. And the success which followed the employment of existing knowledge and the search for new information to meet new needs was one of the distinct accomplishments of the war.

This war work of the men of science has been described by one of them as "participation in a big collective undertaking where the end sought was a victory from which, in all probability, one would derive no calculable private reward whatsoever. . . . It signified that for the time being one had forgotten selfish ambitions and become absorbed in a new and bigger thing. . . . It proved the love of doing well something that one could put one's heart in; the love of expending energy with an undivided conscience, and with the approval of one's fellows. It was the sudden consciousness of the new comradeship springing from coordinated and enthusiastic effort; above all it was a sense of scope and power."

To many it was a first experience with the real meaning of emergency. They were under the stern compulsion of getting things done. They found that their experience and training had given them capacity to meet an emergency, to think to a purpose, and to carry their thinking through to the final end. The emergency was both a profound and a common one. "Being a profound emergency it has forced men to go back even to first principles in their thinking; and being a common emergency it has forced men to meet it together in thought and in action. So that the effect on men's minds has been to emancipate them from the trivial and to redeem them from the selfish."

These things have given a consciousness of man's power, of the service of his vocations to mankind, of almost limitless ability with close application and in association with others to meet extraordinary emergencies. They have fired the imagination, and especially they have given a passion for the problems which lie close to human life and welfare.

Something of these impressions has been shared also by those who remained at their posts and were in contact with or under the spell of the agricultural production campaigns and other civil activities for combating the common enemy. The situation finally took hold of all mankind. It could hardly be escaped. It became a matter of pride to be stirred by it and of zeal to take even a small part in it. It was everybody's war.

What then may be the effect of these experiences on the station forces? What will be their reaction to the problems which lie within their special fields? What will be their standards in selecting problems in these fields for individual study? They have seen the interdependence of nations and of human beings; they have seen how often the problems make it necessary to cut across department and division boundaries of science and organize the work around the subject and the purpose. Will this make them less individualistic and isolated? Will it broaden their view of the common interest in problems and the opportunity to draw workers together in closer association? Will the need for strengthening our great basic industry through teaching based on investigation appeal to them with new force; and will the fact that the research side must depend on a relatively small group of workers emphasize the responsibility of the individual to make himself and his work as efficient and productive as possible?

The progress of knowledge is a necessarily slow process. Results can rarely be rushed or made to order, and safety is usually more important than haste. Investigation in normal times has not been carried on under the spur. But a new realization of the vital importance of science in food production and of the responsibility resting on a limited group of workers may prove an unusual stimulus.

Now that the days of war service are over those who have taken part may find that their thoughts have been turned more largely to practical ends, and they may feel that these are not more sordid or ignoble in peace than in war. They may be given a larger aptitude for living problems. They may come to see that not only war but life itself is made up of perpetual emergencies, and that "the emergencies of to-day like those of yesterday are both profound emergencies and common emergencies."

When a man catches the real spirit and significance of agricultural research—the reach of its possibilities, he sees, as Dr. E. J. Russell has said, "the noble side of the subject and realizes that it is not merely a way of making money but of getting all the best out of life. When he does that he becomes an enthusiast, and to make an enthusiast is emphatically a great achievement."

It is conceivable that to those who have been away working under the stress of emergency the station work may appear easy-going in some respects, and lacking in the urge of necessity. They may note a not infrequent failure of dependent parts of an investigation to keep in step, due to defect of organization or miscalculation; and they may be impressed at times with a lack of force in the attack, or a failure to bring to conclusion long continued studies which are essentially finished as far as actual progress is concerned. The contrast with their recent experiences may bring these things out more vividly than formerly. Doubtless they will see opportunity for improvement in certain respects, even in their own work—for concentration on a smaller number of subjects, more energetic attack, keeping of parts of an undertaking up to date, and studying the trend of results so that the work may be live and actually progressive, and not mainly a series of repetitions.

And finally, they may carry back a quickened sense of their relations to the organization of which they are constituent parts and in whose success as a whole they should be vitally concerned. Occasionally a man has seemed more concerned over his "reputation as a scientist" than he is over the reputation of the station he is associated with, or its measure of success in solving the problems of agriculture. The efficiency of a station is the sum of the efficiency of its workers, measured by the product and its relations to matters which are vital.

As to the stations themselves, what may be expected of the effects of this new experience? Nearly all of them have shared in it. Will they carry the influence of these things into the future?

A research institution is thought of as a particularly stable type having its fixed purposes and lines of endeavor, and hence less subject to change or influence from current affairs than some other classes of institutions. But practically every class of research enterprises, even such as are removed from direct responsibility to the public, and every branch of pure as well as applied science, was drawn under the influence of the great conflict. The desire to serve in a practical way pervaded them. There are indications that all science has been more than temporarily affected. It has itself been stimulated and humanized. It has been said that research must mean a different thing hereafter, and that the search for truth for truth's sake must now be raised "to an inspiration with a very passion for truth for humanity's sake." Science for service must continue to be a watchword.

As permanent research institutions the stations must have fixed policies in relation to their purposes and the means of carrying them out. But as public institutions they naturally can not fail to be responsive to the conditions and influences about them. Their relations to the whole agricultural industry have been materially strengthened and clarified. They have shared in the popular acknowledgment of science in the war and the broadening realizations of what it means to human welfare. It would not be surprising, therefore, if the recent experiences permanently affected the stations and their management in the new régime.

It is clear that more will be expected of these institutions, and that an aggressive policy regarding their future work must be followed if they are to keep at the head of the procession and in advance of the demands upon them. The working program must be a discriminating one, for judgment must determine to what the limited resources are to be devoted; and it will need to have quite definitely in mind the channels where new information is most urgent. With all possible latitude toward individual preference, therefore, the needs of the industry the stations serve will necessarily be a prime consideration. This will require close contact with the situation and a clear vision, and it will result in a working plan suited to meet local problems and requirements.

The demand is for information which will be practical, but naturally this can not be construed too narrowly. There is a difference between studying a subject for the use the knowledge of it may be in practice, and studying it from a purely practical point of view, as there is also from studying it with no thought or reference to the use that may come of it, in the abstract view that it is desirable to know all things. Even though the last is true, some things are more desirable to know than others at this present stage, and promise a more important and far-reaching bearing on agriculture. Discriminating selection will determine the subjects to be taken up for intensive study, and here special preference may give way to the end sought to be served.

Now as ever the stations must stick to the big things. They must study the agricultural problems and questions in their broader aspects as they relate to general principles and underlying facts. They can deal rarely with purely individual or localized conditions unless these represent a quite generalized situation. The extension service will increasingly meet the needs of A, B, and C's farm and discover where special studies are required.

None the less, the stations must themselves interpret the results of their work in practical terms. They can not leave it at the laboratory or research stage, as a technical scientific contribution for some one else to work out the application of at some future time. They will need to bring it down to the practical stage and the place it has in the affairs of agriculture. This implies carrying the study to a point which takes full cognizance of actual conditions in practice, subjects the results to test, and proves that they have a place and a value there. This is needed quite as much as ever to prove the soundness of conclusions and suit the product for wider dissemination through the extension service.

This interpretation is a large task, often involving somewhat different methods from those employed in the basic investigation, but it is not trivial or unworthy of the most skilled investigator. It may be made just as scientific as the acquiring of the facts, and its successful performance may mark the difference between a theorist and a practical investigator in science. No one else will interpret one's work with the same skill and force as the originator if he has the understanding of practical affairs which he needs.

The larger function of the station experts does not end with making substantial contributions to science, even agricultural science, but it seeks through them to make science practical and practice scientific. Hence specialists need not only to know their science but to vizualize its application to useful ends. It is not what they do and learn that makes agricultural investigation valuable to the industry; it is the use they put the things to that are done and learned. It is a relating of the things done and the thinking connected with them to the actual conditions of practical farming. Time to think is one of the important requirements in the work and one too often cut short.

Research from its nature involves considerable negative and inconclusive work—of prowling in blind alleys. But it is important to recognize when the end of the blind alley has been reached. There should never be any hesitation to abandon a line of procedure or a method after it has been found incompetent or inadequate, and the progress of the investigation should be followed so closely and so critically that ineffectual efforts will be detached. The results need to be studied as they are acquired, not only with reference to themselves but to the light they are shedding and the efficiency of the method in effecting progress. This would avoid long continuation of projects which are marking time rather than making constructive advancement, or protracted efforts which in the end are abortive.

It is recognized, of course, that the very nature of research is experimental—the following of hypothetical suggestions and theories, but its very essence is the testing of these suggestions and theories in the light of the results and scrapping them as soon as their fallacy or weakness develops. Productive investigation needs to be constantly of the nature of inquiry, and each step examined as to what it is contributing or bids fair to add. This will give a basis of security to the work. In other words, it will prevent drifting, is one of the most serious criticisms that can be passed on a pi experimental work. If station workers of all classes could hav pressed upon them that drifting is inexcusable and intoleral would strengthen both the experimental and the research activ It would result in greater concentration as well as in more inter and critical study. If the individual himself fails to recogniz there should be a way to detect it and effectually discourage it.

There is an important place for critical examination of the w of the stations in particular lines—for unbiased critical study committees of experts into the soundness of the procedure, and es cially of the problems as they are organized. Such a wholeso broad-minded criticism of the fundamental viewpoint on comp questions and of the method of their approach and attack is n largely lacking. It might serve to save effort and economize fu if conducted and accepted in the proper spirit.

The war has disclosed some deficiencies and gaps in the exist fund of information, as was to be expected. The disclosure of th as well as the nature of inquiries which arose will naturally lead a taking account of stock, and to new plans for amending or exte ing the lines of investigation. As a rule, however, the stations not in position to expand the range of their activities with th present funds, and some are even under the necessity of restrict it. The action of the legislatures in several of the States in incr ing the appropriations to the stations is encouraging and reflect appreciation of the situation.

The Secretary of Agriculture has pointed to the rôle of the A ican system of agricultural education and research in helping to the war. He has emphasized the advantage of entering the with this well organized and highly efficient system, and declar "not extravagant to say that this Nation had agencies workin the betterment of rural life and agriculture which in point o sonnel and effectiveness exceed those of any other three nations world combined." There was no suggestion, even during the pr of the war, of a cessation of effort to acquire information would make American agriculture more resourceful and ef and enable the country "to grow strong in agriculture while I and especially the Central Powers, was growing weak."

The war has been a great demonstration of the strength of ican agriculture, and to those who stop to think it has been a lesson in the means by which it has grown strong. It is an of the country's strength that our research and experiment be continued with so little abatement in such a time of stres recognition of its necessity is a sign of our progress.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A handbook of colloid chemistry; the recognition of colloids, the theory of colloids, and their general physicochemical properties, W. OSTWALD, trans. by M. H. FISCHER (*Philadelphia: P. Blakiston's Son & Co., 1919, pp. XVI+284, pl. 1, figs. 63*).—This is the second English edition of this book, previously noted (E. S. R., 34, p. 801). A few corrections in quotation and formulas have been made, and several paragraphs by E. Hatschek have been added on important advances in colloid chemistry, particularly those dealing with mechanical properties of colloids.

Industrial and manufacturing chemistry.—I, Organic, G. MARTIN ET AL. (*London: Crosby Lockwood & Son, 1918, 4. ed., rev. and enl., pp. XX+744, pls. 10, figs. 246*).—In this revision of the book previously noted (E. S. R., 34, p. 801) the various sections have been brought up to date. The new material includes a short description of the cracking of oils, a discussion of the modern nitrocellulose varnishes and dopes, and a description of modern methods of bleaching linen yarns. A new section on the tobacco industry has been contributed by S. E. Hodgkinson.

Note on trypsin, and a new method of purifying enzyms, J. T. WOOD (*Jour. Soc. Chem. Indus., 37 (1918), No. 23, pp. 313T–315T*).—A simple method of purifying enzyms is reported, which consists essentially in soaking pieces of Swedish filter paper in the impure enzym solution and drying quickly in hot air. When the paper thus treated is placed in water, the enzym is said to dissolve quickly to a perfectly clear solution, while the colloidal matter with which it is associated adheres firmly to the paper. The liquid should be filtered in from 15 to 20 minutes.

While the author does not consider this preparation to be a pure enzym, its strength and purity are said to be greatly increased.

Preparation of mediums: A new hydrogen-ion concentration method, E. STRONG (*Jour. Amer. Med. Assoc., 72 (1919), No. 6, p. 413*).—The adjustment of mediums to the alkalinity of the human tissues is accomplished in the method described by the use of phenolsulphonephthalein, 1 cc. of which is added to a liter of the broth medium. About 5 cc. of the medium is poured into each of two test tubes. To one tube a drop of any acid solution is added and to the other a drop of sodium hydroxid solution. To the remainder of the medium is then added, drop by drop, acid or alkali until the color of about 5 cc. poured into a third test tube is between the color of the other two tubes, representing a hydrogen-ion concentration of pH=7.5.

The following advantages of this method are pointed out: No standard solution is used. Any tube that changes reaction can be told at a glance and discarded before inoculating. Growth of all organisms is more rapid and luxuriant, always producing a color change. Much time is saved in the preparation of the medium.

Pressed yeast and yeast extract in the preparation of media, F. I[illegible] (*Deut. Med. Wchnschr., 44 (1918), No. 7, p. 186*).—It is stated that dried y[illegible] or yeast extract makes a satisfactory substitute for meat extract in the preparation of culture media and in the regeneration of used agar.

An efficient laboratory funnel for filtering neutral liquids, especially the volatile organic solvents, T. B. ALDRICH (*Jour. Indus. and Engin. Chem., 11 (1919), No. 2, pp. 139, 140, figs. 2*).—A funnel is described in which the filter paper is clamped securely between two plates by a screw thread so that it can not lift even when the filtration is interrupted and the solvent evaporates. The filtration is said to be more rapid and complete than with the ordinary or Buchner funnel.

A new indicator of vegetable nature, C. MARINI (*Ann. Chim. Appl.* [*Rome*], *10 (1918), No. 1–4, pp. 32–36; abs. in Chem. Abs., 13 (1919), No. 1, pp. 17, 18*).—An alcoholic extract of myrtle berries is used as the basis of an indicator which is said to be more delicate than litmus. The indicator is green in alkaline solution and carmine red in acid.

Action of iodin on hypophosphorous and phosphorous acids. Application to the determination of hypophosphites and phosphites, BOYER and BAUZIL (*Jour. Pharm. et Chim., 7. ser., 18 (1918), No. 11, pp. 321–334, figs. 4*).—The action of iodin on hypophosphorous and phosphorous acids is discussed, and modifications of the usual iodometric methods for the determination of these acids are described which are said to be applicable to their quantitative separation.

In the determination of hypophosphorous acid by iodin in an acid medium, the authors consider it unnecessary to carry the oxidation beyond the phosphorous acid stage. It was found that with a pure hypophosphite the iodin required in an acid medium is exactly half that required in a medium alternately acid and alkaline. Deviation from these proportions indicates the presence of phosphites, which can be determined by the amount of deviation.

A study of the influence of sodium hydroxid, sodium carbonate, and sodium bicarbonate in equimolecular amounts upon the oxidation of sodium phosphite by iodin showed that the rapidity of the oxidation is in inverse ratio to the strength of the alkali. The reaction is complete in 30 minutes with sodium bicarbonate and in 3 hours with neutral carbonate, while with sodium hydroxid it is almost negligible even after 6 hours. The details of the methods are as follows:

Determination of hypophosphorous acid.—One gm. of the substance is dissolved in distilled water and made up to 100 cc. To 10 cc. of this solution are added 10 cc. of sulphuric acid (1:4) and 30 cc. of N/10 iodin. The flask is securely stoppered, left in a dark place for from 8 to 10 hours, and the solution then titrated with N/10 hyposulphite.

Determination of phosphorous acid.—To 10 cc. of phosphite solution prepared as above are added 10 cc. of a 5 per cent solution of sodium bicarbonate and 20 cc. of N/10 iodin. After standing for 2 hours in a closely stoppered flask, 10 cc. of 10 per cent acetic acid is added and the solution titrated with N/10 hyposulphite.

In a mixture of salts of the different acids of phosphorus, the hypophosphites and phosphites are determined separately, and the phosphates then determined by precipitation as magnesium-ammonium phosphate. The results obtained in this way can be checked by oxidizing another portion of the substance with nitric acid and determining the orthophosphoric acid thus formed.

Volumetric estimation of the sulphion, R. HOWDEN (*Chem. News, 117 (1918), No. 3063, p. 383*).—A rapid method for the estimation of the SO_4 ion is outlined which is based on the decomposition of soluble alkaline sulphates by insoluble barium carbonate, generating alkaline carbonate which can be estimated by alkalimetric titration. Heavy metals or calcium must first be precipitated by an excess of sodium carbonate and filtered off and the solution made exactly neutral, using methyl orange as an indicator.

While the method is claimed to give only approximate results, the errors are mainly compensatory, due to the presence of small amounts of both Ba and SO_4 ions.

Determination of hypochlorites and chlorates in the same solution, I. M. KOLTHOFF (*Pharm. Weekbl., 55 (1918), No. 37, pp. 1289–1295*).—The hypo- chlorites were determined as follows:

To 25 cc. of N/10 As_2O_3 solution are added 5 cc. of 4 N acetic acid and 3 drops of a 2 per cent solution of methyl red. The hypochlorite solution to be test is run in from a burette until the solution is decolorized. The volume of hypo chlorite required contains 88.75 mg. of active chlorin.

The chlorates are determined by adding to the clear solution obtained ab 25 cc. of 0.1N As_2O_3 and 20 cc. of concentrated hydrochloric acid, heating for minutes, and titrating the excess of As_2O_3 with N/10 potassium bromate, us indigo as an indicator. One cc. of As_2O_3 consumed is equivalent to 1.4 mg. ClO_3 or represents a loss of 3.45 mg. of available chlorin.

The method is said to be applicable to the determination of the strength chlorin water.

A convenient and efficient digestion apparatus for the determination crude fiber, H. D. SPEARS (*Jour. Indus. and Engin. Chem., 11 (1919), No. 2, 140, 141, figs. 2*).—In the apparatus described, which is said to have been satisfactorily for several years in the feeding stuffs laboratory of the Kentuc Experiment Station, the reflux condensers employed in the official method the determination of crude fiber are substituted by a series of round flasks w intake and outflow tubes, connected by rubber tubing through which flows water for cooling. The flasks are about 2¼ in. in diameter, so as to rest pr erly in the mouth of beakers 2$\frac{7}{8}$ in. in diameter, 6 in. in height, and of ab 375 cc. capacity, which are used as the digestion containers. The flasks are pended over the beakers by loops of sheet iron or zinc.

While there may be a slight loss of water from evaporation during the boil on account of the condensers not being attached to the digestion containers tight joint, it is believed that the concentration of the solvents thus brou about is not enough to cause an appreciable error, as is shown by a table duplicate determinations made with the apparatus.

The detection of vegetable gums in food products, A. A. COOK and A. WOODMAN (*Jour. Indus. and Engin. Chem., 10 (1918), No. 7, pp. 530–533; abs. Jour. Soc. Chem. Indus., 37 (1918), No. 17, p. 527A*).—The procedure consis brief, in removing the protein of the food mixture by heating with acetic and tannin, and then precipitating the gums from the filtrate by acetone. precipitate is dissolved in acetic acid, and ammonia is added to remove soluble phosphates. The pure gum is then precipitated by alcohol.

The possible maximum vitamin content of some Philippine vegetab H. C. BRILL and C. ALINCASTRE (*Philippine Jour. Sci., Sect. A, 12 (1917), No pp. 127–132*).—A method based upon the property of pyridin derivatives yielding approximately three-fourths of their nitrogen by the Kjeldahl me has been employed for determining the relative amounts of vitamins in var Philippine vegetables.

A portion of the fresh vegetable was dried at a low temperature, and 100 of the finely ground material was thoroughly extracted with methyl alc The alcohol was evaporated at a low temperature and the residue taken u water and filtered. After acidifying the filtrate with sufficient sulphuric a to make a concentration of 5 per cent, phosphotungstic acid was added to precipitate the antineuritic substance. The precipitate, washed with sulphuric acid and with alcohol and dried in a desiccator over sulphuric acid, was used for nitrogen determinations by both the Kjeldahl and Dumas methods. The difference in the values of the vitamin in the original samples, calculated from the Kjeldahl and the Dumas nitrogen, is considered to represent one-fourth of the true vitamin content.

The values for the vitamin content of Philippine vegetables determined by this method are in general higher than the results found by Funk (E. S. R., 30, p. 508) for milk, but are considered to have comparative value.

The formation of ammonia and amins in canned sardines during storage, F. C. WEBER and J. B. WILSON (*Jour. Indus. and Engin. Chem., 11 (1919), No. 2, pp. 121–126*).—This is a report of investigations conducted during the seasons of 1913 to 1916 of the sardine industry of Maine by the Bureau of Chemistry of the U. S. Department of Agriculture.

In following the degree of spoilage of the fish, ammonia determinations were made by titration and by nesslerization of the volatile alkaline materials. Variations in the results obtained by the two methods led to the conclusion that the packed goods on standing undergo a change with the liberation of amins. A comparison of the amounts of ammonia and amins in old packs of sardines and in various experimental packs showed that directly after processing the volatile alkaline material contains practically two-thirds ammonia and one-third alkyl amins. During storage at room temperature, the proportions appear to change slowly, until after a long period of standing the total alkaline material contains about equal amounts of ammonia and amins. When stored at a temperature just above freezing, the total quantity of volatile alkaline material produced is much less than that produced when stored at ordinary temperatures. This difference is considered to be an indication that these changes may be caused in some instances by bacterial growth. The amins consisted chiefly of triamin with small quantities of monamin and diamin. On prolonged storage the monamin is apparently converted into diamin.

The authors consider that it is doubtful whether the quantities of ammonia and amins in the canned product have any direct relation to the keeping qualities of sardines, although it has been shown that they have a decided bearing upon the detinning of the interior of the cans.

Microscopic color reaction for wheat, rye, and potato starch in the same sample, E. UNNA (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 3–4, pp. 49–53, pl. 1*).—The solutions used for staining are as follows: (1) Water blue-orcin mixture, consisting of 1 part water blue, 1 part orcin, 5 parts glacial acetic acid, 20 parts glycerin, and 50 parts 86 per cent alcohol, made up with water to 100 parts; (2) 1 per cent alcoholic solution of eosin; (3) 1 per cent safranin solution: (4) 0.5 per cent potassium bichromate solution.

The flour, after preliminary treatment with 3 per cent phenol solution, is washed and a small portion allowed to dry on a microscope slide. The slide is then treated for 10 minutes with 1 gm. of the water blue-orcin mixture dissolved in 6 drops of the eosin solution. After washing with water, the slide is placed in the safranin solution for from 15 to 20 minutes, thoroughly washed again with water, and placed for from 20 to 30 minutes in the potassium bichromate solution. It is then washed with water and alcohol, dried, mounted, and examined under the microscope.

A plate is given showing the colors produced. Potato starch is colored red, with a concentric blue ring; wheat starch pink, with the surrounding gluten protein blue; and rye starch a brownish yellow.

The true composition of sugar cane molasses, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 35 (1917), No. 4–6, pp. 118–129*).—The author points out the errors in the usual methods for determining the composition of sugar cane molasses, and outlines a procedure which is claimed to overcome these errors.

The determination of carbon dioxid and carbonates in baking powders, G. RUPP and E. WOHNLICH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 5–6, pp. 101–110*).—For the examination of baking powders containing calcium carbonate the procedure given below is suggested, and suitable methods for each determination are described.

The total carbon dioxid is first determined, a sample of the baking powder is then heated in water suspension and filtered, and the carbon dioxid determined in both filtrate and residue. The carbon dioxid of filtrate and residue subtracted from the total carbon dioxid gives the active or effective carbon dioxid of the baking powder.

A new formula for the calculation of added water in milk, L. J. HARRIS (*Analyst, 43 (1918), No. 511, pp. 345–347; Chem. News, 118 (1919), No. 3072, pp. 99, 100*).—The author has deduced a formula by which the percentage of added water is calculated on the assumption that the original milk contained the minimum of both fat and solids-not-fat (3 and 8.5 per cent, respectively). If N and F equal, respectively, the percentage of solids-not-fat and the percentage of fat in the milk-water mixture, X, or the percentage of milk of the minimum standard in the original mixture, is determined from the formula

$$x=\frac{10,000\ N}{3N+8.5\ (100-F)};$$

100—X then equals the required percentage of added water in the milk. The probable amount of added water may be found by substituting average values for fat and solids-not-fat in place of the figures 3 and 8.5.

The formula is considered by the author to be more accurate than the Richmond rule, in that it introduces a compensation for any deficiency which may have been caused by the rising of cream and the consequent depression of solids-not-fat in the creamery fraction.

The determination of the Reichert-Meissl number according to the method of Bondzynski and Rufi, J. PRESCHER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 3–4, pp. 67–69*).—Slight modifications of the method of Bondzynski and Rufi[1] are described, in which the soluble acids obtained by the saponification of the butter fat and subsequent treatment with H_2SO_4 are filtered from the insoluble acids and titrated without distillation. In place of an alcoholic KOH solution, used in the original method, the author employs a 15 or 16 per cent water solution. The excess of KOH, after saponification is complete, is titrated with N H_2SO_4. The insoluble acids are then filtered off and the soluble acids in the filtrate titrated with N/10 NaOH, using phenolphthalein as an indicator.

The oxidase reaction for the detection of rancid fats, J. PRESCHER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 7–8, pp. 162–166*).—The author reviews the literature on oxidase reactions, and reports an investigation proving the reliability of the method of Vintilescu and Popescu, previously noted (E. S. R., 36, p. 109), for the detection of rancidity of fat by the guaiac reaction.

The presence of acetylmethylcarbinol in saccharin sorghum silage, W. G. FRIEDEMANN and C. T. DOWELL (*Jour. Indus. and Engin. Chem., 11 (1919), No. 2, pp. 129, 130*).—Samples of saccharin sorghum silage were found to contain a volatile reducing substance, considered from its osazone to be acetylmethylcarbinol, previously found by Balcom (E. S. R., p. 112) to be a constituent of

[1] Ztschr. Analyt. Chem., 29 (1890), pp. 1–6.

cider vinegar. It is pointed out that since acetic acid is formed by the oxidation of acetylmethylcarbinol, the Duclaux method for the determination of alcohols is unreliable for the determination of ethyl alcohol in saccharin sorghum silage. If acetylmethylcarbinol is found to be present in the fresh silage made from field crops, the authors consider that it will be necessary to modify the methods for the determination of sugars and of alcohols in silage.

Modifications of Benedict's and Folin's quantitative sugar methods, H. D. HASKINS (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 303, 304*).—The author has substituted sodium thiocyanate for potassium thiocyanate in the Benedict method (E. S. R., 25, p. 15) for determining sugar in urine and in Folin's modification of this method (E. S. R., 38, p. 614). Benedict's solution prepared with the substitution of equivalent amounts of sodium thiocyanate for the potassium salt proved to be a perfect substitute, but in the preparation of Folin's mixture it was found that correct titrations could be obtained only by reducing somewhat the amount of sodium thiocyanate and using periods of boiling half as long as those originally recommended.

New titration method for the determination of uric acid in urine, J. L. MORRIS (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 231–238*).—A volumetric method for the determination of small amounts of uric acid in urine is described which is based upon the precipitation of uric acid as the zinc salt and a single direct titration with permanganate in a solution made alkaline with sodium bicarbonate. The end-point used is the blue starch iodid color. The procedure, which requires from 30 to 40 minutes for the complete determination, is said to be entirely satisfactory for urine, and to give with the usual blood filtrate obtained by precipitating proteins with dilute acetic acid results agreeing with those obtained with the colorimetric method.

Detection of methyl alcohol, G. MAUE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 4–5, pp. 179–183*).—The author discusses various methods for the detection of methyl alcohol and describes the following procedure, which depends upon the use of o-dioxybenzol or its derivatives:

A few cubic centimeters of the solution to be tested are distilled, and 1 cc. of the distillate is oxidized with 1 cc. of sulhpuric acid (1:3) and 8 cc. of a 0.3 per cent solution of permanganate. At the end of 10 minutes the solution is filtered, and 20 cc. of the filtrate is mixed with 2 drops of ferrous sulphate solution and a few crystals of dioxybenzol or guiacol. After shaking thoroughly, 2 cc. of concentrated sulphuric acid is poured slowly down the side of the tube. In the presence of formaldehyde a violet red ring is formed between the two layers. With the use of guiacol carbonate and ferric chlorid in place of guiacol and ferrous sulphate, a raspberry colored ring is formed in from 3 to 5 minutes.

Both tests are applicable to the detection of formaldehyde in milk. The author considers the colored substances formed to belong to the group of aurines.

Lead in pharmaceutical zinc oxid, W. D. COLLINS and W. F. CLARKE (*Jour. Indus. and Engin. Chem., 11 (1919), No. 2, pp. 138, 139*).

A special bleaching powder for use in hot countries, T. RETTIE, J. L. SMITH, and J. RITCHIE (*Jour. Soc. Chem. Indus., 37 (1918), No. 23, pp. 311T–313T*).—The treatment found most successful in preventing deterioration in bleaching powder at tropical temperatures consists in mixing the bleaching powder, which should contain as low a percentage of moisture as possible, with one-fourth more than the theoretical amount of freshly ignited quicklime necessary to absorb the moisture. The product obtained, if suitably packed in air-tight containers, is said to withstand any temperature likely to be encountered in the Tropics. This treatment is considered specially advisable when the bleaching

powder is to be used in the preparation of eusol and other antiseptic solutio
and in the sterilization of drinking water.

Relation of dehydration to agriculture, S. C. PRESCOTT (*U. S. Dept. Ag
Off. Sec. Circ. 126 (1919), pp. 11*).—This is an address before the National As
ciation of Commissioners of Agriculture at Baltimore, Md., January 7, 1919. I
contains a brief history of food drying, with particular reference to the stim
lation of the drying industry by war, and a description of the dehydrati
systems in the United States.

The methods now in use are classified as follows: (1) The tunnel syste
which consist of long chambers or tunnels into which the prepared vegetab
are introduced on screens or racks and through which a strong current of
heated air is blown, (2) kilns, whcih consist essentially of square chambers w
sloping roofs and perforated floors, heated from below by means of stoves
furnaces, (3) the vacuum process, employing closed chambers with a large nu
ber of shelves heated by steam at greatly reduced pressure, and (4) spec
machines so arranged as to bring about a carefully regulated drying. With
first two methods, a lack of uniformity in the products is likely to result, ow
to the fact that there is not absolute control of the physical conditions. T
vacuum process is considered to give excellent results for many kinds of prod
but tends to break down the cellular structure of the material. It is poin
out that only in those processes where there is practically perfect control
temperature, humidity, and rate of air flow are products obtained which w
retain their flavor, color, and appearance, and, when soaked in water, will ret
to approximately their normal appearance.

The most important advantages of dehydration, from the standpoint of ag
culture, are considered to be the stabilization of crops and the conservation
food materials. A third factor of importance is that a better diversity of cr
can be secured, as a result of which there will be a good variety of vegetab
available to all classes throughout the year.

[Investigation on cider], O. GROVE (*Univ. Bristol, Ann. Rpt. Agr. and H
Research Sta., 1917, pp. 10–20; Jour. Bath and West and South. Counties S
5. ser., 12 (1917–18), pp. 114–124*).—Three papers are presented.

Single variety ciders and perries, 1916–17.—This contains a table compris
a list of the ciders and perries made at the National Fruit and Cider Instit
during the season 1916–17, with details as to chemical composition, etc.

A ropy cider bacillus.—The cultural and morphological characteristics
given of a bacillus found to be the cause of ropiness in some samples of ci
A study of the effect of organic acids upon the bacillus showed that they hav
pronounced preventive action upon the development of the organism. It
pointed out that if the mixture of apples used in cider making contains a s
ficient proportion of sharp apples to bring the initial acidity up to 0.5 per c
or more, there is not much danger of ropiness setting in.

A note on cider vinegar.—Brief directions are given for the manufacture
cider vinegar in the home and on a commercial scale.

The manufacture of cider apple jelly, B. T. P. BARKER (*Univ. Bristol, An
Rpt. Agr. and Hort. Research Sta., 1917, pp. 55–70; Jour. Bath and West.
South. Counties Soc., 5 ser., 12 (1917–18), pp. 142–158*).—This is a report of
commercial manufacture of cider apple jelly as conducted at the National Fr
and Cider Institute, including a description of the mills, presses, and evaporat
used; the details of the process, essentially noted from another source (E. S. R
39, p. 808); and statistics as to the output and cost of the product.

Grape sirup, F. T. BIOLETTI and W. V. CRUESS (*California Sta. Bul.
(1918), pp. 227–242*).—This is a preliminary report of investigations conduct

for the purpose of determining whether a grape sirup can be made that will be bought for its special properties, and whether such a sirup can be produced and sold at prices that will attract the consumer and pay the grower. A method for manufacturing the sirup based on the experimental work reported is as follows:

Ripe grapes, preferably 25° Balling or higher, are crushed and pressed in the ordinary winery equipment as soon after picking as possible. The juice from the pomace is extracted by progressive washing with boiling water and steam and two supplementary pressings. The liquid from the first extraction is mixed with the undiluted juice, and that from the last extraction is used for the first extraction of the next lot of pomace. To 100 gal. of juice 1.25 lbs. of liquid sulphurous acid or 2.5 gal. of 6 per cent sulphurous acid solution are added to prevent fermentation, and the juice is then stored in clean, completely filled, and lightly bunged wooden tanks. If stored for some time before being sent to the sugar factory, a sediment forms from which the clear juice can be drawn off and shipped in clean, sterilized barrels. At the sugar factory the juice is desulphited with steam, clarified, if necessary, with casein or a mixture of casein and Spanish clay, decolorized with bone black, filtered, deacidified with calcium carbonate, filtered again, concentrated to 65° Balling in triple-effect vacuum pans, and allowed to settle for two weeks in clean tanks to remove excess of calcium tartrate. The clean sirup is then packed in containers, pasteurized for from 25 to 35 minutes, and cooled in water.

This process is said to yield a sirup of agreeable taste and flavor which can be used as a table sirup, in cooking, canning, and in making certain preserves. Attempts to use it in the preparation of jellies and marmalades were not successful. It is said that by slight modifications of the process special sirups can be made of different colors and flavors.

Estimations of the yield and cost of the sirup indicate that if practically all the juice were extracted a ton of grapes would yield a number of gallons of 65° Balling sirup equal to two and one-half times the Balling degree of the juice, and that the cost of the sirup would be about $1.35 per gallon. It is pointed out that about 250,000 tons of wine and table grapes, representing a value of the raw material of over $4,000,000, can not be used next year in the usual way, and that if these grapes were made into grape sirup the product saved would be equivalent to over 40,000 tons of sugar.

Industry of lactose and of the vegetable casein of the soy bean, F. J. G. Beltzer (*Industries du Lactose et de la Caséine Végétale de "Soja." Paris: Bernard Tignol,* [*1918*], *pp. 144, figs. 35*).—This publication deals particularly with the industrial manufacture of lactose and of vegetable milk and vegetable casein from the soy bean. In addition, the chemistry of the above-named substances is discussed, and a chapter is included on various industrial treatments of milk, such as homogenization, pasteurization, sterilization, and condensation of milk; separation of cream; and the manufacture of butter and casein. An extensive bibliography is given of the literature on lactose.

The utilization of waste products, T. Koller (*London: Scott, Greenwood & Son, 1918, 3. English ed., rev. and enl., pp. VIII+338, figs. 22*).—This is the third English edition of this book, revised and enlarged (E. S. R., 14, p. 717).

Report of the agricultural chemist, J. C. Brünnich (*Ann. Rpt. Dept. Agr. and Stock* [*Queensland*], *1917–18, pp. 28–39*).—This is the customary annual report, including tables of analyses of Queensland soils, mixed fertilizers, edible plants occurring in prickly-pear scrubs in the Maranoa district, and agricultural and vegetable seeds.

METEOROLOGY.

A much needed change of emphasis in meteorological research, W. S. Franklin (*U. S. Mo. Weather Rev., 46 (1918), No. 10, pp. 449–453*).—This paper sets forth especially the value of the statistical method of studying meteorology.

It is stated that three fairly distinct objects are to be attained by statistical analysis of weather observations: "(1) The determination of systematic variations in time and place, (2) the elaborate classification of individual storm movements with respect to a great number of measurable or specifiable characteristics, and the establishment of statistical coefficients of correlation between the characteristics of a given type of storm on successive days so that weather predictions can be made and qualified, as they should be, by probable departures. . . ., and (3) the intensive study of weather conditions should lead to a clear recognition of critical conditions in a given storm movement (conditions of static or dynamic instability) and make it possible to devise means for controlling the storm movement by the suitable expenditure of very moderate amounts of energy at the critical time and place."

Some correlations between the solar activity and the far eastern climates, R. Sekiguchi (*Abs. in Jour. Met. Soc. Japan, 37 (1918), No. 7, pp. 33–42, figs. 3; U. S. Mo. Weather Rev., 46 (1918), No. 9, pp. 413–415, figs. 3*).—Correlations between sun spots and temperature, rainfall, and cyclones are discussed.

Clouds and their significance in local weather forecasting, A. H. Palmer (*U. S. Mo. Weather Rev., 46 (1918), No. 9, pp. 407–413*).—It is stated that "everywhere within the United States, and particularly along the Pacific coast, clouds offer the forecaster a clue to the coming weather which can not well be disregarded. . . . From a study of almost a thousand cloud observations made at San Francisco during nine years, it is apparent that the significance of clouds regarding subsequent precipitation is worthy of the forecaster's attention, the significance increasing as the height of the cloud decreases. The significance regarding precipitation varies greatly with direction at all cloud levels. For the highest clouds those moving from the southwest are most frequently followed by rain; for those of intermediate levels those from the south are so followed; while for the lowest clouds southeast is the direction of greatest significance, the probability of rain increasing as the direction changes from southwest to southeast, and the height of the cloud diminishes. As far as temperature changes are concerned, the significance of clouds is not great at San Francisco. It is least with high clouds and greatest with low clouds, and varies greatly with direction at all levels. This fact is doubtless influenced by the semimarine environment of the city."

Monthly Weather Review (*U. S. Mo. Weather Rev., 46 (1918), Nos. 9, pp. 401–444, pls. 10, figs. 5; 10, pp. 445–496, pls. 9, figs. 13*).—In addition to weather forecasts, river and flood observations, and seismological reports for September and October, 1918; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during September and October, 1918; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 9.—Wolfer Provisional Sun Spot Relative Numbers, by H. H. Kimball; Halo Phenomena Observed during September, 1918, by W. R. Gregg; Capt. Schroeder Establishes World Altitude Record (Abs.); Halo Observations at York, N. Y., by M. N. Stewart; Clouds and Their Significance in Local Weather Forecastings, by A. H. Palmer (see above); Some Correlations Between Solar

Activity and the Climate of the Far East (illus.), by R. Sekiguchi (Abs.) (see p. 416); Cumulus Clouds of Hawaii (illus.), by A. M. Hamrick; and Some New Facts About the Centers of Typhoons (illus), by Co-Ching Chu.

No. 10.—Halo Phenomena Observed during October, 1918, by W. R. Gregg; Forecast Service for Aviators Begins; A Much Needed Change of Emphasis in Meteorological Research, by W. S. Franklin (see p. 416); Dynamic Heating of Air as a Cause of Hot Volcanic Blasts (illus.), by G. N. Cole; Smoke as an Indicator of Gustiness and Convection (illus.), by P. W. Etkes and C. F. Brooks; The Structure of Gusts, by C. C. Turner (Abs.); A Virginia Tornado (illus.), by A. W. Giles; Abnormal Change of Air Temperature at Tokyo and Sinagawa, by K. Sigetomi (Abs.); and Major Controls of the Climates of the United States, by R. DeC. Ward.

Meteorological records for the year ending November 30, 1917, E. Burke (*Montana Sta. Rpt. 1917, pp. 263–266*).—Observations at Bozeman, Mont., on temperature, precipitation, frosts, and cloudiness are summarized and the general character of the weather of the year is described. The highest temperature recorded in 1917 was 93° F., July 8, 22, and 26; lowest, —25°, January 22 and 31; mean, 40.87°; total rainfall, 15.68 in.; days with 0.01 in. or more precipitation, 96; last killing frost in spring, June 3; first killing frost in fall, October 17; and number of clear days in year, 146. The weather was the coldest of which there is any record, and was characterized by unusually heavy snowfall and the absence of chinook winds. The precipitation for the growing season was below normal, and the hot months of July and August, combined with a low precipitation, made the season extremely unfavorable for the growing of dry-land crops.

SOILS—FERTILIZERS.

Relation of inorganic soil colloids to plowsole in citrus groves in southern California, C. A. Jensen (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 9, pp. 505–519*).—The plowsole, which was the subject of the investigations reported in this article, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, is the hard soil layer which usually forms immediately under the soil mulch in cultivated citrus groves in southern California. "It often seriously limits the root system of the shallow-rooted citrus trees, and seriously interferes with penetration of irrigation water. After being broken up with a subsoiler, it re-forms when cultivation is resumed. . . . Mechanical packing is not necessary for its formation. . . .

"No greater accumulation of water-soluble iron, calcium, magnesium, or silica was found in the plowsole than in the soil mulch or subsoil. No greater accumulation of total ammonia-soluble silica, iron, aluminum, or phosphoric acid was found in the plowsole than in the soil mulch or subsoil, after the calcium had been removed with hydrochloric acid. The humus extract . . . contained more colloidal silica, iron, and aluminum than either the soil mulch or subsoil, but no more colloidal phosphoric acid. Both the organic and inorganic colloidal material in the humus extract moved toward the positive pole in an electric current. . . .

"Plowsole contained a markedly higher percentage of inorganic colloid suspension than the soil mulch, and usually a higher percentage than the subsoil. When soils were placed in pots in the laboratory, irrigated, and allowed to dry, the percentage of colloid suspension was found to be appreciably greater in the surface soil layer than in the subsurface layer, indicating that the colloids moved with the capillary soil moisture. No relation could be observed between the percentage of inorganic colloid suspension and the percentage of organic carbon or humus in the soil.

"Native uncultivated soils contained appreciably less colloid suspension than did similar soils which had been under cultivation for a number of years. The decomposition of 1 per cent organic matter in soil had no marked effect on the percentage of inorganic colloid suspension; 3 per cent organic matter in some cases decreased the percentage of colloids. Barley decreased the amount of colloid suspension more than did alfalfa or manure.

"The addition of ground lime rock appreciably decreased the percentage of inorganic colloid suspension in the soil when no organic matter was added. When organic matter was added, the flocculating effect of lime was appreciably diminished, especially in clay loam soil. The addition of powdered sulphur and gypsum to soil markedly decreased the colloid content, and organic matter had no appreciable effect in counteracting the flocculating effect of these substances. The addition of sodium nitrate to soil markedly increased the colloid content, and the addition of organic matter appreciably decreased the deflocculating effect of this compound. The addition of lime, sulphur, sodium nitrate, iron sulphate, ammonium sulphate, and organic matter to soils did not fundamentally change the composition of the inorganic colloid suspension obtained from the soil. The addition of gypsum to soil increased the percentage of silica, calcium, and manganese, and decreased the percentage of iron in the colloid suspension.

"The inorganic colloid suspension contained an appreciably higher percentage of iron, aluminum, and manganese than the untreated soil. In soils which readily form plowsole the percentage of silica in the colloid suspension was also appreciably higher than in the untreated soil. The percentage of iron and aluminum in colloid suspensions from soils which readily form hard plowsole was higher than in colloid suspensions, from soils which do not form a hard plowsole. The percentage of iron and aluminum in the colloid suspension from a soil was found to be directly correlated with the readiness with which the soil formed plowsole."

A list of references to literature cited is given.

Studies on nitrification in natural soils and its importance from an ecological point of view, in Sweden, H. Hesselman (*Skogsvårdsför. Tidskr., No. 4–6 (1917), pp. 321–446, figs. 30; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, pp. 662–665; Chem. Abs., 12 (1918), No. 23, p. 2646*).—The author distinguishes between two kinds of humiferous soils, one type being described as well aerated by the action of worms and insects and as characterizing deciduous forests and to a lesser degree pine forests on soils rich in inorganic salts, while the other type, comprising dead, decomposed, or decomposing vegetation, is said to occur in ordinary pine forests and frequently to form a series of layers of varying stages of decompositon clearly defined from the mineral subsoil. Studies were made with soils from different types of forests, and included an examination of the soil samples for nitrifying bacteria, tests of the nitrifying capacity of the different soils, and determinations of the nitrogen content of trees and plants growing on the various soils at different seasons. Conclusions were reached as follows:

The humus of beech woods contained as many nitrifying as denitrifying bacteria distributed throughout the mass, while samples of this soil formed considerable amounts of nitrates. On the other hand, the humus of pine forests with a mossy covering was characterized by the absence of denitrifying organisms and of bacteria capable of nitrifying ammonium sulphate. No potassium nitrate was found in the tissues of plants growing on this soil.

It is stated that the isolation of organic substances from the soil said to be partly toxic to plants should not be overemphasized, as no proof is available that such substances occur in the dark-colored, acid humus of coniferous forests.

In many places nitrification was so rapid that considerable amounts of nitrogen accumulated in the covering vegetation, this being specially marked in dense beech, elm, oak, ash, and alder forests with moving underground water. In the higher mountain regions the soil covering contained a large quantity of nitrogen, while in woodlands and spruce forests with grassy soil coverings the nitrogen of the humus nitrified without a resulting accumulation of nitrogen in the layer. Plant associations on bare rocky soils were often composed of nitrophilous species, which accumulated nitrogen in their tissues. In pine forests having a covering of lichens and mosses, nitrification did not occur, and the decomposition of the dead covering gave rise to the formation of ammonia and its compounds. Natural soils were capable of accumulating as much nitric nitrogen as ordinary cultivated soils.

Nitrification was found to be influenced not only by the origin of the soil to a large extent but also by the climate. Since the degree of nitrification constituted an important factor in determining the composition of the plant associations of a given soil, those factors affecting the formation of the soil might have a decisive influence on this composition. A suitable forest system, therefore, should make it possible to thin the forests in such a way as to favor soil nitrification, thus assuring a higher yield of wood. It is stated, however, that good yields of pine and spruce could be obtained on soils having no nitrate formation. In the latter case, the rate of growth appeared to be proportional to the rate of ammonification.

The shrinkage of soils (*West Indian Bul., 17 (1918), No. 2, pp. 107–118, figs. 2*).—This is an account of work done by Tempany and previously noted from another source (E. S. R., 38, p. 321).

[Report of soil investigations in Montana], E. Burke (*Montana Sta. Rpt. 1917, pp. 238–240*).—The nature of the soil fertility work in progress at the station and in cooperation with farmers throughout the State is briefly described, and the construction of a geological map of Montana is noted. It is stated that observations covering a period of seven years showed little difference in the amount of nitrates present in the soil where different cropping systems had been practiced, including alternate summer fallow and crop, a rotation of corn, peas, fallow, and wheat, and continuous cropping to corn or sugar beets. Where alfalfa, brome grass, or wheat had been grown continuously the soils did not contain so large amounts of nitrates as occurred with the various cropping systems noted above.

Soil survey of Monroe County, Ala., H. C. Smith, A. L. Patrick, and J. F. Stroud (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 53, figs. 3, map 1*).—This survey, made in cooperation with the State of Alabama, deals with the soils of an area of 647,680 acres situated in the southwestern part of the State, and lying entirely within the Gulf Coastal Plain. The topography of the county ranges from prairie-like to rough, about one-sixth being untillable, one-sixth flat land, and the remainder rolling to hilly. Approximately 80 per cent of the area is upland. Natural drainage is generally well established.

The upland soils of the county have been derived from lime-bearing rocks, noncalcareous siliceous rocks, and from unconsolidated deposits of sand, clay, and gravel. In addition, areas of terrace soils, derived from old alluvium, are found largely above ordinary overflow, while flood-plain soils occur which are overflowed several times annually. Exclusive of meadow, 27 soil types of 17 series are mapped. Orangeburg fine sandy loam, Ruston gravelly sandy loam, Susquehanna clay, and Norfolk fine sandy loam, are the principal soil types, occupying 10.1, 9.3, 9.2, and 8.4 per cent of the total area, respectively.

Soil survey of Porter County, Ind., T. M. Bushnell and W. Barrett (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 47, figs. 2, map 1*).—This survey, made in cooperation with the Indiana Department of Geology, deals with the soils of an area of 265,600 acres situated in the northwestern corner of the State. The main physiographic divisions comprise the glacial Lake Chicago Plain lying in the northern part of the county, the Valparaiso morainic system across the center, and the Kankakee Basin located in the southern and southeastern section. Except for a narrow belt of sand dunes along Lake Michigan, the topography of the northern and southern parts of the area is generally level to gently sloping, while that of the moraine belt includes considerable rough land. Drainage is generally well established over most of the morainic region, but the Kankakee Basin is said to lack good natural drainage.

The soils of the county are of glacial, glacial-lake, and alluvial origin. In addition to muck, dunesand, and swamp, 23 soil types representing 11 series are mapped. Miami silt loam, occupying 16.4 per cent of the total area, is the principal type encountered.

Soil survey of Cleveland County, N. C., E. S. Vanatta and F. N. McDowell (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 37, pls. 2, figs. 2, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, deals with the soils of an area of 299,520 acres, situated in the south-central part of the western half of the State, and lying almost wholly within the Piedmont Plateau province. The mountain range along the northern border of the county and outlying ridges within the county are included in the Appalachian Mountain province. The topography of the area is described as that of a broad plain of moderate elevation sloping southward, with occasional mountains and hills standing out prominently above the surrounding country. Natural drainage is well established throughout most of the area.

The upland soils of the county are derived from the underlying rocks, including granites, gneiss, schist, and diorite. In addition to meadow and rough stony land, 13 soil types of 6 series are mapped. Cecil sandy clay loam and Cecil clay loam, occupying 41.1 and 21.5 per cent of the total area, respectively, predominate.

Soil survey of Payne County, Okla., W. B. Cobb and H. W. Hawker (*U. S. Dept. Agr. Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 39, figs. 2, map 1*).—This survey deals with the soils of an area of 444,800 acres situated in the north-central part of the State, and lying in the transition belt between the prairies and plains. The topography of the county varies from level to gently undulating, and in the western and eastern parts to rolling. Natural drainage is well established in practically all parts of the area.

The upland soils of the county are residual in origin, being derived largely from sandstone and shale, and in the eastern part from limestone. Areas of eolian and alluvial soils also occur. Eighteen soil types representing 11 series are mapped. Vernon loam occupying 24.1 per cent of the total area, and Vernon very fine sandy loam occupying 19.9 per cent, are the prevailing types.

Analyses of West Virginia soils, R. M. Salter and C. F. Wells (*West Virginia Sta. Bul. 168 (1918), pp. 36, fig. 1*).—This forms the second report (E. S. R., 36, p. 722) on chemical studies of the most important soil types found in the State and presents the results of analyses of the first 240 samples.

It has been concluded that the average West Virginia soil contains about 1,100 lbs. of phosphorus per acre to a depth of 6⅔ in., while 55 per cent of the soils examined contained less than this amount. Many of the soils were also deficient in organic matter. Over 40 per cent of the soils had less than 2,500 lbs. of nitrogen per acre, more than 80 per cent showed a need of lime, while over 75 per cent contained more than 20,000 lbs. of potassium per acre.

Effect of farm manure in stimulating the yields of irrigated field crops, C. S. SCOFIELD (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 9, pp. 493–503*).—Experiments are reported in this article, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, in which "the effect of manure on the yields of Irish potatoes and sugar beets under irrigation has been tested for six years in seven rotations at each of three different stations in the northern Great Plains. Comparison is made between the yields of these crops when grown in rotations without manure and when grown in the same sequence in other rotations in which manure is applied at the rate of 12 tons per acre once during the cycle of the rotation.

"It is concluded that the effect of the manure has been to increase the yield of potatoes about 40 bu. per acre at Scottsbluff, Nebr., about 34 bu. at Bellefourche, S. Dak., and about 26 bu. at Huntley, Mont. The proportion of marketable potatoes was increased about 8 per cent at Scottsbluff and about 7 per cent at Bellefourche, while at Huntley the proportion of marketable potatoes was not influenced materially. The yield of sugar beets was increased 4.3 tons per acre at Scottsbluff, 1.9 tons at Bellefourche, and 2.6 tons at Huntley, without material change in the sugar content of the beets in any of these localities.

"In five of the seven rotations considered, the increased yields were from the crop immediately following the application of the manure. In the other two rotations the yields were from crops produced the second season after the manure was applied. The increases in yield shown in these two cases, as well as the effects observed with other crops grown in these rotations, show that the benefit of the manure was appreciable for two years or more after it was applied."

Plant products and chemical fertilizers, S. H. COLLINS (*London: Baillière Tindall & Cox, 1918, pp. XVI+236, fig. 1; rev. in Sci. Prog.* [*London*], *13* (*1919*), *No. 51, pp. 500, 501*).—This is one of a series of volumes, edited by S. Rideal, designed to give a comprehensive survey of the applications of chemistry in industry and to serve as a guide to the standard literature on the subject. It is not intended to be a textbook, but to serve as an adjunct to the ordinary textbook.

The plan of the book is to "pick up the story of those industrial waste products which are useful as fertilizers, and carry it on through the soil and crops, until new products are available for industrial uses." It is divided into four parts, namely, fertilizers, soils, crops, and the production of meat, and the topics discussed vary from the properties and uses of the various fertilizers, to the chemistry, characteristics, and uses of the crops produced. There are also sections devoted to the calorific value of foods, the future prospects of scientifically controlled agriculture, and to the discussion of labor difficulties and education of land workers. Special bibliographies are included in each section and a general bibliography is given for the whole volume.

[Fertilizers in relation to agricultural production in the United States in 1919] (*U. S. Dept. Agr., Off. Sec. Circ. 125* (*1919*), *p. 23*).—Discussing agricultural production in 1919, with special reference to crops and live stock, it is stated that for the first six months of 1918 there was produced in the United States approximately 3,500,000 tons of mixed fertilizers and 1,400,000 tons of acid phosphate, practically all of which was used on the spring crops of that year, with little carry-over for fall use.

"The prospects of adequate supplies of fertilizer for use this spring are good. The supplies of nitrogenous materials will probably be ample. There are large stocks of nitrate of soda in the country which were brought in for munition purposes and are now available for agriculture, and in addition the producing capacity of ammonium sulphate plants has been increased from about 200,000 tons in 1913 to approximately 400,000 tons at present." The Department of Agriculture has procured a supply of nitrate of soda, which it is preparing to distribute to farmers at cost for cash under much the same plan as was followed last year.

"Acid phosphate supplies should be ample to meet all demands, since there is a large surplus of sulphuric acid producing capacity in the country, and our own supplies of phosphate rock are, of course, available to practically any extent demanded. The indications are that supplies of European potash can not be secured, either from Alsace or from Germany, in time for use this spring."

[Fertilizer needs of England, France, and Italy], W. O. Thompson, R. A. Pearson, T. F. Hunt, and D. R. Coker (In *Rpt. Agr. Com. Europe. Washington: U. S. Dept. Agr., 1919, pp. 13, 16, 31, 32, 64, 66, 80*).—In this report on agricultural conditions in Great Britain, France, and Italy, of the Agricultural Commission to Europe (E. S. R., 39, p. 708), it is stated, with reference to fertilizers, that the situation in Great Britain "is serious, but not nearly so bad as it would have been without the fertilizer by-products from manufacturing and munition making."

The outstanding fertilizer shortage and needs in France is also noted and it is stated that "the one requirement of French agriculture upon which the French authorities are agreed is the need of commercial fertilizers."

The fertilizer situation in Italy is stated to be causing much anxiety. "It is said that only about 16 per cent of the normal amount of phosphates is now available. The phosphate question was referred to as the most serious agricultural question in Italy for the next few years. On considerable areas it has been the custom to secure nitrogen through alfalfa and to accumulate phosphate through its application each year for about three years. Then the land was plowed and planted to wheat without phosphate. The lack of this fertilizer during a short period of years is likely to have a serious effect for a prolonged period. . . . The potash question is not so serious. Some substitutes have been found for the usual forms of potash. These substitutes include olive-oil residues and some local mineral deposits. Nitrates are made in Italy from water power," but during the war the quantity available for agriculture was reduced to about one-third the normal amount because of munitions requirements. The situation was made still more difficult because of the failure of shipments of ammonium sulphate from England.

Experiments with fertilizers, E. B. Stookey (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1919), No. 10, pp. 138–141, fig. 1*).—Field tests of various fertilizer treatments made on muck soil for a period of five years and on Puget fine sandy loam and Everett gravelly sandy loam for one year are briefly described. On all three types of soil, manure is said to have produced better results than any of the commercial fertilizers used. The muck showed a marked deficiency in potash.

[Nitrate of soda for corn in the South] (*U. S. Dept. Agr., Weekly News Letter, 6 (1919), No. 30, p. 4*).—Observations for one season on the effect of sodium nitrate upon corn in the South were made in 9 counties in South Carolina, 7 in Alabama and Virginia, 5 in Georgia, and 4 in North Carolina, by the Bureau of Plant Industry in cooperation with the States Relations Service. The nitrate was applied at a uniform rate of 100 lbs. per acre after the corn was above the ground, usually after it had attained a height of 18 in. Classifying the farms as good and ordinary, the results for all tests showed average yields of 30.1 bu. per acre without nitrate and 39.4 bu. with nitrate on the former, as compared with 20.8 bu. without nitrate and 27.5 bu. with nitrate on the latter.

Experiments on the value of greensand as a source of potassium for plant culture, R. H. TRUE and F. W. GEISE (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 9, pp. 483–492, pls. 2*).—In the experiments described in this article, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, the availability of the potash in samples of greensand and greensand marl from New Jersey and Virginia, containing from 1.52 to 7.63 per cent of total potash, was studied in pot experiments with wheat and red clover, comparative tests being also made with other forms of potash.

The conclusions reached were that, as shown by pot experiments carried out with crushed quartz and Shive's culture solution as a basis, "greensands and greensand marls from Virginia and New Jersey are able to supply sufficient potassium to satisfy the demand of Turkey red wheat and red clover during the first two months of their growth. This enables them to make a greater dry weight of tops than was seen in similar cultures in which the potassium demand was supplied by potassium chlorid, potassium sulphate, and potassium phosphate. The prompt availability of sufficient potassium to meet the needs of many, perhaps most, farm crops seems to be indicated."

Limestone action on acid soils, R. STEWART and F. A. WYATT (*Illinois Sta. Bul. 212* (*1919*), *pp. 266–296, fig. 1*).—Experimental work begun in 1902 on the Odin experiment field in Marion County and in 1912 on the Newton field in Jasper County is described, in which observations have been made upon the effect of limestone on the surface soil, loss through drainage, the influence of applications of limestone to surface soil upon acidity in the subsurface and subsoil, the relative value of high-calcium and dolomitic limestone, the effect of the degree of fineness upon loss and upon acidity, and the comparative effect and loss of light and heavy applications. Considerable tabular data are presented and fully discussed showing the rates and form of lime applied to the various plats, and giving information relative to the amount of residual limestone and degree of soil acidity found and destroyed with the different treatments. Based on the evidence secured, the following conclusions with regard to the common prairie land of southern Illinois are deemed justified.

An application of one ton of limestone per acre once in three or four years is sufficient to keep the soil alkaline, after the initial acidity has been destroyed by heavier applications. Dolomitic limestone can be used successfully on acid soils, being slightly more effective than high-calcium limestone in neutralizing soil acidity, being more durable, and having no injurious effects on crop yields.

Results obtained on the Newton field failed to show that finely ground limestone was more effective in correcting soil acidity than was the total product from a ¼-in. screen, which contained both the finer material for immediate use and the coarser material for greater durability. It is stated that this "mill-run" product appeared to be the most economical form to use, although final conclusions must await further data concerning crop yields.

On the Odin field after fourteen years one-half the acidity in the subsurface soil was neutralized where the larger applications had been made to the surface, and one-fourth where the lighter applications had been made, while applications of limestone to the surface soil seemed to have no effect upon the acidity of the subsoil. The amount of native limestone found in the subsoil was a variable quantity, none being present in some cases, even at a depth of 40 in., while in other cases it extended upward even slightly into the subsurface soil.

The annual loss of limestone from the soil depended upon a number of factors, among which were the kind, form, and amount of lime added. The data presented are held to indicate that the annual loss of limestone is not so large as is generally assumed, the average loss for all determinations with the surface 20 in. of soil being 760 lbs. per acre from the Newton field and 542 lbs. from the Odin field. A study of the total calcium is said to indicate that the actual loss of bases may have been less than is shown by these figures, which are based upon the carbon dioxid and acidity determinations.

"It is very evident from the data presented that chemical analysis may be depended upon to measure the acidity in the soil, the reduction in acidity due to the action of limestone applied, and also to find the limestone still remaining in the soil, whether from applications made or from a supply native to the soil."

Commercial fertilizers, 1918, C. D. Woods (*Maine Sta. Off. Insp. 90 (1918), pp. 101–120*).—This reports the results of actual and guarantied analyses of 295 samples of fertilizers and fertilizing materials collected during 1918.

AGRICULTURAL BOTANY.

Atmospheric electricity as an environmental factor, I. Jörgensen and W. Stiles (*Jour. Ecology, 5 (1917), No. 3–4, pp. 203–209*).—This is largely a discussion of a paper by Rose Stoppel, not yet available, in which she is said to have shown that atmospheric electricity may have a profound influence on certain vital processes in the plant. This has led to the inference that atmospheric electricity is to be reckoned with as one of the environmental factors affecting the life of the plant.

On the ecology of the vegetation of Breckland.—V, Observations relating to competition between plants, E. P. Farrow (*Jour. Ecology, 5 (1917), No. 3–4, pp. 155–172, pl. 1, figs. 2*).—This article deals with cases illustrating the operation of competition between plants in mixed associations, competition between pure plant associations, destruction of competitors (by means of fallen dead fronds, as in case of *Pteris aquilina*), and a biological barrier to rhizome spread of *Carex arenaria* (caused by a layer of dead fallen leaves from a single row of pines).

On competition between Galium saxatile (G. hercynicum) and G. sylvestre (G. asperum) on different types of soil, A. G. Tansley (*Jour. Ecology, 5 (1917), No. 3–4, pp. 173–179*).—Studies carried out on *G. saxatile* and *G. sylvestre* (the former preferring light siliceous soils, the latter limestone hills and pastures) are described in some detail for mixed sowings made on a calcareous garden soil of medium texture, a noncalcareous garden loam, a strongly acid peat, and a natural sandy woodland loam.

The calcifugous species *G. saxatile* is heavily handicapped, especially in the seedling stage, on calcareous soils, being unable to compete with *G. sylvestre*, which is more severely handicapped and subordinated on acid peat, though both species can establish themselves and grow for several years on either soil if the handicap of competition with other vegetation is not too severe. On sandy loam from a healthy woodland both species germinate freely, and both growing better during the first year than thereafter, the relations between the two species resembling those obtaining on peaty soil.

Plant life on saline soils, T. H. Kearney (*Jour. Wash. Acad. Sci., 8 (1918), No. 5, pp. 109–125*).—Following a discussion of the physiology of the halophytes, the author considers the question of the rôle, if any, played by sodium in plant nutrition, discussing the possible significance of such a relation in view of a possible continuance of hostile control of the great potash deposits. The opinion is expressed that when potassium is not available in sufficient quantity some of the physiological functions normally performed by that element may be assumed by sodium. Regarding the nature of these functions, several suggestions are given.

A comparative study of salt requirements for young and for mature buckwheat plants in sand cultures, J. W. SHIVE (*Soil Sci., 6 (1918), No. 1, pp. 1–32, figs. 3*).—This is a report of work done with sand cultures on the salt requirements during two different developmental periods of buckwheat plants, corresponding to that reported with solution cultures (E. S. R., 39, p. 732). The results obtained from the two series of studies are compared in this paper. The sand cultures were supplied with nutrient solutions of salts having the same range of concentration as in the work previously noted.

The relation of growth rates to variations in the osmotic proportions of the solutions supplied to the sand cultures differs markedly for the two developmental periods, whether this be judged by top or root growth, transpiration, or water requirements.

Factors determining character and distribution of food reserve in woody plants, E. W. SINNOTT (*Bot. Gaz., 66 (1918), No. 2, pp. 162–175, figs. 2*).—A study of the minute deposits of food materials in twigs and young branches of different plants shows that in winter starch is to be found more commonly in regions remote from centers of conduction and in cells having thick walls with small pits, while fat is most abundant in and near the phloëm, close to vessels, and in cells with thin or unlignified walls or large pits. These facts indicate that the character of the food reserves in any cell depends primarily upon the readiness or difficulty with which water or solute reaches the cell, fat appearing in the former case, starch in the latter. This suggests that differences in the type of food reserve may be due to differences in water content of the various storage cells (resulting in modification of enzym activity) or to differences in the ease with which enzyms have access to the storage cells.

The nature and rôle of mitochondria in vegetable cells, A. GUILLIERMOND (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 19, pp. 917–924, pls. 2*).—The author replies to some objections offered to his views, as set forth in connection with his various contributions, regarding the characters and significance of certain bodies or structures said to be present in the cells of both animals and plants.

The formation of nitrites from nitrates in aqueous solution by the action of sunlight, and the assimilation of the nitrites by green leaves in sunlight, B. MOORE (*Proc. Roy. Soc. [London], Ser. B, 90 (1918), No. B 627, pp. 158–167*).—The author considers the assumption to be entirely untenable that the green cell, complex and highly organized as it now is, constituted at the dawn of life the only agency capable of utilizing light energy so as to produce a gain in chemical energy. He emphasizes the importance of a study of the action of light on organic substances present in air and water and supposedly capable of being acted upon endothermically by light so as to produce more complex compounds of organic character. A continuation of experimentation previously reported (E. S. R., 33, p. 627) is said to show that air, rain, and dew invariably contain a mixture of nitrites and nitrates, the former ordinarily tending (on their being kept together) to pass over into the latter, and the process being reversed as a result of insolation or exposure to artificial light of short wave length. The inference is that both these nitrogen compounds occur in atmospheric air, and this is said to have been supported by experiments referred to. The nitrogen percentage requirement for plants is said to average not above 5 per cent of the carbon assimilation requirement.

Sunlight passing through the upper layers of the atmosphere, while still rich in ultraviolet wave lengths, must produce vast amounts of ozone, which may oxidize nitrogen, giving nitrites and nitrates. It is thought that many of the natural bleaching, deodorizing, and sterilizing actions in air and water, hitherto ascribed to hydrogen peroxid and ozone, are more probably due to nitrites and oxids of nitrogen of high dilutions possessing an odor indistinguishable from that of ozone. It is stated that air bubbled through distilled water gives afterwards a positive reaction when tested for both nitrites and nitrates. It is said that neither hydrogen peroxid nor ozone exists at surface level.

Action of light rays on organic compounds, and the photosynthesis of organic from inorganic compounds in presence of inorganic colloids, B. Moore and T. A. Webster (*Proc. Roy. Soc.* [*London*], *Ser. B, 90* (*1918*), *No. B 627, pp. 168–186*).—Giving results of work related to that previously noted (E. S. R., 38, p. 627) and that noted above, the authors state that a number of organic systems, in the presence of carbon dioxid and under exposure to light, can build up formaldehyde, while others remain inert. The activity is related to the development of an optimum degree of colloidality, and is probably not due to the formation of higher or lower oxids but rather to surface condensation on interfaces.

The report also discussed conditions favorable to condensation of formaldehyde to form-reducing substances leading to the formation of carbohydrates, as well as the energetics of such a system and the effects of general or local concentration upon which the equilibrium point depends in reversible reactions. A general reversible reaction is described as a result of which formaldehyde arises in all intense reactions of light upon substances of biochemical origin, this reaction under excessive light being supposedly a reversal of the process by which all organic matter has been built up from inorganic. Some bearings of these points are discussed, in particular as regards the germicidal action of sunlight and ultraviolet rays. It is claimed that the simple organic products so formed are incompatible with the life processes of living organisms and therefore cause their destruction.

The authors claim that the building up of organic from inorganic matter must have preceded the advent of living organisms on the earth, and that all accumulations of reduced substances possessing stores of chemical energy must have arisen from the energy of sunlight.

Oxidases: With special reference to their presence and function in the sugar cane, R. Narain (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 47–64*).—In order to throw light on the question as to whether or not oxidases can be regarded as enzymic, the author has made a study of the presence and behavior of oxidases in sugar cane, the phenomenon of browning and the chromogen of the cane, the action of preservatives, the effect of medium on the action of the oxidases, the strength of oxidases in different portions of the cane, the effect of boiling the oxidase extract, the action of reducing agents on the oxidases, the acidity of the cell sap, the starch potassium iodid test for oxidases, the presence of nitrites in the cell sap, and the nature of oxidases. The results are detailed, and the conclusion has been reached that the oxidases are not enzymic in any sense, but that they are probably compounds of some inorganic substance with certain colloids which are probably not proteins as has been supposed.

The evaluation of the soil temperature factor in root growth, W. A. Cannon (*Plant World, 21* (*1918*), *No. 3, pp. 64–67*).—The author proposes the formula *TR*, the product of growth rate at a given temperature by the time that temperature is maintained, for the effectiveness of temperature at a given place. According to this, the relative temperature-growth effects on *Covillea tridentata* during August, 1916, would be at the Tucson, Ariz., and the Carmel, Cal., laboratories, respectively, 588.7 and 74.4. Survival of this species at the latter place is not considered probable.

Determination of wilting, A. L. Bakke (*Bot. Gaz., 66 (1918), No. 2, pp. 81–116, figs. 5*).—A study of *Helianthus annuus*, as carried out during 1915 and 1916 with standardized hygrometric paper according to methods previously described (E. S. R., 36, p. 824), is said to give an accurate knowledge of the internal water relations of the plant.

The exact wilting point occurs when there is a serious rupture of the water columns. The maximum is attained at a time previous to the greatest evaporation. During the time of approximately maximum evaporation, a marked fall occurs in the index of foliar transpiring power, followed soon by a rise. The ratio between maximum and minimum is not sufficiently definite for the expression of a law. A ratio approximating unity marks a state of intense incipient drying.

When the maximum does not rise above the usual minimum, the plant is near its wilting coefficient. High evaporation coincides with high transpiration value, but during wilting the index of foliar transpiring power becomes independent of evaporation. A condition of equilibrium is noted to occur during the process of wilting, the duration of this condition supposedly giving a measure of the comparative drought resistance of different plants. In *H. annuus* the equilibrium period for 1915 was much shorter than that for 1916, when the season was much drier. Permanent wilting occurs much sooner in old than in young leaves. Stomatal movements or changes are not important factors when the plant is in an intense state of wilting.

Fertility in Cichorium intybus: Self-compatibility and self-incompatibility among the offspring of self-fertile lines of descent, A. B. Stout (*Jour. Genetics, 7 (1918), No. 2, pp. 71–103, pls. 3*).—This work continues, with material identical in part, that previously noted and is also related to some which have been reported more recently (E. S. R., 39, p. 482; 40, p. 225).

The results presented in the present paper pertain to the variation, the heredity, and the results of selection in respect to seed production in progenies of self-fertile plants of chicory, these having first appeared sporadically among the descendants of self-sterile parents. The type of sterility previously studied has been ascribed to physiological and not to anatomical incompatibility. Embryo abortion resulting from gametic incompatibility developing after fertilization may, it is thought, also account in part for the decreased seed production and poor germination. These facts, the many instances of cross-sterility and self-sterility in wild and cultivated varieties, instances where self-fertile plants appear in the progeny of self-sterile parents, and other facts are thought to be of special importance in their bearing on the fundamental problems of sexuality and fertilization, particularly as noted in the bisexual higher plants.

The plants for which data are here presented and discussed in considerable detail were descendants during and since 1916 of three self-sterile parents, two of which were of common, unimproved chicory, these being each crossed with a wild, white-flowered plant so that there resulted two main families with their reciprocals. This work is thought to strengthen the conclusion that self- and cross-incompatibilities in chicory develop independently of anatomical incompatibility with its marked structural differences and adaptations for cross pollination also independently of embryo abortion, at least of the sort due to malnutrition of embryos. Impotence and embryo abortion probably occur, however, in chicory. The new data here reported are considered to be in full accord with those previously noted in the several contributions on this subject.

FIELD CROPS.

Some factors of success and failure in dry farming, A. Kezer (*Proc. Soc. Prom. Agr. Sci., 38 (1917), pp. 79–83*).—The author presents a general discussion of data obtained in farm survey work conducted by the Colorado Experiment Station during 1914 in El Paso, Cheyenne, Lincoln, Adams, and Logan Counties to determine what farm methods are profitable under the dry land conditions of eastern Colorado.

It is concluded that a proper adjustment between live stock and crop acres is essential, but that it varies with locality, the best practice being deemed one in which all the time possible is devoted to crop production and just enough live stock kept to consume and furnish a market for all crops that can not be marketed for cash. The highest labor incomes were not obtained from the farms having the highest yields, but from those having good yields on considerable acreages.

Arranging the farms in groups according to the average number of crop acres per farm, the relative labor incomes were found to be as follows:

Average crop acres per farm and labor income equivalent.

County.	Number of farms studied.	Average size of farm.	Labor income equivalent.	County.	Number of farms studied.	Average size of farm.	Labor income equivalent.
		Crop acres.				*Crop acres.*	
El Paso	19	82	64	Lincoln	17	261	99
Do	19	143	91	Adams	17	46	34
Do	19	287	142	Do	18	87	66
Cheyenne	16	36	32	Do	20	154	106
Do	18	71	55	Logan	21	114	61
Do	15	128	88	Do	22	221	140
Lincoln	14	73	37	Do	24	460	248
Do	16	160	54				

Other data indicate that the best ratio of live stock to crop acres varies from year to year, but is apparently one of 8 acres in crops per animal unit. A special study made in Logan County showed the labor income was higher for that class of residents which had occupied the land from 7 to 10 years than for that of the 10 to 15 or 15 to 20 year class, due to a better balancing of live stock and crop acres.

Experiments in electrical stimulation of crops, H. L. Washington (*U. S. Dept. Com., Com. Rpts., No. 134 (1918), p. 940*).—This briefly notes experiments with various crops grown on electrified and nonelectrified areas in Calderstones Park, Liverpool, during 1917. The electrical treatment consisted in the discharge of a high-tension current from a series of fine wires suspended above the area. The following table shows the results obtained expressed in percentages of increase or decrease in weight of the electrically treated crops in comparison with the untreated crops:

Effect of electrical stimulation of crops.

Crops.	Increase (+) or decrease (−) over untreated crops.	Crops.	Increase (+) or decrease (−) over untreated crops.	Crops.	Increase (+) or decrease (−) over untreated crops.
	Per cent.		*Per cent.*		*Per cent.*
Beet root	+390	Mangolds	+219	Potatoes—Contd.	
Onions	+633	Swedes	− 16	British Queen	+63
Peas (late)	+ 29	Cabbage	+ 25	Barley	+30
Carrots (intermediate)	+ 29	Potatoes:		Barley straw	−18
Kohl-rabi	+ 3	Great Scot	− 13	Oats	+39
Sugar beets	+467	King Edward	− 2	Oat straw	+ 9

Experiments on the treatment of growing crops with overhead electric discharges, J. HENDRIC (*Scot. Jour. Agr., 1 (1918), No. 2, pp. 160–171, fig. 1; abs. in Nature [London], 101 (1918), No. 2547, p. 495*).—The application of a high tension electric discharge to oats, barley, hay, potatoes, turnips, and swedes grown in rotation in experiments conducted in Kincardineshire, Scotland, during the period 1913 to 1917, inclusive, is said to have failed to produce sufficient increases in the yield of the crops to repay the cost of the treatment.

The electroculture of crops, I. JÖRGENSEN and W. STILES (*Sci. Prog. [London], 12 (1918) No. 48 pp. 609–621; Sci. Amer. Sup., 85 (1918), No. 2214, pp. 366–368*).—The authors present a brief review of the more prominent experimental work dealing with overhead electrical discharge in relation to crop production, beginning with experiments made by Nollet in 1747. They conclude that whatever advances have been made in electroculture in the past have come from the physicist, but that, although a knowledge of physical methods is essential for intelligent research, the problems involved are essentially problems of plant physiology.

[Report of work with field crops in Montana] (*Montana Sta. Rpt. 1917, pp. 227–229, 237, 240–242, 253–254*).—This describes the continuation of work similar to that previously noted (E. S. R., 38, p. 333), including observations on small grain variety tests, selection work with oats, tests of annual forage crops for dry lands, fertilizer experiments with small grains and legumes, and observations on soil moisture under different cropping systems, all by L. F. Gieseker, weed control with arsenicals, by D. B. Swingle, observations on the amount of plant food removed annually by different crops, by E. Burke, and variety tests, selection work, and cultural experiments with potatoes, by O. B. Whipple.

Marquis spring wheat seeded late in the fall has produced an average yield of 41.3 bu. per acre. A field selection of Kharkov also seeded in the fall has outyielded all other Turkey Red and Kharkov strains, producing an average of 49.3 bu.

Observations of 29 different correlations made on oats introduced from New York each year and on oats grown continuously at the station are said to indicate that the same relationships hold under the climatic and soil conditions prevailing in Montana for introduced oats as for acclimated sorts.

Mammoth Russian sunflower, producing 39.8 tons of green forage per acre when seeded at the rate of 60 lbs. per acre in 8 in. rows, is described as a promising soiling and silage crop. Under field conditions seeding in 30 or 36 in. rows is recommended. Yields of 23 tons per acre have been obtained under irrigation with the crop seeded at the rate of 16 lbs. per acre in 28 in. rows. Analyses of the dry material showed it to contain 0.203 per cent of phosphorus and 1.96 per cent of nitrogen. A tabular statement is presented showing the relative amounts of plant food removed annually by different crops, from which it is concluded that sunflowers remove more nitrogen from the soil than any of the grain or root crops.

Acid phosphate applied at different rates to small grains and legumes at Bozeman, Huntley, and Judith Basin failed to produce any marked increase in yield. An 8-ton application of manure to dry land rotation crops failed to give a sufficient increase in yields to cover the cost of application at Bozeman and Judith Basin, while the small grains responded to the treatment at Huntley.

Observations of soil moistures to a depth of 10 ft. on 27 differently cropped plats on the Fort Ellis farm for the past eight years have led to the following conclusions:

The season is deemed to be a greater factor in governing crop yields than cultural methods. Small grains yielded best on those plats in which the seasonal moisture penetrated each year to the subsoil moisture. Spring wheat, barley, and oats removed moisture from the soil to a depth of from 5 to 6 ft., alfalfa from 9 to 10 ft., and brome grass from 6 to 7 ft., plant roots removing the moisture from the soil zones where it is most available. Less than a third of the annual rainfall has been retained in clean summer-fallowed land. Except in seasons of heavy rainfall, small grains grown on summer-fallowed land removed all the available soil moisture by the time the grain was in the heading stage, the yields being largely dependent on the seasonal rainfall received after this period. Manuring and deep plowing held a large percentage of the seasonal moisture in the surface soil, while plowing to a depth of 5 or 6 in. with a shallow surface soil mulch permitted the moisture to penetrate into the subsoil. Intertilled crops such as corn did not start active growth until after the greater part of the seasonal rainfall had fallen. These crops matured early, leaving a portion of the seasonal moisture in the soil for subsequent crops. Weeds were found to be by far the greatest factor in removing the moisture content of the summer fallow during the summer months.

Spraying perennial weeds with sodium arsenite is said to have given promising results with poverty weed (*Iva axillaris*) and blue lettuce (*Lactuca pulchella*), while the results with Canada thistle (*Carduus arvensis*) and weeds of the same general habit of growth were less encouraging.

The maximum potato yield for the season was 38,270 lbs. per acre from Mills Prize. Of seed selected in various ways that chosen by noting the vigor of the vines gave the highest yield, resulting in increases in several varieties of over 30 per cent. By varying the environment under which seed was grown in 1916, yields ranging from 16,700 to 24,000 lbs. per acre within the same variety were secured in 1917. Selecting culls from a crop grown from culls has not seriously reduced the yielding power of Russet Burbank, Rural New Yorker, or Early Rose. Seed from thinned plats is said to have higher yielding powers than that from unthinned plats. Very little difference was noted whether Green Mountain potatoes were planted 12, 15, 18, or 24 in. apart in the row.

[Work with field crops on the Scottsbluff reclamation project experiment farm in 1917], J. A. HOLDEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1917, pp. 12–14, 19–25, 25–28*).—This reports the continuation of work along the same general lines as previously noted (E. S. R., 39, p. 130).

Alfalfa yields ranged from 3.44 tons per acre for native to 4.63 tons for Baltic, with an average of 4.19 tons for the seven varieties tested. Harrowing with a spring-tooth harrow, disking, and manuring alfalfa resulted in yields of 4.33, 4.53, and 4.61 tons per acre, respectively, as compared with 4.43 tons from untreated checks. Alfalfa seeded alone in the spring after beets in the irrigated rotation experiments has produced a 4-year average yield of 1.55 tons per acre the first season, as compared with 4.21 tons from alfalfa seeded in the fall in oat stubble.

Sugar beets thinned at the ordinary time and 10 and 20 days later resulted in average yields amounting to 17.16, 13.77, and 9.61 tons per acre, respectively. The decrease in the value of the crop due to late thinning is estimated to have been $18.65 per acre where thinning was delayed 10 days and $43.58 where it was delayed 20 days. An average increase in yield of sugar beets of 4.61 tons per acre has been secured where the beets follow manure and 5.21 tons where they follow alfalfa the second and third season after it has been plowed up. Alfalfa land, pastured by hogs receiving different quantities of grain during 1914 and 1915, produced 316 bu. of potatoes in 1916 and 18.29 tons of beets in 1917, as compared with 288.3 bu. of potatoes and 16.72 tons of beets during the same period from land producing alfalfa hay during 1914 and 1915.

Giant Eckendorf, with a yield of 28.46 tons per acre, was first in variety tests with mangels. Sugar beets on similar land and grown under similar conditions produced 17.16 tons per acre. Mangels are said to be much more difficult to silo successfully than sugar beets.

In potato variety tests, Rural was first with a yield of 484.9 bu. per acre, with Red Triumph and Downing next in order with 456 bu. and 455.1 bu., respectively. A date-of-planting test was made in which potatoes were planted at four weekly intervals beginning June 11. The yields decreased consistently with an advance of the planting date, ranging from 272.6 bu. per acre for Eureka seeded June 11 to 126 bu. for the July 2 planting, and from 342.2 bu. for the June 11 planting of Pearl to 203.9 bu. for the July 2 planting. Rural seeded July 2 produced 213.7 bu. It is suggested that potatoes may prove satisfactory for recropping blown-out sugar-beet land. Potatoes following alfalfa in the irrigated rotation experiments produced an average yield of 298 bu. per acre and following manure 193.6 bu., as compared with 138.6 bu. where potatoes were grown without alfalfa or manure. The average increase in yield for a 6-year period has amounted to 104 bu. per acre after alfalfa and 48.1 bu. after manure.

Dry-Land White corn, with a yield of 71.5 bu. per acre, was first in variety tests. Calico corn from locally grown seed produced 68.8 bu. per acre, while that from seed grown in the eastern part of Nebraska yielded only 37.4 bu. of inferior corn. In the irrigated rotation experiments corn produced on the average 48.5 bu., while corn following alfalfa showed an increase of 14.6 bu. Corn following oats is said to have shown a slight advantage over that following a cultivated crop. Planting corn after sugar beets can not be recommended. Nebraska White and Hagner Yellow, with yields amounting to 16.9 and 15.9 tons per acre, respectively, were the highest yielding varieties in silage tests. Russian sunflowers produced 22.93 tons of silage.

Red Mexican, tepary, large navy, small navy, and pinto beans produced 17.4, 16.2, 15.5, 14, and 13 bu. per acre, respectively.

In cereal variety tests the yields of spring barley ranged from 37.2 bu. per acre for Bald to 79.4 bu. for Trebi, of spring oats from 64.4 bu. for Kherson to 76.4 bu. for Newmarket, and of spring wheat from 49.4 bu. for Galgalos to 52.9 bu. for Beloturka.

Oats grown in the irrigated rotation experiments were badly damaged by grasshoppers, but produced at the rate of 71.6 bu. per acre as an average for all plats. The residual effect of manure applied to the previous crop produced an increase of 17.5 bu. per acre, and oats following alfalfa showed an increase of 19.5 bu. Smaller yields were obtained where oats followed a grain crop than where they followed potatoes or beets, while still larger yields were obtained where they were grown on disked corn land.

Wheat after alfalfa produced 40.2 bu. per acre, and after oats 23.7 bu. Winter wheat grown continuously for 6 years yielded 28.3 bu.

[Report of field crops work at the Umatilla reclamation project experiment farm, Oreg., in 1917], R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1917, pp. 9, 12–14, 17–20, 27–30, fig. 1*).—In a continuation of work previously noted (E. S. R., 38, p. 431) this describes the progress of fertilizer tests with corn, irrigation experiments with alfalfa, variety trials with pasture grasses, and observations on vetch seed production, together with a report on crop rotation and lysimeter investigations conducted by H. K. Dean.

The yields of corn per acre ranged from 3.15 tons of field-cured corn for the no fertilizer plat with an annual vetch crop to 7.65 tons for the plat receiving blood meal.

Rye grown as a cover crop after alfalfa attained a height of 2.9 ft. with no manure, 3.2 ft. with manure applied at the rate of 8 tons per acre, and 3.8 ft. with a 32-ton application, as compared with a growth of 1.3, 1.8, and 2.4 ft., respectively, after feterita. Alfalfa yields following 8- and 32-ton applications of manure amounted to 5.47 and 6.25 tons per acre, respectively, as compared with 4.47 tons without manure. Feterita following alfalfa showed a marked superiority over that following a cover crop of rye and vetch with respect to the number of plants maturing heads, yield, and height, weight, stalks, and mature heads per plant, the greatest increases occurring without manure.

Applying different amounts of water to alfalfa at intervals of 1, 2, and 3 weeks resulted in average yields of 5.98, 5.57, and 3.97 tons per acre, respectively, for the period of 1914–1917, inclusive. The respective yields per acre-foot of water amounted to 0.87, 1.41, and 1.41 tons. The use of 4 acre-in. of water per application at intervals of two weeks is deemed best.

The arrangement and methods of cropping the lysimeters and observations on the amount of moisture lost through percolation, evaporation, and transpiration from the different soil types may be summarized as follows:

Summary of results obtained in lysimeter investigations.

Lysimeter.	Soil type.	Crop.	Alfalfa yield per acre.	Total water applied.	Percolation.		Evaporation-transpiration.	
					Total.	Percentage of application.	Total.	Percentage of application.
			Tons.	*In.*	*In.*	*Per ct.*	*In.*	*Per ct.*
1	Medium sand	None		62.86	43.006	68.4	19.854	31.6
2	Do	Vetch and soy beans		64.86	25.886	39.9	38.973	60.1
3	Do	Rye and alfalfa	1.99	62.86	17.969	28.6	44.891	71.4
4	Do	Alfalfa (manured)	5.54	62.86	12.023	19.1	50.837	80.9
5	Fine sand	Alfalfa	1.95	48.76	6.256	12.8	42.504	87.2
6	Coarse sand	do	1.19	48.76	14.053	28.8	34.947	71.2
7	Silt soil	do	3.62	47.76	None.		48.760	
8	Silt loam	do	3.38	51.76	None.		51.760	

Lysimeters 1 to 4, inclusive, received 8.86 in. rainfall during the year, while numbers 5 to 8, inclusive, which were started later in the season, received 3.76 in. During 1917 the irrigation water and percolate were tested for total solids, and calcium, carbonates, bicarbonates, chlorids, sulphates, and nitrates were found. It is stated that in no instance was the amount of salt constituents added to the soil by irrigation or that leached out by percolation sufficient to affect the soil materially. More nitrogen was leached from all lysimeters than was added, except in number 5. A net loss of carbonates occurred in all lysimeters except those having the fine and the coarse sand, respectively, while more bicarbonates were lost than added to lysimeters 1 to 3, inclusive, and more added to than lost from numbers 4 to 8. The sulphate represented a net gain for all lysimeters, and the chlorids for all except number 1. There was a net loss of nitrates in the percolate of all lysimeters.

Brief notes are given on the germination and general appearance of 14 varieties of grasses and 2 of clover grown in a test of pasture grasses. Meadow fescue, English rye-grass, tall oat-grass, timothy, orchard grass, western rye-grass, and alsike and white clover are said to be promising sorts for use in mixed pastures on sandy soil if the land is prepared for frequent and even irrigation.

Approximately 2,500 lbs. of vetch seed grown between orchard trees were harvested from 10 acres of land.

[Report of field crops work on the Yuma reclamation project experiment farm in 1917], R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1917, pp. 14–21, 23–32, 45, figs. 7*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 39, p. 433).

In cotton variety tests the Egyptian varieties Pima and Yuma, a selected strain of Durango, and Dixie, a short staple sort, were the highest yielding kinds, producing 2,184, 2,169, 2,022, and 2,620 lbs. of seed cotton per acre, respectively. Larger plantings of Pima, Yuma, Durango, Acala, and Tuxtla resulted in average yields of seed cotton amounting to 1,669, 1,686, 1,882, 2,033, and 1,918 lbs. per acre, respectively. The estimated total cost of production ranged from $107.85 per acre for Tuxtla to $139.57 for Yuma, while the total net return per acre ranged from $122.49 for Tuxtla to $250.27 for Pima.

In thinning tests with Egyptian cotton the highest yield of Pima, 1,661 lbs. of seed cotton per acre, was obtained from one thinning to a distance of from 17 to 19 in. between plants, and the highest yield of Yuma, 1,732 lbs., from plants thinned twice to a distance of from 9 to 11 in. between plants. Similar tests made with Durango, Acala, and Tuxtla resulted in increased yields for all varieties from delayed final thinning and a relatively close spacing of plants in the row as compared with only one thinning at an earlier date and a greater distance between plants. Egyptian cotton produced slightly better results when grown by the furrow-and-bed method than by the ordinary method of planting. The highest yield of Pima was obtained from plats having the pairs of rows spaced 6 ft. apart between the centers of the furrows, although the increase in yield was not deemed sufficient to justify the extra difficulty in handling the crop as compared to plantings with the furrows 7 to 8 ft. apart. The best results were also obtained with the plants thinned to from 12 to 16 in. apart. The highest yield of Durango cotton was secured from plats with the furrows 8 ft. apart.

Variety tests with alfalfa resulted in yields of field-cured hay of 3.12 tons per acre for hairy-leaved Peruvian, 2.36 tons for Indian, 2.25 tons for smooth-leaved Peruvian, and 2.22 tons for common Chilean. Yields of alfalfa seed were obtained as follows: Arabian, 202 lbs. per acre, Chilean 135 lbs., Peruvian 130 lbs., and Grimm 110 lbs. Hairy-leaved Peruvian sown in 20-in. rows produced 562 lbs. of seed per acre, as compared with 431 lbs. when sown broadcast. Additional hay yields were obtained amounting to 3.78 and 5.35 tons per acre, respectively.

White durra, Dwarf milo, Dwarf hegari, and feterita grown on a field basis in variety tests with grain sorghums produced 36.7, 31.3, 29.8, and 29.5 bu. per acre, respectively. Brown kaoliang grown on a limited scale yielded 36.6 bu. of grain. In spacing tests with Dwarf milo the maximum yields were obtained where the plants were spaced 12 in. apart in the row, amounting to 36.2 bu. on medium heavy soil and 32.2 bu. on light soil. From 94.2 to 98.7 per cent of the heads were well filled on the medium soil and from 85.8 to 90.8 per cent on the light soil.

Date-of-seeding tests were made with flax sown in 30-in. rows at intervals of 15 days from November 25 to February 1, inclusive. The highest yield, 26.1 bu. per acre, was obtained from the December 15 planting, with the January 2 planting next in order with 24.5 bu. Rate-of-seeding tests, in which flax was sown broadcast at a rate of from 18 to 60 lbs. per acre, resulted in yields ranging from 8.98 bu. for the 18 lb. rate to 10.9 bu. for the 40 lb. rate, although 25 lbs. of seed is deemed sufficient.

Tests of forage sorghums for sirup production made in cooperation with the U. S. Indian Service resulted in yields of sirup amounting to 200 gal. per acre for Gooseneck, 176 gal. for White African, 149 gal. for Honey, and 70 gal. for Sumac. Sorghum grown on soil containing much white alkali was found to be undesirable for sirup production.

Amraoti and Bangalia field peas gave the highest yield of seed, 15.45 and 12.35 bu. per acre, respectively, while selections of the Tangier pea grown during 1917 failed to produce yields equal to these.

Chufas are said to have produced much higher yields on medium soil than on sandy soil. Yields of 2.1 tons of tubers and 2 tons of hay per acre were obtained.

The failure of rice on the project is briefly noted, and the possible danger to all other crops of raising the water table of areas adjacent to land being heavily irrigated for rice is indicated.

Eastern-grown seed of a strain of Irish Cobbler potatoes was compared with seed grown as an autumn crop on the experiment farm the preceding year, and also with seed from the spring crop of the preceding year that had been shipped to a cool climate for summer storage. Yields amounting to 89.3, 28.3, and 36.6 bu. per acre, respectively, were obtained.

Report on the department of agriculture, Barbados, 1916–17, J. R. Bovell (*Rpt. Dept. Agr. Barbados, 1916–17, pp. 2–30*).—This reports the progress of work with sugar cane, cotton, cassava, economic Caladium and Xanthosoma, various legumes, yams, sweet potatoes, and miscellaneous fodder crops along the same general lines as previously noted (E. S. R., 38, p. 526).

Field experiments [in Ireland], 1917 (*Dept. Agr. and Tech. Instr. Ireland Jour., 18 (1918), No. 2, pp. 158–168*).—The results of fertilizer, variety, and cultural tests with potatoes already noted (E. S. R., 38, p. 432) are reviewed, and variety tests with winter wheat are briefly reported. Queen Wilhelmina, Square Head Master, and White Stand-up tested at 22 centers during 1917 produced average yields of approximaely 46.2, 43.9, and 41.5 bu. per acre, respectively.

Cereal culture in New Castile, Spain, G. Quintanilla (*Bol. Agr. Téc. y Econ., 10 (1918), No. 110, pp. 115–132; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 7, pp. 782–784*).—This article reviews the available data on weather conditions (temperature and rainfall) of New Castile in relation to the production of crops, particularly cereals.

"The author lays stress on the necessity of such examinations of the soil as will immediately give the data by which it is possible to calculate approximately the probability of growing successfully any crop in a country with so unfavorable a climate," and on the importance of choosing resistant types (preferably native), the date of sowing, and the character of soil.

The influence of chemical fertilizers on the composition of grain (*Agr. Mod. [Milan], 23 (1917), No. 20, pp. 265–267*).—Experimental work with wheat and corn is briefly described showing the effect on the composition of the grain of the application of nitrates, phosphates, and potash to different soils. The results indicated a general increase in the weight of grain, total nitrogen, and phosphoric acid content, and the amount of dry gluten for the fertilized over the unfertilized grain.

Relative effect of sodium chlorid on the development of certain legumes, G. W. Hendry (*Jour. Amer. Soc. Agron., 10 (1918), No. 6, pp. 246–249*).—This paper, a contribution from the University of California, describes experiments in which 13 varieties of legumes were grown in the greenhouse in glass jars containing chemically pure quartz sand to which sodium chlorid was added in amounts representing 0.04, 0.16, 0.3, 0.5, and 1 per cent of the dry weight of the sand. Observations were made on the relative effects of the different concentrations upon the life period, height of growth, and leaf area for all the varieties studied, and upon nodule development and the blossoming period in certain of the varieties.

Windsor bean (*Vicia faba*), Blackeye cowpea (*Vigna sinensis*), and Mexican garbanzo (*Cicer arietinum*) were found to be less affected by sodium chlorid than the other varieties tested, while Lewis lima (*Phaseolus lunatus*), and White tepary (*P. acutifolius* var. *latifolius*) were less affected than the other varieties of *P. vulgaris* employed in the test. None of the plants grew in the 1 per cent solution, while only the Windsor bean and the Mexican garbanzo survived in the 0.5 per cent solution.

Nodules developed on all varieties except the lima, tepary, and garbanzo, and were most numerous and largest in the control cultures, diminishing in size and number as the concentration of the solution increased, and disappearing entirely in the 0.3 per cent solution. Differences in the degree of injury sustained by the different legumes with regard to nodule production are held to indicate a specific alkali tolerance for the nodule-forming organisms themselves. Other effects of sodium chlorid upon plant development included retardation of germination, height of growth, and blossoming period, reduction in the number and size of leaves, and premature death.

Our colonial agriculture.—XII, Fibers, G. VAN ITERSON, JR. (*Onze Koloniale Landbouw.—XII, Vezelstoffen. Haarlem: H. D. Tjeenk Willink & Son, 1917, pp. 80, figs. 43*).—This is one of the series of popular handbooks, edited by J. Dekker, on the agricultural products of the Dutch East Indies. It deals with the production and utilization of various fiber plants.

Field beans, G. STEWART (*Utah Sta. Circ. 37 (1919), pp. 3–45, figs. 15*).—This is a rather detailed account of the distribution and adaptations of the crop, together with a description of the field practices and cultural methods employed in growing, harvesting, thrashing, and marketing beans in Utah. Brief notes are presented on bean pests and on the utilization of beans.

Little Navy Wonder, Utah Pea, White Marrow, and Michigan Pea are deemed to be the best varieties in the order named.

Our colonial agriculture.—IX, Cassava, K. R. F. BLOKZEIJL (*Onze Koloniale Landbouw.—IX, De Cassave. Haarlem: H. D. Tjeenk Willink & Son, 1916, pp. VIII+76, figs. 24*).—This is one of the series of popular handbooks noted above. It deals with the cultural methods and field practices employed in growing cassava, and gives a rather detailed account of the preparation of the different products obtained from the plant. A brief account of the history and botanical relationships of the plant and of cassava diseases is also included, and the results of chemical analyses of the roots are noted.

Breeding new castor beans, O. E. WHITE (*Jour. Heredity, 9 (1918), No. 5, pp. 195–200, figs. 5*).—The author briefly outlines the possibilities of crop improvement with the castor bean on the basis of observations made in breeding work at the Brooklyn Botanic Garden. Many varieties are said to breed true to their most prominent characters immediately. Even under favorable conditions cross-pollination was observed in only about 5 per cent of the plants.

Relation between yield and ear characters in corn, T. B. HUTCHESON and T. K. WOLFE (*Jour. Amer. Soc. Agron., 10 (1918), No. 6, pp. 250–255*).—The authors describe work done at the Virginia Experiment Station during 1916 and 1917 in a study of the relation between corn yields and certain ear characters of the progeny of seed ears selected at random. Boone County White grown at the station for nine years and selected for earliness was employed. In 1916 12 high-yielding and 10 low-yielding strains, and in 1917 9 high-yielding and 11 low-yielding strains were selected for examination. The high-yielding strains produced 20.77 bu. more per acre than the low-yielding strains in 1916 and 14.72 bu. more in 1917.

The data relative to the various ear characters were in close accord for the two years and in general favored the high-yielding strains. A significant correlation was observed between yield and length, average circumference, average circumference of cob, uniformity of exhibit, shape of ears and trueness to type, character of tips, uniformity of kernels, and shape of kernels and size of germ, while the correlation between yield and ratio of butt to tip circumference, percentage of grain, number of rows, average length of kernels, character of butts, space between kernels, and space between rows was small. The results are said to indicate that points emphasized in the corn score card may be of value in selecting high-yielding strains, and that high-yielding strains are high-scoring strains.

A fifth pair of factors, Aa, for aleurone color in maize, and its relation to the Cc and Rr pairs, R. A. EMERSON (*New York Cornell Sta. Mem. 16 (1918), pp. 231–289, fig. 1*).—Observations of F_2, F_3, and F_4 individuals are said to indicate the existence of a fifth pair of aleurone color factors in addition to the four factor pairs concerned in the development of aleurone color in maize, previously described by East and Hayes (E. S. R., 25, p. 736) and East (E. S. R., 28, p. 634). Considerable data are presented in tabular form, and certain other factors, genetic and otherwise, concerned in aleurone color development are discussed.

The fifth factor pair designated as *Aa* was found to bear such a relation to the other factors *Cc*, *Rr*, *Ii*, and *Prpr*, that dominant *A*, *C*, and *R*, and duplex recessive *i*, must all be present for the development of any aleurone color. Duplex *pr*, together with the other factors, resulted in red aleurone, while *Pr* gave purple. F_2 ratios of colored to colorless approaching 27:37 are noted and are compared with the well known 9:7 F_2 ratios. Variation in the percentage of colorless individuals was sufficient to cause an overlapping of the two classes, the range for the 9:7 class being from 36 to 53.7 per cent and for the 27:37 class from 44.9 to 66.5 per cent. The mean F_2 percentages were found to be 42.91 ±0.28 and 57.79 ±0.21 and the theoretical percentages 43.75 and 57.81, respectively.

The hypothesis that color developed only in the presence of dominant *A*, *C*, and *R*, and that all three were heterozygous in F_1 was subjected to every genetic test known to the author with results said to be quite in accord with expectations, as follows:

(1) Colorless F_2 individuals bred true colorless in F_3, while colored F_2 individuals were found to be of four kinds with respect to their behavior in F_3, giving ratios of colored to colorless of 1:0, 3:1, 9:7, and 27:37 in approximately the expected numerical relation of 1:6:12:8, respectively. Colored F_3 individuals of the 9:7 class were tested and were found to give F_4 ratios of 1:0, 3:1, and 9:7 in about the expected numerical relation of 1:4:4, respectively. The results in F_4, so far as determined, were in agreement with the hypothesis. (2) The seven classes of colorless individuals expected on the basis of the hypothesis, namely, *aCR*, *AcR*, *ACr*, *Acr*, *aCr*, *acR*, and *acr*, have been found, demonstration of their existence having been made possible by the use in crosses of the three classes *aCR*, *AcR*, and *ACr*, known as aleurone testers, after these had first been isolated by random intercrosses of colorless individuals. The results expected from crossing the three aleurone testers with each of the 27 possible genotypes involving *A*, *C*, and *R* are noted, and examples illustrating some of these results are given. The effect of the degree

of maturity on the development of aleurone color is indicated, and the difference in appearance of aleurone colors due to the color, composition, and texture of the underlying endosperm are discussed.

Certain previously unannounced genetic factors influencing aleurone color and color patterns are described, although the mode of inheritance of some of these, and their interrelations with other aleurone factors, have not as yet been fully determined.

Heterozygous mottling of aleurone color is said to be due to the *Rr* factor pair or to some factor closely associated with it. Furthermore it was shown by means of reciprocal crosses that mottling occurred only when *R* was contributed by the male parent and *r* by the female parent of a cross, indicating that colored aleurone of the constitution *RRR* or *RRr* is self-colored, while that of the constitution *rrR* is ordinarily mottled. Various hypotheses bearing upon the relation of *R* to mottling are discussed.

Examples are presented of anomalous development of aleurone color resulting in seeds that were partly colored and partly colorless, it being demonstrated that *R* was rarely if ever concerned in this peculiar coloration, while *C* and *A*, the latter probably more frequently than the former, were so concerned. Such colored-colorless seeds apparently occurred only when at least one of the aleurone color factors was heterozygous, and then only when the dominant factor entered the cross from the male parent and its recessive allelomorph from the female parent. From these facts it is inferred that the *aaA* condition of the aleurone, for instance, but not the *AAa* and *AAA* conditions, may occasionally result in anomalously colored seeds. Three possibilities are discussed in this connection, vegetative segregation, somatic mutation, and aberrant chromosome behavior.

Cotton variety tests, 1918, L. E. RAST (*Ga. State Col. Agr. Circ. 81 (1919), pp. 4*).—Of the 38 varieties of cotton tested, College No. 1 was first in yield of lint with 972 lbs. per acre, and Wanamaker next in order with 877 lbs. Based upon the yield and value of both seed and lint, Meade, a long-staple upland variety, is estimated to have given the largest total money return, $371.80 per acre. College No. 1 was second with $341.61.

Varieties of cotton, 1909–1917, W. E. AYRES (*Arkansas Sta. Bul. 157 (1918), pp. 40, figs. 2*).—This bulletin presents general conclusions and recommendations with regard to cotton varieties in Arkansas, together with considerable tabulated data on yields of different strains grown in numerous tests throughout the State and previously noted (E. S. R., 39, p. 637).

It is estimated that good varieties of cotton will produce for the State products worth $75,000,000 more annually than poor varieties and $25,000,000 more than average sorts, and that good varieties alone will increase the value of the cotton crops of the South by $230,000,000 annually. The use of well-bred seed from consistently high yielding varieties is recommended, and community action for the protection of seed cotton from deterioration through mixing at the gin is urged. It is stated that a few varieties could profitably replace the large number now grown in the State.

Trice, Cleveland, and early strains of Triumph are said to be the most satisfactory short staple varieties for the hill and thin valley lands of northeastern Arkansas, while Express and early strains of Webber are deemed to be the best long staple kinds. Express and early strains of Foster and Webber are recommended for the better soils in the bottom lands of this section which are adapted to long staple cotton. Trice and dwarf strains of Cleveland and Triumph are regarded as desirable short staple varieties for these soils.

Express, Foster, and Webber, together with early strains of the last two under severe weevil infestation, were found to be the best long staple varieties for the better soils of the west-central, central, and east-central parts of the State, while Cleveland and early strains of Triumph were the best short staple sorts. Where "benders" are desired, Rowden and Lone Star are deemed best. On the poorer soils of this region Trice, Rublee, and Cleveland did well. Express and Webber are recommended for hill lands where long staple cotton is to be grown.

On the thin soils of the southern third of the State, Trice, Rublee, and Cleveland were best. On the better soils, long staple kinds such as Express, Foster, and Webber gave good results, while Triumph, Rowden, and Lone Star also did well.

Varieties of cotton. Summary 1909 to 1917, W. E. AYRES (*Arkansas Sta. Circ. 44* (*1918*), *pp. 4*).—This presents a summarized statement in tabular form of the results noted above.

Production of American Egyptian cotton, C. S. SCOFIELD, T. H. KEARNEY, C. J. BRAND, O. F. COOK, and W. T. SWINGLE (*U. S. Dept. Agr. Bul. 742* (*1919*), *pp. 30*).—This is a revision of Bulletin 332 (E. S. R., 34, p. 529).

The cotton resources of the [French] colonies, P. BOURDARIE (*Bul. Soc. Encour. Indus. Nat.* [*Paris*], *129* (*1918*), *No. 1*, *pp. 97–134*).—This is a comprehensive account of the cotton resources of the French possessions, with a review of the position of the French cotton industry with respect to raw material and of the relation of the English and German industries to raw materials.

Experiment with flax growing at the government farm at Guemmeiza, G. C. DUDGEON (*Min. Agr. Egypt, Tech. and Sci. Serv. Bul. 12* (*1917*), *pp. 1–9*, *pl. 1*).—This forms a preliminary report on a study of flax growing in Egypt, noting some experiments begun in 1915 with Egyptian-grown seed to determine the best rate of seeding and the effect of different dates of harvesting on the production of both seed and fiber. The details of weights, analyses, and valuations were obtained from a report on the work made by F. Hughes.

The average maximum yield of seed, harvested April 2, 1916, was obtained from a planting rate of approximately 2.27 bu. per feddan (2.19 bu. per acre), and amounted to about 178.2 lbs. The maximum yield of stalks, harvested April 7, amounted to 470.75 lbs., and was obtained from a seeding rate of 3.62 bu.

The inheritance of hull-lessness in oat hybrids, H. H. LOVE and G. P. MCROSTIE (*Amer. Nat.*, *53* (*1919*), *No. 624*, *pp. 5–32*, *figs. 7*).—The authors describe work begun in 1910 at Cornell University in cooperation with the U. S. Department of Agriculture, in which a number of crosses were made between hulled and hull-less types of oats. The hull-less oat used was typical of the *Avena nuda* group, while the hulled forms comprised *A. fatua* and different varieties of *A. sativa*, including Black Tartarian, Danish Island, Swedish Select, and Sixty Day. In addition to observations made upon the inheritance of hull-lessness studies were also undertaken to determine whether the percentage of hulled plants secured from any heterozygous parent varied with the percentage of hulled kernels possessed by that parent, and whether hulled and hull-less kernels of a heterozygous plant give approximately the same results in their offspring.

It is said to be evident from the results obtained that hull-lessness exhibits a simple Mendelian ratio of one hulled, two intermediate, one hull-less. The intermediates showed all gradations of hull-lessness from individuals nearly hulled to those nearly hull-less. The percentage of hulled kernels on heterozygous plants appeared to indicate to some extent the percentage of hulled kernels on the heterozygous offspring. Regardless of the percentage of hulled kernels present on heterozygous individuals, they tended in general to produce a 1:2:1 ratio. Hulled and hull-less kernels from intermediate plants produced a similar ratio.

Scientific potato culture, A. J. Young, sr. (*Huntington Beach, Cal.: Huntington Beach News* [*1918*], *pp. 90, figs. 15*).—A concise discussion of the potato and its production, designed especially for the potato growers of California.

The effect of inoculation, fertilizer treatment, and certain minerals on the yield, composition, and nodule formation of soy beans, C. R. Fellers (*Soil Sci.*, *6* (*1918*), *No. 2*, *pp. 81–129*, *figs. 5*).—Greenhouse pot tests and field plat experiments conducted at the New Jersey Experiment Stations are described. Black Eyebrow soy beans were grown without inoculation, and also with inoculation from soil, different commercial cultures, and from a pure culture of *Bacillus radicicola* isolated from a soy bean nodule, to study the effect of inoculation upon yield, nodule formation, and composition of seed, with particular reference to its effect upon the protein and oil content. Similar observations were made of the effect of different quantities of burnt lime, ground limestone, and ground oyster shell, and of fertilizers and salts used alone and in varying combinations, including acid phosphate, sodium nitrate, potassium chlorid, calcium carbonate, manganese sulphate, sulphur, calcium sulphate, zinc sulphate, and ferric sulphate. The data are presented in tabular form, fully discussed, and conclusions reached as follows:

Certain commercial cultures of legume bacteria were found to be unreliable for inoculating soy beans, while others were as efficient in nodule production as freshly isolated cultures of *B. radicicola* or well-infected soil. Inoculation resulted in a substantial increase in the yield of both the total dry matter and the seed in every case. An average decrease of 8 per cent in the oil content of soy bean seeds followed inoculation, while the protein content was increased 7 per cent, the respective decreases and increases being in direct proportion to the thoroughness of inoculation of the plants. No differences were observed in the drying power of the oil extracted from the seeds of inoculated and uninoculated plants. It is stated that the spread of natural inoculation in the soil appeared to be very small, unless *B. radicicola* was transferred by means of wind, water, animals, etc.

Ground oyster shells and burnt lime were both found to be very efficient in increasing the yield and total dry matter of soy beans on acid soils, the increases varying from 30 to 50 per cent. Small applications (1,000 to 2,000 lbs. per acre) were nearly as beneficial as large amounts, and are deemed preferable to a single large application if made at intervals of a few years. Liming seemed to stimulate nodule production by as much as 1,500 per cent in some cases, appearing to be nearly as important as inoculation, although it is stated that both should be practiced for the best results. Nodule development did not take place readily on acid soil, even when the root-infecting organisms were plentiful in the soil. The oil content of the seeds decreased in direct proportion to the increased amounts of lime applied, while the protein content increased. The average decrease in the oil content following liming was 2.8 per cent. Small amounts of lime were nearly as effective in raising the protein content as larger applications.

Immature and small seeds were lower in oil content than mature seeds. This is thought to be due possibly to the failure of the reserve carbohydrates in the seed to be fully transformed into oil.

The yield of total dry matter and seed and the oil content of the seed was materially increased with small applications of acid phosphate, especially when the soils were well limed, from 100 to 200 lbs. per acre appearing to be as beneficial as larger applications. On acid soils acid phosphate failed to show any appreciable increase. Nodule production was also stimulated on limed soils by acid phosphate, but this effect was not so marked on acid soils. Acid phosphate seemed to exert a beneficial influence on protein formation in seed on both limed and unlimed plats.

Applications of from 50 to 400 lbs. of muriate of potash per acre were followed by an average increase of about 10 per cent in the yield of total dry matter and seed on both limed and unlimed plats, while nodule production was slightly stimulated on the limed plats but not on the unlimed. A slight decrease in the percentage of oil in the seeds followed the use of potash, but little influence on their protein content was observed.

Various combinations of acid phosphate, muriate of potash, and nitrate of soda, with lime, showed substantial increases in the yield of total dry matter and, except for two plats fertilized with manganese sulphate, in seed as well. That fertilizer treatment which appeared to give the greatest return for the money invested on acid soils comprised from 200 to 300 lbs. of acid phosphate, together with a ton of lime. Other fertilizer mixtures showed increased yields, but these were not sufficient to justify their use. Nitrate of soda, for example, apparently increased the yield and protein content of the seed, but inhibited nodule formation and caused a decrease in the oil content.

With manganese sulphate, germination and early growth of soy beans were stimulated, but not nodule production or yields. There was little, if any, effect upon the oil or protein content of the seed.

Sulphur did not show increased yields of dry matter or seed in applications over 100 lbs. per acre, large amounts seeming to injure the plants. It is suggested that this may have been due to oxidation of the sulphur in the soil to sulphuric acid, thus producing acidity. The protein content appeared to be increased by moderate applications of sulphur but was decreased by large applications, the exact reverse being true in the case of the oil content. In general, sulphur seemed to stimulate nodule formation. Calcium sulphate in amounts up to 600 lbs. per acre seemed to exert little influence on the yield of total dry matter or seed, while with large amounts there was an increase in oil content in the seed and also a stimulation of nodule formation. The results obtained with zinc sulphate and ferric sulphate are deemed inconclusive, but these minerals seemd to stimulate plant growth and to give increased seed production. The protein content was also apparently somewhat increased and the oil content slightly decreased.

A list of 54 titles comprising the literature cited is appended.

Farm practice in growing sugar beets in Michigan and Ohio, R. S. Washburn, L. A. Moorhouse, T. H. Summers, and C. O. Townsend (*U. S. Dept. Agr. Bul. 748 (1919), pp. 45, figs. 23*).—This bulletin reports the result of studies made on 320 farms in the vicinity of Caro, Alma, and Grand Rapids, Mich., and in northwestern Ohio, to ascertain the field practices employed in the production of sugar beets under humid conditions, together with the cost of growing the crop. The data were obtained during the crop seasons of 1914 and 1915.

In the Michigan areas, sugar beets followed corn or beans in the rotation, while on 39 per cent of the farms visited in northwestern Ohio they followed clover. Manure was applied at an average rate of about 13 tons per acre on 201 of the farms, while commercial fertilizers were applied on 68 per cent of the farms in the Caro region, 47 per cent at Alma, 78 per cent at Grand Rapids, and 39 per cent in northwestern Ohio, the rate of application ranging from 130 to 170 lbs. per acre. Planting dates varied from April 5 to June 1.

Most of the handwork on sugar beets was performed at a contract rate of $18 per acre for beets grown in 22-in. rows, $16 for 24-in. rows, and $15 for 28-in. rows. Blocking and thinning was done by 15 per cent of the farmers, hoeing by 17 per cent, and topping by 10 per cent, this work being done on a contract basis on the remaining farms. At Caro growers produced on the average 9.72 tons of beets per acre at an estimated cost of $47.65; at Alma 11.4 tons for $57.42; at Grand Rapids 10.16 tons for $53.05; and in northwestern Ohio 13.17 tons for $56.04. A yield of 8 tons or less per acre produced by 22 men cost $49, or $7.05 per ton, as compared with a cost of $58.18 per acre, or $3.92 per ton, for a yield of 14 tons or more obtained by 25 growers.

Labor constituted about 64 per cent of the total cost of producing sugar beets in the region; manure, fertilizer, and seed about 11 per cent; and insurance, taxes, interest, rent, machinery charges, etc., about 25 per cent.

Approximately 96 per cent of the growers in Michigan fed the beet tops to stock, while about one-half of the producers in northwestern Ohio fed the tops and about one-half plowed them under.

Sugar beet seed, T. G. Palmer (*New York: John Wiley & Sons, 1918, pp. XV+120, figs. 34*).—This book presents a comprehensive discussion of the history, development, and present status of the sugar beet seed industry, based largely on information obtained during 1908 to 1911, inclusive, when the author visited sugar beet seed farms in France, Germany, Holland, and Bohemia. Seed growing in Washington, California, Utah, Idaho, and South Dakota is also discussed. Statistical information is given showing the exports and the value of the sugar beet seed from Germany to various countries and from Russia into Germany, and the estimated sugar beet seed requirements of the world.

A review of the results of field experiments with sugar cane in Java, VII–IX, J. M. Geerts (*Arch. Suikerindus. Nederland. Indië, 25 (1917), No. 43, pp. 1637–1689, figs. 28; 26 (1918), Nos. 3, pp. 55–132, figs. 30; 4, pp. 135–144; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 16 (1917), pp. 53, figs. 28; No. 1 (1918), pp. 78, figs. 30; No. 2 (1918), pp. 10*).—The author presents preliminary observations on the most promising sugar-cane varieties, as indicated by field tests for the year ended January 1, 1917, reports the results of variety tests for the season of 1917, and reviews the results of fertilizer and cultural experiments with sugar cane in connection with work previously noted (E. S. R., 37, p. 426; 38, p. 516).

[Java canes in Tucumán], A. H. Rosenfeld (*Sugar [Chicago], 19 (1917), Nos. 11, pp. 425–429, figs. 2; 12, pp. 472–476*).—This describes variety tests with Java seedling canes at the Tucumán Experiment Station, giving the results obtained from the plant cane and stubble from eight crops for the period 1911 to 1916, inclusive.

Average yields of cane were obtained amounting to 76,054 kg. per hectare (about 33.84 tons per acre) for Java 36; 68,880 kg. for Java 213; 63,345 kg. for Java 139; and 47,584 kg. for Java 234. The average sucrose content of the juice was 14.2, 13.9, 12.5, and 14.9 per cent, respectively. Native striped cane used as a check produced 22,494 kg. of cane per hectare and 13.4 per cent of sucrose. The four Java varieties are briefly described.

Fall and winter planting [of sugar cane] in the Argentine, A. H. Rosenfeld (*Sugar [Chicago], 20 (1918), No. 2, pp. 47, 48*).—The author presents a brief review of work begun in 1911 at the Tucumán Experiment Station to determine the best planting date for sugar cane. The maximum yields of cane were obtained from plantings made between July 15 and September 15.

A cane drainage experiment, A. H. Rosenfeld (*Sugar [Chicago], 20 (1918), No. 3, p. 97*).—The author describes field tests conducted at the Tucumán Experiment Station during 1912 and 1913 with sugar cane grown on drained and undrained plats.

Yields of plant cane from the drained plat amounted to 34,142 kg. per hectare (about 15.19 tons per acre), and the yield of stubble was 48,609 kg. as compared with 31,198 and 38,273 kg. per hectare, respectively, from the undrained plat. Analysis of the juice showed 11.9 per cent sucrose for the cane grown on the drained plats and 12.2 per cent for that grown on undrained plats for both plant and stubble cane.

Avoiding frost damage to cane stools, A. H. Rosenfeld (*Sugar [New York], 20 (1918), No. 5, pp. 182, 183*).—The author briefly describes experiments begun at Tucumán in 1912 to ascertain the effect upon the yield and stand of sugar cane of covering the stubble to prevent injury from frost. Cane cut in June was covered about two weeks later with soil thrown up on each side of the row, and the following crop was harvested August 9, 1913. The covered stubble yielded at the rate of 39,534 kg. per hectare (about 17.59 tons per acre), with 719 stalks per row of 100 meters (about 328 ft.), as compared with 35,970 kg. per hectare from uncovered stubble averaging 700 stalks per row.

Observations were also made of the effect of frost injury upon cane harvested at different times. In 1912 a series of cane rows corresponding to the uncovered rows described above were harvested June 22, and a second series corresponding to the covered row was harvested August 2. The 1913 crop was harvested July 24, yielding at the rate of 31,746 kg. per hectare for the August stubble and 23,100 kg. for the June stubble. The average number of stalks per row of 100 meters was 626 and 519, respectively.

Sweet tussock (Phalaris bulbosa), A. Botto (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 13 (1918), No. 1, pp. 1–32, figs. 9*).—The production and use of *P. bulbosa*, said to be a valuable forage crop for Argentina, is described.

Some studies in blossom color inheritance in tobacco, with special reference to Nicotiana sylvestris and N. tabacum, H. A. Allard (*Amer. Nat., 53 (1919), No. 624, pp. 79–84*).—Crosses of pink-flowered with carmine-flowered varieties of tobacco and of carmine or pink-flowered strains with white-flowered sorts are briefly described. The white-flowered types used included *N. sylvestris* and *N. tabacum;* the pink-flowered varieties Connecticut Broadleaf, 70-leaf Cuban, and Maryland Mammoth; and the carmine-flowered strain was a variety sold for ornamental purposes as a giant red-flowering tobacco.

Carmine and pink behaved as unit characters, carmine being dominant. In the F_2 generation perfect Mendelian segregation occurred, approximating very closely the theoretical ratio of three carmines to one pink. Extracted recessive pinks and homozygous carmines bred true, heterozygous carmines again breaking up into carmine and pink. Heterozygous plants of the F_1 generation crossed with pure carmine produced all carmine blossoms, whereas when crossed with pink both carmines and pinks appeared in approximately a 1:1 ratio. In crosses of carmine or pink with white, white behaved as a recessive appearing in the second generation.

Trials with Réunion tobacco in 1916–17, G. G. Auchinleck (*Dept. Agr. Mauritius, Gen. Ser., Bul. 9 (1917), [English Ed.], pp. 12, pls. 3*).—The first season's results of an attempt to establish Réunion tobacco in Mauritius are noted.

A unique system of curing the crop, known as "carotting," is described, in which the leaves are rolled into torpedo-shaped bundles and securely bound with cord, the cord being tightened as the tobacco dries out. The "carottes" are then stored for two years or more before being sold to the manufacturer.

Our colonial agriculture.—VIII, Tobacco, O. de Vries (*Onze Koloniale Landbouw.—VIII, Tabak. Haarlem: H. D. Tjeenk Willink & Son, 1915, pp. VIII+79, figs. 47*).—This is one of the series of popular handbooks edited by

J. Dekker, on the agricultural products of the Dutch East Indies. It deals with the cultivation, harvesting, and marketing of tobacco, and contains brief notes on tobacco diseases.

Culture and possible utilization of Typha in France, J. B. Gèze (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *15* (*1916*), *Dec., pp. 490–498*).—The species of Typha employed in France, their geographical distribution and cultivation, and the utilization and exploitation of the roots, stems, leaves, flowers, and fruit are briefly described.

Spring wheat for Illinois, W. L. Burlison and W. R. Stark (*Illinois Sta. Bul. 214* (*1919*), *pp. 313–320*).—Observations on growing spring wheat in the northern part of the State are briefly described.

Early seeding is deemed essential for the best results, while somewhat higher yields were obtained from the use of an 8 in. drill than with a 4 in. drill. Illinois No. 1 was the highest yielding variety of spring wheat tested at Urbana (central Illinois), producing an average of 29.3 bu. per acre for a 4-year period, while Marquis with an average of 34.8 bu. was first at De Kalb (northern Illinois). In central Illinois hardy varieties of winter wheat have outyielded all spring wheat varieties, while at De Kalb, due to partial winterkilling of fall-sown wheat, Marquis has produced an average of 2.5 bu. per acre more than Turkey Red, the hardiest winter wheat variety. At Urbana Turkey Red winter wheat, Oderbrucker barley, and Sixty Day oats gave greater monetary returns per acre than any spring wheat, while at De Kalb, Wisconsin Pedigree barley gave better returns than any other spring-sown crop.

Fourth annual report of the Montana grain inspection laboratory, A. Atkinson and E. W. Jahnke (*Montana Sta. Bul. 125* (*1918*), *pp. 19*).—This reports work for the year ended September 30, 1917. Germination and purity tests were made on 6,668 samples of seed sent in by farmers and seedsmen, and on 2,082 official samples.

Laboratory tests with 66 samples of frosted wheat resulted in an average germination of 77 per cent, as compared with 93 per cent for unfrosted wheat. Winter wheat showed 27 per cent germination one week after thrashing, 70 per cent one month later, and 93 per cent two months later; spring wheat 31, 81, and 94 per cent; oats 21, 57, and 88 per cent; and barley 43, 77, and 89 per cent, respectively, for similar periods.

Commercial agricultural seeds, 1918, C. D. Woods (*Maine Sta. Off. Insp. 88* (*1918*), *pp. 61–76*).—Tables are given showing the results of the 1918 seed inspection, together with a list of the weed seeds found.

Report of seed tests for 1918 (*Bul. N. C. Dept. Agr., 39* (*1918*), *No. 9, pp. 36*).—This reports the results of purity and germination tests made by the North Carolina State seed laboratory during the year ended July 15, 1918. A total of 773 samples of agricultural seed and 363 samples of vegetable seed was received from regularly appointed inspectors and from farmers. Tobacco seed recleaned for the tobacco farmers of the State amounted to 156,149 cc.

Disinfection of seeds with bromin, V. Artsikovsky and I. Stom (In *Hibridicultura y Otros Trabajos de las Estaciones. Madrid: Estac. Ensayo Semillas, 1917, pp. 51–64, pl. 1, figs. 4*).—The sterilization of peas, beans, corn, wheat, flax, and pumpkin with 1 per cent solution of bromin is described, and the results are reported of germination tests with peas, corn, wheat, and flax treated from ½ to 4 hours and with beans and pumpkin seed treated from ½ to 32 hours.

The results are said to indicate that bromin is an effective sterilizing agent. The viability of the seed was not seriously affected by the shorter periods of treatment, except in the case of wheat, which was rendered practically useless by treatments of only 30 minutes.

HORTICULTURE.

[Report of horticultural investigations], O. B. WHIPPLE (*Montana Sta. Rpt. 1917, pp. 252, 253, 254, 255*).—A brief statement of progress made in variety and cultural tests of vegetables and fruits.

A continuation of studies of premature seeding in celery again clearly demonstrated that moving plants to the cold frame early was the most important factor in favoring premature seeding (E. S. R., 38, p. 344). Plants subjected to the cool temperature of the cold frame produced 50 per cent of seed stalks, while check plats produced none. In the selection work with tomatoes the great majority of the station's selections of Earliana and Chalk Early Jewel outyielded seed purchased from well-known seed houses.

Some data were secured during the year on the influence of the position of the fruit in the cluster upon the form of McIntosh and Wealthy apples. In general, the length of the apple increases from the outside of the cluster to the center and the length of stem increases from the center outward. In the case of the McIntosh, the best fruits were secured from the fourth and fifth blossoms, counting from the outside of the cluster. The center blossom in clusters of six flowers produced an inferior-shaped fruit.

[Horticultural investigations at the Umatilla experiment farm, Oreg., in 1917], R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1917, pp. 9–12, 23–27*).—This is a progress report on the apple-orchard cover-crop and the peach-orchard experiments being conducted at the farm (E. S. R., 38, p. 443), together with notes on variety tests of orchard fruits, grapes, and ornamental and windbreak plants. Tabular data are given showing the yield of fruit in 1917, and the sizes of the trees in 1915 and 1917 on the various plats in the apple and peach orchard experiments, and also the growth record of peach varieties on the farm in 1915 and 1917.

[Horticultural investigations on the Yuma reclamation project in 1917], R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1917, pp. 35–44, figs. 7*).—The usual progress report on cultural and variety tests of orchard and small fruits and vegetables (E. S. R., 39, p. 444).

The garden: How to make it pay, H. H. THOMAS (*London and New York: Cassell & Co., Ltd., 1918, pp. VIII+151, figs. 74*).—A popular treatise on vegetable, fruit, and flower gardening, including a monthly working calendar.

A new method of using explosives in tree planting.—Its advantages and utilization in the rapid reconstitution of orchards devastated by the enemy, A. PIÉDALLU (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 21, pp. 763, 764*).—The author calls attention to the vigorous development of wild plants growing on the border of shell holes and abandoned trenches, as well as to certain beneficial results which have followed the use of explosives in tree planting in the United States. He then advocates the use of a combined fertilizer and explosive shell in replanting the devastated regions of France, with a view to distributing the essential fertilizers through the subsoil broken up by the explosives.

Progress report on rootstock experiment, W. L. HOWARD (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 1, pp. 13, 14, fig. 1*).—Tests of different rootstocks for deciduous fruit trees were started at the University Farm at Davis, Cal., in the spring of 1915. The present paper briefly reviews all varieties and stocks of different ages from one to four years.

The results thus far secured indicate that the quince stock is not congenial for the Bartlett pear, which variety has done best on French pear and has also done well on Japanese stock for two seasons. There is essentially no difference in the appearance of Royal Ann cherry trees on mazzard and on mahaleb stocks. The mahaleb stock has failed to dwarf any of the cherries. The Drake and Ne Plus Ultra almond trees have made practically the same growth on myrobalan, peach, and almond roots. Burbank plums made the largest percentage of gain on peach stock, but have made satisfactory growth on myrobalan and almond stock. The Royal apricots have made slightly better growth on peach stock than on myrobalan, almond, and apricot stocks. Of the five different fruits grown on the myrobalan, peach, almond, and apricot stocks, four showed the largest gains for the first year on peach root. The difference observed between these stocks appears to decrease each year.

In April, 1917, a severe test was made to determine whether asphaltum could be used as a protective coating against rabbits or borers without injuring the trees. The asphaltum was applied to the trees from top to bottom, all of the buds being covered without any noticeable injury to the bark of any of the trees. The results indicate, however, that the asphaltum should be applied as soon as possible after the trees are planted in order to keep out the borers.

Orchard spraying v. dusting, N. J. Giddings (*West Virginia Sta. Bul. 167 (1918), pp. 18, figs. 2*).—This bulletin reports a series of experiments conducted during a period of five years in both apple and peach orchards to determine the value of dust treatments as compared with ordinary methods of spraying. The peach dusting experiments are described in detail, and a brief general statement is given of the work with apples. The detailed results with apples are to be reported at a later date.

Sulphur dust was found quite effective against peach scab and brown rot. The dust treatments have also been found very effective for the control of biting or chewing insects. It is believed that the dusting method may be of much practical value in peach orchards.

After four years of experimental work it is not felt that the dusting method is to be recommended in West Virginia apple orchards where scab or sooty blotch is severe, or for the treatment of bitter rot, black rot, or blotch, unless it is used primarily for the control of insects, such as codling moth, curculio, cankerworm, or caterpillar. In apple orchards where it is difficult to use a spraying machine, or where it is difficult to obtain water, the dusting method will be of considerable benefit for insect control.

The cost of materials required for efficient dust applications is considerably greater than for sprays. Relative to labor and time required, however, it was found that one man and a driver with a dusting outfit can dust between three and four times as many trees per hour as two men and a driver can spray with the ordinary power-spraying outfit. With the spraying outfit it was customary to handle two rows at a time and short but frequent stops were necessary. The dusting machine usually covers three rows at a time and the team is kept moving at a good walk.

Why prune bearing apricot trees heavily? W. P. Tufts (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 1, pp. 15–21, figs. 8*).—In this paper the author presents some results of experiments conducted by the division of pomology of the University of California which indicate that it is not desirable to follow the customary practice of severely cutting back the annual growth of apricot trees.

Although the experiments have not proceeded sufficiently long to warrant definite conclusions as to the proper system of pruning, the work thus far conducted indicates that some form of pruning should be adopted which will provide for a moderate amount of new growth which may be retained for fruiting purpose from three to five years and then cut away. The present system of heavy annual pruning is frequently followed by sunburned branches and, in many cases, by lighter yields than are believed to be necessary or desirable.

Breeding a hardy pear, C. G. Patten (*Minn. Hort., 47 (1919), No. 3, pp. 89–95, pl. 1, figs. 2*).—A popular summary of results secured by the author at his experimental grounds, Charles City, Iowa, in breeding hardy and blight-resistant pears.

Acclimatization, selection, and hybridization experiments with fruit trees in Alaska (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, p. 682*).—This comprises a summary of investigations at the Alaska Experiment Stations during the period 1903–1915, based on the annual reports of the stations (E. S. R., 36, p. 442).

Hybridization experiments between different varieties of the cultivated and wild strawberry in Alaska (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 6, pp. 681, 682*).—A summary, similar to the above, of investigations conducted with strawberries at the Alaska Experiment Stations during the period 1904–1915 (E. S. R., 36, p. 442).

A new method of grafting, H. Verdié (*Rev. Vit., 49 (1918), No. 1266, pp. 212–214*).—The method described has been successfully used by J. M. Mothes for some time in rejuvenating old grafted grapevines, and has given good results in trials conducted by the author.

Vigorous sprouts from the old stock are shield-budded in summer, preferably in July, in the Department of Gers, France, where the trials were conducted. The budded sprouts are layered about five inches deep in mounds of mellow, fresh soil, where conditions are favorable for cicatrization. Union is perfected in about three weeks' time, after which the soil is removed and the shoot continues its normal growth. The following spring the old vine is removed just above the budded shoot, which is then tied up to a stake like a young vine.

In budding shoots a straight cut about 1.5 in. long is preferred to the ordinary T cut. To facilitate loosening the edges of the bark, the vines should be flexed and the bark gently rubbed with the thumb. Great care should be taken not to injure the liber in lifting the edges of the bark. Insertion of the bud shield is also made easier by bending the shoot during the process. The ligature should be made preferably with wool.

A contribution to the chemical composition of pineapple and the materials necessary to its cultivation, J. V. Gonçalves de Sousa (*Rev. Agron. [Portugal], 13 (1918), No. 1–4, pp. 26–31; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 10, p. 1200*).—Analyses were made of pineapple fruits, plants, soils, and organic manures used in fertilizing pineapple soils. The results indicate that the pineapple plant requires large quantities of potash and nitrogen from organic sources.

Assuming the average weight of fruit and plant to be 4 kg. (8.8 lbs.), the amount of food removed from the soil per 1,000 plants was, nitrogen 8.1 kg., phosphoric acid 0.84 kg., potash 17.50 kg., and lime 2.68 kg.

The detection and elimination of frosted fruit, E. M. Chace (*Cal. Citrogr., 4 (1919), No. 5, pp. 108, 109, 144, figs. 3*).—The author describes the hesperidin crystal and desiccation tests for detecting frosted oranges and the specific gravity method of detecting and eliminating the frosted fruit. Data are given on experimental tests of these methods conducted by F. E. Denny under the direction of the Citrus By-products Laboratory of the U. S. Department of Agriculture. Related investigations are briefly cited.

The hesperidin crystal test is believed to be the most accurate method of detecting frost injury. These crystals are found on the membrane between the segments of the frosted orange, and also occur in the pulp if the injury is severe. Fruit injured by excessive hot weather is said also to show this phenomenon. The frosted orange generally shows a drying out of the pulp as well as the presence of fine crystals, but the crystals may occur to some degree in oranges which show no desiccation. The drying out of the pulp is made the basis of the tests adopted by the Horticultural Commission of the State of California and by the U. S. Department of Agriculture. Desiccation incident to frost injury can be accelerated by holding the fruit at elevated temperatures.

Sound fruit when stored at ordinary temperatures was found to gain in specific gravity, whereas the specific gravity of frozen fruit will diminish in storage. Inasmuch as these changes can be noticed from day to day it is believed possible to develop a laboratory method of detecting frost injury on the basis of the increasing or diminishing specific gravity of individual fruit of the samples.

After the freeze in California in 1913, F. Chase devised a water separator which depended upon the difference between the specific gravity of frozen and unfrozen fruit. Separators of this type are now in common use in California. Experiments were conducted by Denny with a number of these separators in 1917 to determine their efficiency. When the fruit was separated into two classes, first grade and culls, there was an average efficiency of 85 per cent for first-grade fruit and of 70 per cent for cull fruit. An attempt to separate the fruit into three grades gave very poor results for the second grade. The machines were found to vary widely, owing to the different methods of operation.

The specific gravity of certain frosted oranges may at times be greater than of certain sound oranges, hence frequent samples should be taken of the fruit and the skimming devices regulated with care. Some work was conducted in pre-sizing the fruit before separation, but the results thus far secured are not conclusive as to the value of pre-sizing.

Trees, their use and abuse, J. B. Berry (*Bul. Ga. State Col. Agr., No. 162 (1919), pp. 19, figs. 18*).—Suggestions are given for the selection, planting, protection, and care of street, roadside, and farm trees.

Trees and shrubs on the farm, O. B. Whipple and C. C. Starling (*Montana Sta. Circ. 78 (1918), pp. 23*).—This circular contains practical suggestions for planning the home grounds and the planting of trees and shrubs, both for ornamental purposes and as windbreaks. A descriptive list is given of desirable shrubs and trees. Although the circular is intended primarily for nonirrigated farms, many of the suggestions are applicable also to irrigated farms, and special advice is given for those who use irrigation water.

Seaside planting for shelter, ornament, and profit, A. D. Webster (*London: T. Fisher Unwin, Ltd., 1918, pp. 156, pls. 32*).—A treatise on seaside planting with special reference to British conditions. The successive chapters discuss sand dunes and coast erosion, preparation of the ground and planting, tree growth around the coast, trees for seaside planting, shrubs for seaside planting, climbing and wall plants for the seaside, alpine and herbaceous plants for the sea coast, native seaside plants, cost of seaside planting, returns from seaside planting, insects and fungi injurious to seaside trees, and choice of trees and shrubs.

Bud variation in dahlias, A. D. Shamel (*Jour. Heredity, 9 (1918), No. 8, pp. 362–364, figs. 2*).—The author states that according to a recent inquiry among southern California dahlia growers striking bud variations in dahlia plants propagated from cuttings are of common and frequent occurrence. A bud variation of this type observed by the author is here illustrated and described.

FORESTRY.

National Forest areas (*U. S. Dept. Agr., Forest Serv., 1918, pp. 8, fig. 1*).—A statistical report on National Forest areas, national monuments, national game preserves, and lands acquired in the White and Appalachian Mountains under the Weeks Law to June 30, 1918, accompanied by a map showing the location of the National Forests.

Timber supplies and forestry in the Union, C. E. Legat (*So. African Jour. Sci., 15 (1918), No. 2, pp. 79–99*).—An account of the forestry resources and present status of forestry in the Union of South Africa, including measures which are being taken to provide for the future timber requirements of the Union.

Annual progress report upon State forest administration in South Australia for the year 1917–18, W. Gill (*Ann. Rpt. State Forest Admin. So. Aust., 1917–18, pp. 13, pls. 6*).—This is the usual progress report relative to the administration and management of the State forests of South Australia, including a financial statement for the year ended June 30, 1918. Data are given relative to the alterations in forest areas, planting operations, yields in major and minor products, revenues, expenditures, etc.

Effect of grazing upon aspen reproduction, A. W. Sampson (*U. S. Dept. Agr. Bul. 741 (1919), pp. 29, pls. 5, figs. 7*).—This bulletin reports a study conducted on the Manti National Forest, in central Utah, during the years 1912 to 1916, inclusive, to determine the extent of injury to aspen reproduction by sheep and cattle, the effects of such damage on the development of young trees, and the best method of protecting the reproduction from injury without unnecessarily restricting the grazing of live stock.

The results are presented in a series of tables and diagrams and fully discussed. It is believed that the recommendations embodied herein may be of value, with slight modifications, in the case of farm woodlands in the East where the forage under aspen is converted into meat or butter fat.

Manuring of Hevea brasiliensis, R. D. Anstead (*Agr. Jour. India, 13 (1918), No. 4, pp. 660–665; Trop. Agr. [Ceylon], 51 (1918), No. 6, pp. 331–334*).—The author finds, after briefly reviewing the results of manuring experiments with Hevea rubber in South India and Ceylon, that the results of practically all such experiments have been that the unmanured plats give quite as good yields, if not better, than the manured ones. It is pointed out that the failure of manurial treatments to show beneficial effect may have been due to the detrimental influences of too close planting. It is recommended that new manurial experiments with Hevea should be designed from the start to test the influence of manures on trees widely spaced, and on trees thinned out early.

The scientific principles of the budding of Hevea brasiliensis, W. Bobilioff (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 11, pp. 861–877, figs. 11*).—From a theoretical examination of the three methods generally used in budding Hevea trees (patch-budding, the inverted T process, and the Forkert method), the author concludes that patch-budding has a great advantage over the two other methods because by it regular and quick union takes place, first between the rows of latex vessels, and second between the food-carrying sieve tubes which are necessary for the proper development of the plant. In the inverted T and Forkert methods, the growing together starts only after about six months, when a new cambium unites both parts.

On the structure, the degeneration, and the regeneration of latex rings with Hevea trees, P. E. Keuchenius (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 11, pp. 837–851, figs. 8*).—The structure, degeneration, and regeneration of latex rings in Hevea trees are illustrated and described.

The scraping of bark affected by canker is held to be better than paring, because in scraping the bark the diseased tissues only are removed, and a large number of uninfected latex rings is preserved intact, thereby hastening recovery. Pared-off bark requires at least three years for regeneration. Paring the bark is not sufficient when the cambium is affected, since the diseased cambium must be scraped away.

Tapping on renewed bark, T. PETCH (*Trop. Agr.* [*Ceylon*], *51* (*1918*), *No. 5, pp. 293–296, fig. 1*).—Tabular results are given on a comparative test of rubber yields obtained from renewed bark of different ages. The test was started at the Gangaruwa Experiment Station in July, 1916, and continued for 2 years. Trees on which the renewed bark was 5 years 9 months old at the beginning of the experiment yielded 3,601 gm. of rubber per tree for the 2 years; renewed bark 4 years 8 months at the beginning of tapping yielded 2,828 gm. per tree; and renewed bark 3 years 7 months at the beginning of tapping yielded 2,629 gm. per tree.

The African oil palm, its possibilities in Malay, B. J. EATON and F. G. SPRING (*Agr. Bul. Fed. Malay States, 6* (*1918*), *No. 11, pp. 493–512*).—An account of the African oil palm (*Elæis guineensis*), with reference to its distribution, botany, cultural requirements, estimated yields of palm oil and palm-kernel oil, and methods and machinery used in extracting oil. Analyses are given of palm fruit of different parts of western Africa, and the industry is considered with reference to its development in Malay.

A note on the occurrence and method of formation of the resin (yacca gum) in Xanthorrhœa quadrangulata, T. G. B. OSBORN (*Trans. Roy. Soc. So. Aust., 40* (*1916*), *pp. 1–8, pls. 3, figs. 3*).—A preliminary study of resin formation in *X. quadrangulata*, an Australian grass tree, led the author to conclude that the resin is an intracellular secretion, principally of the peripheral cortical cells of the stem. The resin so formed is molded by pressure between the persistent leaf bases clothing the stem. It becomes viscous at sun heat, flows to a certain extent, and destroys the original cellular matrix. There appears to be little likelihood of collecting the resin other than by destroying the tree. The macroscopic and microscopic structure of the stem and leaf bases are described.

DISEASES OF PLANTS.

The relation of phytopathologists to plant disease survey work, G. R. LYMAN (*Phytopathology, 8* (*1918*), *No. 5, pp. 219–228; abs. in 8* (*1918*), *No. 2, pp. 78, 79*).—An outline is given of some of the work of the plant disease survey which has been organized in the United States Department of Agriculture.

[Report of] the botany and bacteriology department, D. B. SWINGLE (*Montana Sta. Rpt. 1917, pp. 236, 237*).—A report of progress is given on the various lines of work, including the studies of the injury to foliage by spraying and to roots by adding arsenicals.

In the study of the brown bark spot of fruit trees the cause has not been determined, but the investigations so far have given indications that the disease is not due to a pathogenic organism. Spraying experiments for the control of plum pockets caused by *Taphrina communis*, though carried on in a very unfavorable season, gave satisfactory results, and the author recommends a single application of lime-sulphur just before the flower buds open. Notes are given on potato diseases, particular attention having been paid to the wilts and rots caused by species of Fusarium and to the bacterial disease of potatoes known as blackleg.

Seed treatment control and overwintering of cucumber angular leaf spot, W. W. GILBERT and M. W. GARDNER (*Phytopathology, 8* (*1918*), *No. 5, pp. 229–233, fig. 1*).—It having been shown by Carsner (E. S. R., 40, p. 250) that the causal organism of cucumber angular leaf spot may overwinter in the seed and cause infection, the authors confirmed by field tests the accuracy of these observations, and they report upon the efficacy of seed disinfection as a control measure.

It is claimed that outbreaks of angular leaf spot may originate from contaminated seed or infected soil, and that seed disinfection reduces the incidence of the disease nearly one-half. The use of treated or disease-free seed in fields well removed from previous cucumber patches is recommended as a control measure. For seed treatment, immersion in a 1 : 1,000 corrosive sublimate solution for 5 minutes, followed by 15 minutes' washing, proved most satisfactory from the standpoint of safety and effectiveness, this treatment having been used on a commercial scale in 1918.

Copper sulphate as a disinfectant for potatoes, G. R. Bisby and A. G. Tolaas (*Phytopathology, 8 (1918), No. 5, pp. 240, 241*).—The results of three years' treatment of potatoes with copper sulphate solutions as a disinfectant are given. Seed tubers infected with black scurf were used to compare the efficiency of copper sulphate, corrosive sublimate, formaldehyde, and lime-sulphur. The tubers were planted at University Farm, Minn., in rather acid soil, and the results were fairly consistent in that the best average yield was obtained from seed treated with copper sulphate.

Two Illinois rhubarb diseases, F. L. Stevens (*Illinois Sta. Bul. 213 (1919), pp. 298–312, figs. 19*).—Descriptions are given of anthracnose and leaf spot of rhubarb.

The anthracnose, which is said to be due to *Colletotrichum erumpens*, was first noticed on market rhubarb in the stores of Champaign, Ill., in 1918. The fungus causes a soft rot of the petioles, the decayed spots usually being soft, watery, translucent, and oval in outline, with the long axis lengthwise of the petiole. In the market only milder cases of the disease were found, but in the field in the more advanced stages the older petioles were dead and the yield of marketable product was considerably reduced. In addition to the original locality, the disease has been observed in a number of other places in Illinois. The fungus has been isolated and its cultural characters are described at considerable length.

The leaf-spot disease, which is said to be due to *Phyllosticta straminella*, was first collected in Kankakee County, Ill., where it occurred in great abundance in one field, nearly every leaf in the planting being affected with spots. Unlike the anthracnose, the leaf spot is not a disease of old leaves, as even the comparatively young leaves may be seriously affected. In addition to affecting the leaf blade, the disease has also been found on the petioles. The leaf spot is said to have been observed not only in several localities in Illinois, but also in Indiana and Wisconsin.

Physiological studies of normal and blighted spinach, R. H. True et al. (*Jour. Agr. Research [U. S.], 15 (1918), No. 7, pp. 369–408*).—The results are given of laboratory studies from the Bureau of Plant Industry of the U. S. Department of Agriculture on normal and blighted spinach plants as contributing possible explanations regarding spinach blight. The papers presented are: Ash Content in Normal and in Blighted Spinach, by R. H. True, O. F. Black, and J. W. Kelly; Oxidase Reaction in Healthy and in Blighted Spinach, by H. H. Bunzell; Carbohydrate Production in Healthy and in Blighted Spinach, by R. H. True and L. A. Hawkins; and Nitrogen Metabolism in Normal and in Blighted Spinach, by S. L. Jodidi, E. H. Kellogg, and R. H. True.

In the study of the ash content, it was found that, while the quantity of total ash is not strikingly different in normal and in diseased material, normal tops seem to be a little richer than the diseased tops, whereas the diseased roots seem to have somewhat more ash than the normal roots. Silica was present in large quantities when compared with the ash content of other plants, calcium showed an increased accumulation in both tops and roots of diseased plants, and magnesium was present in blighted plants in almost double the quantity found in normal ones. A striking feature of the investigation was the high potassium content of both normal and blighted plants. Phosphate absorption seemed influenced by the blight, and the iron content of blighted plants was less than that of normal ones.

The results obtained in the study of the oxidase activity resemble those obtained in the study of other plant diseases, such as the mosaic of tobacco, curly top of sugar beets, and leaf curl and curly dwarf of potatoes. The diseased material shows a greater power to transfer atmospheric oxygen to certain aromatic compounds than the healthy material. In all of the above-mentioned plant diseases, which cause dwarfing of the plants affected, the capacity of the plant juice to utilize atmospheric oxygen for the oxidation of certain chromogens is abnormally increased. How this increase in the catalytic activity of the cell sap is brought about remains to be determined.

It appears from the study of the effect of spinach blight on carbohydrate production that the manufacture of carbohydrates is not inhibited by the disease, although it may be retarded. The reducing sugars are practically absent from the roots of all plants, while the tops of normal plants contain somewhat more than the diseased. Both sucrose and starch are present in the leaves of diseased plants in markedly greater quantity than in those of normal plants. They are found in the roots of both healthy and diseased plants in approximately like quantities. Determination of diastatic activity failed to bring out any marked difference between healthy and diseased plants. The accumulation of carbohydrates is considered due, not to a breaking down of digestion, but to some partial failure in the subsequent metabolic processes in connection with which carbohydrates are used.

The accumulation of carbohydrates in the leaves of blighted plants is shown not to be due to the inability of the diseased plants to make proteins. Although carbohydrates were found in the tops of diseased plants in a somewhat smaller percentage, calculated on the dry weight of the material, than in normal tops, the proteins make up a larger proportion of the total nitrogen in the diseased than in the healthy material. The proteins in the roots of blighted plants were found to exceed those in the roots of healthy plants both with reference to the dry weight and to the total nitrogen. Spinach blight is said to be physiologically characterized by retarded growth and a lower moisture content. This is considered to be due to the fact that the rapidly growing normal tissues are comparatively rich in water and poor in complex organic compounds, such as proteins, etc. The lower percentage of total nitrogen and of acid amid nitrogen in the diseased material is explained by the assumption that denitrification takes place in these tissues, whereby a part of the nitrogen may be lost either as elementary nitrogen or in the form of ammonia.

Brown blotch of the Kieffer pear, G. W. Martin (*Phytopathology, 8 (1918), No. 5, pp. 234–239, figs. 9*).—The author describes a disease of Kieffer pears in southern New Jersey which is locally known as brown blotch. While the Kieffer pear is most seriously attacked, the disease is also found on other varieties.

The spots when small and scattered are usually circular and without well-defined borders. As the season progresses, a number of the spots coalesce, forming large, irregular patches or blotches and frequently covering one side of the fruit and sometimes the entire pear. The blotches resemble very closely the natural russet coat characteristic of certain varieties of pears, and it is thought that this fact has prevented the previous recognition of the parasitic nature of the disease. It is believed to be unquestionably of fungus origin, the organism causing it being very similar to the common sooty blotch fungus (*Leptothyrium pomi*).

The author claims that the disease may be readily controlled by two rather late sprayings in addition to the regular spring treatments. Weak Bordeaux mixture has proved somewhat more effective than dilute lime-sulphur solutions.

Plum pocket and leaf gall on Americana plums, D. B. SWINGLE and H. E. MORRIS (*Montana Sta. Bul. 123 (1918), pp. 167–188, figs. 6; abs. in Circ. 77 (1918), pp. 151–164, figs. 6*).—According to the authors, the growing of Americana plums in Montana has been greatly hampered by attacks of a fungus and an insect pest. The fungus causing the plum pocket is said to be *Taphrina communis*. *T. pruni*, which is reported as attacking European plums, has not been observed in Montana. The symptoms of the disease and the causal fungus are described at considerable length, after which the authors give an account of spraying experiments for the control of the plum pocket and also the leaf galls caused by the mite *Eriophyes pruni* (see also p. 459).

As a result of their experiments, the authors claim that the plum pocket can be controlled by spraying with lime-sulphur, either self-boiled or commercial, only a single application being necessary. This may be given at any time from a late dormant condition to the time when the flowers are beginning to open. Some evidence has been obtained indicating that the fungus persists as a perennial mycelium in the twigs, but most of the fruits are infected by spores. The leaf gall mite is said to be easily controlled by spraying with dilute lime-sulphur while the trees are still dormant.

A bibliography of literature relating to *T. communis* and *T. pruni* is given.

The life history and parasitism of Eocronartium muscicola, H. M. FITZPATRICK (*Phytopathology, 8 (1918), No. 5, pp. 197–218, pl. 1, figs. 4*).—A description is given of this fungus, which attacks mosses, with a discussion of related species occurring on a number of other host plants.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

[Economic insects and their control in Kansas] (*Trans. Kans. State Hort. Soc., 34 (1916–17), pp. 182–212*).—Included in this work are papers on Practical Insecticides and Proper Application, by S. J. Hunter (pp. 182–192); Some Important Work of the Year 1916 Relating to Horticulture (pp. 192–200), and Some Entomological Work for the Year 1917 Relating to Horticulture (pp. 201–208), both by G. A. Dean; and the Spring Cankerworm: An Orchard and City Problem, by S. J. Hunter (pp. 209–212).

[Report of] the entomology department, R. A. COOLEY (*Montana Sta. Rpt. 1917, pp. 242–248, fig. 1*).—In the course of a discussion of the financial loss caused by insects, estimates are made relating to the comparative loss occasioned by the sugar beet louse as based on the number of irrigations. The data presented emphasize the importance of irrigating five instead of two or three times.

The most notable entomological feature of the season is said to have been an outbreak of grasshoppers in various parts of the State, particularly in Flathead, Missoula, and Sanders Counties. It is estimated that in control work 10,000 lbs. of white arsenic was used in making the poison bait.

Fifteenth annual report of the State entomologist of Montana, R. A. COOLEY (*Montana Sta. Bul. 124 (1918), pp. 193–208, fig. 1*).—This consists in large part of an annotated list of the more important insect pests of 1917. An account of the grasshopper outbreak in 1917 is included.

[Economic insects in Cuba], P. G. CARDÍN (*Mem. Soc. Cubana Hist. Nat. "Felipe Poey," 3 (1917–18), No. 2–3, pp. 53–61*).—Notes are presented on *Monecphora bicincta, Tomaspis bicincta*, and several species of termites, and a list of 17 species of Thysanoptera is included.

[Insect pests in St. Lucia, 1917–18], J. C. HUTSON (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Lucia, 1917–18, pp. 6–13; abs. in Agr. News [Barbados], 17 (1918), No. 427, pp. 282, 283*).—This is a report upon a special visit to the colony made by the author in July to study the black weevil borer of bananas (*Cosmopolites sordidus*). This pest, which occurs wherever the banana is grown in St. Lucia, was found to attack all varieties but seems to prefer the plantain. Brief mention is also made of other insects which attack bananas, plantain, etc., insects which attack limes, miscellaneous insects, and grasshoppers.

Report on the work of the entomological division, E. R. SPEYER (*Ceylon Admin. Rpts. 1917, Sect. IV, pp. C10–C15*).—This report includes a list of the important insects of the year and a report of special investigations into the shot-hole borer of tea, *Xyleborus fornicatus*. A special investigation into the tea tortrix (*Homona coffearia*), by N. K. Jardine, is included.

Insects affecting the castor bean in Cuba, P. CARDIN (*Rev. Agr., Com. y Trab. [Cuba], 1 (1918), No. 10, pp. 527–533, figs. 7*).—This is a preliminary account of the insects which attack the castor bean (*Ricinus communis*) in Cuba.

Particular attention is given to the tingitid or lacewing bug *Corythucha gossypii*, which is a source of serious injury through its attack upon the foliage. Other pests of less importance mentioned include *Hemichionaspis minor, Chrysomphalus dictyospermi, Tetranychus bimaculatus, Xylomiges eridamia, Resthenia atripennis*, and *Epitrix* sp.

The insect pests of maize, W. B. GURNEY (*Agr. Gaz. N. S. Wales, 29 (1918), No. 9, pp. 641–650, figs. 15*).—A summary of information on the more important insect enemies of corn in New South Wales.

"Some 25 species have been recorded so far as attacking maize in the field, as well as the cobs and shelled grain in store, and these include probably most of those which are likely to be seriously destructive. Among them, two species of moth grubs are recorded now for the first time as attacking maize in New South Wales, viz, the pink corn worm (*Batrachedra rileyi*) introduced, and our native species of sugar cane boring moth (*Phragmatiphila [Nonagria] truncata*)."

Notes on insects bred from the bark and wood of the American larch (Larix laricina), M. W. BLACKMAN and H. H. STAGE (*Syracuse Univ. [Pubs.], 18 (1918), No. 4, pp. 11–115, pls. 9*).—This report upon the insect infestation of the wood and bark of larch is based particularly upon an investigation of a 100-acre tract of larch near Crittenden, N. Y. The paper includes a discussion and tabulation of the ecological associations of various predators and parasites in larch and a detailed discussion of each species reared from larch. A 6-page bibliography alphabetically arranged is also included.

The fungi cultivated by termites in the vicinity of Manila and Los Baños, W. H. BROWN (*Philippine Jour. Sci., Sect. C, 13 (1918), No. 4, pp. 223–231, pls. 2*).—A report of studies by the author in the vicinity of Manila.

Machine gun work with a new formula on red spiders in Tulare County, P. R. JONES (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 7, pp. 455–457*).—In control work with the red spider (*Tetranychus telarius*), the author made use of a spray in which miscible oil was combined with lime-sulphur, using the formula

6 gal. of Orchard brand lime-sulphur, 2 gal. of miscible oil (Triumph), and 1 lb. of ground glue per 200 gal. spray tank. In preparing the spray 5 lbs. of ground glue was placed in an empty 5-gal. coal oil or gasoline can. This was covered with a sufficient amount of cold water to make it into a paste, then 2 or 3 gals. of hot or cold water were poured into the can and the solution heated until all the glue was thoroughly dissolved, whereupon sufficient water was added to make 5 gal. One gal. of the glue solution was then stirred into 2 gal. of the miscible oil, and the mixture was stirred while water was added sufficient to make 5 gal. of a thin, creamy emulsion. This emulsion was added to the lime-sulphur solution in the spray tank just as the spraying was begun. Application of this spray is said to have resulted in the immediate destruction of all the red spiders on both surfaces of the leaves.

"The spread of the spray was very great, covering all portions of the trees with a very fine film, and no trouble was experienced at all in breaking down beyond the point intended. After the contact value of the formula had been obtained, secondary killing results showed up over quite a period of time in the action of the free sulphur fumes on the young red spiders hatched from the eggs. The fumes of this solution were very much in evidence for a long period after application, and this secondary killing or 'mopping up' was carried out very efficiently. It is evident that the oil, with what was left of the calcium polysulphids and the sodium and potassium sulphids, did all the contact work on the adult red spiders, while the free sulphur continued to act on the young hatched from the eggs. The lime in the sulphur and free lime formed, together with the very increased spread and fine film over the trees, tended to shade over the spray so as not to cause injury, and the increased spread also kept the liquid from gathering in such large drops when drying. . . .

"For general work throughout the State where there is not an extensive fungus condition, or this problem is not to be taken into consideration, it is probable that it will not be necessary to use this formula stronger than 4 gal. lime-sulphur, 1 gal. miscible oil (Triumph), and 1 lb. glue to 200 gal. spray tank. And it is suggested that this formula be used especially on prunes which have the fruit on them, or on citrus trees, although the stronger formula has been used with great success on the gray scale (*Coccus citricola*) in Tulare County, during the months of July, August, September, and October, and even stronger solutions during the winter months.

"It is a question whether the mark left by the lime-sulphur, when used at the weaker strength, would have any bad effect on prunes, inasmuch as they are dipped before marketing. However, there might be some difficulty in this respect on canning peaches. No trouble was experienced in this respect on almonds or on oranges, as the lime-sulphur came off very readily or else did not show any marks at all at picking time."

The mixing of oil emulsions with lime-sulphur solutions, W. W. Yothers (*Fla. Grower, 18* (*1918*), *No. 18, p. 4*).—The author reports upon the use of oil emulsions mixed with lime-sulphur solution, as recommended by Jones in the article above noted.

In following the directions given by Jones it was found that when the glue-miscible oil combination was added to the lime-sulphur solution a granular scum formed, but this was readily stirred up and apparently formed a fairly good mixture. It is pointed out that, owing to the forming of a granular scum on the surface of the solution, it will be necessary to use an agitator in applying it to the trees, otherwise the granular scum will be at the bottom of the tank when nearly empty and will then be applied to the trees in a concentrated state and cause much damage.

The results of spraying tests made by the author indicate that glue must be added to the oil emulsion when it is being made, whereas it can be added afterwards to a miscible oil. With a view to determining the effect upon white fly and purple scale, applications were made on August 13 in which miscible oil was stabilized (1) with glue solution and (2) with milk powder. A stabilized emulsion was also used in place of the miscible oil, and the glue solution was used for a binder. It was found later that the addition of glue to a stabilized emulsion was unnecessary. White fly pupæ were killed perfectly, and the sooty mold was loosened and fell off after the first rain. At the time of writing the sprayed trees were free from sooty mold and purple scale and had a much better appearance than a check row of unsprayed trees in the same grove. It is pointed out that while the mixture seems to be satisfactory as an insecticide it may injure the trees and fruit.

"There is no evidence to show that the combination of oil emulsions and lime-sulphur is superior to the combination of the emulsion and the soda sulphur solutions. So, until further knowledge has been obtained, it would be well to try the former combination only experimentally."

The toxic action of KCN and its relation to the state of nutrition and age of the cell as shown by Paramecium and Didinium, BARBARA L. LUND (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 35 (1918), No. 4, pp. 211–231, figs. 3*).—A report of studies of the comparative resistance of Paramecium and Didinium to the toxic action of potassium cyanid in culture medium, and the factors responsible for the observed differences among individuals living in the same medium.

The tarnished plant bug and its injury to nursery stock, L. HASEMAN (*Missouri Sta. Research Bul. 29 (1918), pp. 3–20, pls. 6*).—This is a report of investigations of *Lygus pratensis*, of which insect an earlier account has been noted (E. S. R., 29, p. 354). The author's conclusions, based upon the investigations here reported, are as follows:

"The typical injury to nursery stock, known as 'stop-back,' 'bush-head,' or 'bunch-head' in Missouri is the result of feeding by the tarnished plant bug. This injury has been common in the State for years, but has attracted special attention only in the last seven years.

"The main injury is done by the adults which pass the winter. Some of the late work may be done by adults maturing in the summer. The nymphs do not breed and feed on nursery stock. The principal injury is done in the spring before the dormant buds have produced a growth of more than 12 in. Later injury does occur but it is usually of little importance. Peach, pear, and cherry are most severely attacked in Missouri.

"The pest hibernates in the adult stage between the leaves of mullen and similar plants, under rubbish, leaves, and other shelter. Only a small percentage of the adults which hibernate live through the winter. The bugs are strong fliers, but collect in greatest abundance and do most damage on nursery stock near favorable breeding and hibernating places.

"In the development of the pest it passes through five nymphal stages, the second of which can not be distinguished with certainty without actually following the hourly growth and development of the nymph from the time it hatches.

"The pest oviposits largely in the blossoms of composits and nymphs feed on the sap of the same plants. 'Mare's tail' (*Erigeron canadensis*) is preferred, although the pest breeds on a variety of other plants.

"In the control of the pest, clean culture to destroy plants on which it breeds, and the destruction of favorable hibernating quarters are essential.

Trap crops, sticky shields, and driving will also help to reduce the amount of injury. Known insecticides are of little or no value. Judicious pruning will help reshape injured trees."

The value of high temperature for controlling the common bedbug, A. GIBSON (*Agr. Gaz. Canada, 5 (1918), No. 10, pp. 949–951, figs. 2*).—The raising of the temperature of infested rooms within 8.5 hours to not less than 145° F. resulted in the death of all bedbugs present. The results obtained confirm the work of Ross, previously noted (E. S. R., 35, p. 658).

A contribution to the physiology of wing development in aphids, G. O. SHINJI (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 35 (1918), No. 2, pp. 95–116*).—Among the ten species considered in this paper are *Myzus persicæ*, *Aphis brassicæ*, *Macrosiphum ulmariæ*, *M. rosæ*, *M. solanifoliæ*, and *A. gossypii*.

Genetic relations of the winged and wingless forms to each other and to the sexes in the aphid Macrosiphum solanifolii, A. F. SHULL (*Amer. Nat., 52 (1918), No. 622–623, pp. 507–520*).—A report of studies of the pink and green potato plant louse.

The prevention and arrest of lice-borne diseases by new methods of disinfection, W. HUNTER (*Lancet [London], 1918, II, Nos. 11, pp. 347–351, figs. 8; 12, pp. 377–381, figs. 3*).—This is an address delivered before the Royal Society of Medicine on July 17, 1918, by the president of the advisory committee for prevention of epidemic diseases in eastern war areas in 1915–1917.

Notes on Japanese Lepidoptera and their larvæ, I–V, A. E. WILEMAN (*Philippine Jour. Sci., Sect. D, 9 (1914), No. 3, pp. 247–267, pls. 3; 10 (1915), Nos. 5, pp. 281–305, pls. 3; 6, pp. 345–363, pls. 3; 12 (1917), No. 4, pp. 229–247, pls. 2; 13 (1918), No. 4, pp. 151–171, pls. 2*).—The several parts of this paper include descriptions and colored illustrations of the larvæ of 9, 11, 8, 8, and 8 species, respectively.

Control work with the grapevine cochylis in Vaudois vineyards in 1917, H. FAES (*Essais et Traitements Effectués dans le Vignoble Vaudois contre le Ver de la Vigne (Cochylis) en 1917. Lausanne: Sta. Vit. Lausanne, 1918, pp. 15, figs. 3*).—This is a report of experimental control work with electric lights and insecticides.

The large aspen tortrix, Cacœcia conflictana, N. CRIDDLE (*Agr. Gaz. Canada, 5 (1918), No. 11, pp. 1049–1051, figs. 2*).—The small caterpillars of this lepidopteran appeared on aspen poplars in Manitoba during 1916, and became so numerous in a short time as to threaten seriously large numbers of the trees. The caterpillar commences to devour the leaves as soon as they burst from their buds, at first eating holes in them and soon after curling them by means of silken webs, forming funnel or trumpet-shaped inclosures within which individual larvæ live and feed and later move to other leaves. A second season's attack is even worse than the first and is said to have been responsible for much killing.

A second species, *Argyroploce duplex*, which closely resembles *C. conflictana*, was also present and a source of some of the injury.

The origin of the pink bollworm, C. L. MARLATT (*Science, n. ser., 48 (1918), No. 1239, pp. 309–312*).—This is a discussion by the chairman of the Federal Horticultural Board of the origin of *Pectinophora [Gelechia] gossypiella*, a summarized account of which pest by Hunter has been previously noted (E. S. R., 39, p. 764). The author finds that a scrutiny of the records gives strong support to the theory that the pink bollworm originated in southern Asia, probably in India.

Walnut worm threatens industry, R. E. SMITH (*Cal. Cult., 51 (1918), No. 18, pp. 441, 442, 447, figs. 6*).—The author calls attention to the fact that a biological variety of the codling moth is seriously injuring walnuts in certain parts of Santa Barbara and Orange Counties, Cal., and that the immediate inauguration of control measures is necessary to keep it from spreading all over southern California. In some orchards where the worm has been present for several years fully 50 per cent of the nuts on the trees are wormy, and in many groves over 20 per cent of the crop is affected. The damage is gradually increasing from year to year and at the same time the pest is spreading into new territory, many hundreds of acres now being affected and steadily growing worse. The wormy nuts make the worst kind of culls, as they are not only a total loss but are very hard to find in culling. A large amount of extra labor is required, and even then some of the nuts get by. The profits from a grove 50 per cent infested are cut almost in half.

It is pointed out that while the insect in all stages looks exactly like the codling moth its occurrence in walnuts shows no connection with apple and pear trees, and judging from its feeding habits it is a different form from that which ordinarily attacks those fruits. Its spread into new places has taken place largely by sacks taken from infested orchards or packing houses into uninfested places. It is said that in France and other parts of Europe walnuts are commonly attacked by a similar form of the codling moth.

A report upon the nut-feeding habits of the codling moth by Foster has been previously noted (E. S. R., 28, p. 760).

The bean fly, F. Otanes y Quesales (*Philippine Agr.*, *7* (*1918*), *No. 1*, *pp. 2–27*, *pls. 4*).—This is a detailed report of studies of the Philippine bean fly, described by Malloch in 1916 as *Agromyza destructor* (E. S. R., 36, p. 658). This pest was first noticed at Los Baños in 1912, in which year it did serious damage to beans under cultivation. It has since proved to be the worst pest of young beans in the vicinity of Los Baños, sometimes destroying whole fields, and is thought to occur throughout the Philippines.

The female deposits its eggs, about 200 in number, in punctures in the leaves of beans, and the resulting maggots are leaf miners at first. In one or two days after hatching they move from the leaves and mine the stalk, in which they work in greater numbers at the base, causing the tissues to decay. The pest is most destructive to kidney beans and cowpeas, especially from January to April. The Limas and the patani, which belong to the same species (*Phaseolus lunatus*), are the most resistant to it, and are only attacked at the time of the appearance of the first two leaves. Its life cycle is said to average 21 days.

Two chalcidid parasites, *Eurytoma poloni* and *Paratrigonogastra stella*, have been reared, the former being the more abundant. It is thought that spraying for the control of this pest will not prove profitable. It can be more easily and cheaply controlled by cultural methods.

Oviposition in the celery fly, T. H. Taylor (*Ann. Appl. Biol.*, *5* (*1918*), *No. 1*, *pp. 60*, *61*, *fig. 1*).—A description of the manner in which *Tephrites onopordinis* deposits its eggs in the leaf. About six days are required for their incubation.

Winter hibernation of Anopheles larvæ, T. H. D. Griffitts (*Pub. Health Rpts.* [*U. S.*], *33* (*1918*), *No. 46*, *pp. 1996–1998*).—"Anopheles (*A. crucians* and *A. punctipennis*, at least) pass the winter in the larval stage. This is true for northern Louisiana (for *A. crucians*) during a severe winter for that section. Evidence, though less conclusive, shows that *A. punctipennis*, at least in the larval stage, withstands a severe eastern Virginia winter.

"Apparently pupation does not occur at low temperature or until ordinary room temperature obtains. In selected places considerable numbers of Anopheles larvæ pass the winter as such. Larvicides should be applied in the fall sufficiently late to kill the last batch of larvæ, or before season suitable for the completion of their aquatic stages in the spring."

On mosquito larvicides, H. B. KIRK (*Trans. and Proc. New Zeal. Inst., 50 (1917), pp. 193–196*).—This is a brief statement of work with several mosquito larvicides in New Zealand.

A contribution to the knowledge of the Brazilian Œstrinæ, A. LUTZ (*Mem. Inst. Oswaldo Cruz, 9 (1917), No. 1, pp. 94–113, pls. 3; abs. in Rev. Appl. Ent., Ser. B, 6 (1918), No. 7, pp. 129, 130*).—The author takes the view that Œstrinæ should be treated as a subfamily of the Muscidæ. He gives a key to the five genera observed in Brazil and a list of 20 South American species, most of which occur in Brazil. Then follow notes on 15 species, of which 4 belonging to the genus Cuterebra are described as new. Several of the species, including those described as new, are illustrated in colors. Notes on the parasitic habits of the American Œstrinæ follow (pp. 105–113).

The distribution of the nose fly and other species of Gastrophilus in the United States, F. C. BISHOPP (*Psyche, 24 (1917), No. 6, pp. 182–187, fig. 1*).—This paper is based upon studies by the Bureau of Entomology of the U. S. Department of Agriculture.

The common horse bot (*G. intestinalis*), introduced into this country many years ago, has become widely spread throughout the United States, though it appears to vary much in local abundance. The chin fly (*G. nasalis*) is also widespread over the United States. The nose fly (*G. hæmorrhoidalis*), the most important economically of the three, is a serious pest of horses in the north central States, including North Dakota, South Dakota, Montana, Minnesota, Colorado, Idaho, Utah, Washington, Illinois, and Wisconsin. Montana and North and South Dakota are generally infested at this time, and central western Minnesota, northern Nebraska, and northeast Wyoming undoubtedly so. The species is also known to occur in Manitoba and Saskatchewan.

Studies of these pests by Dove, since published, have been noted (E. S. R., 39, p. 189).

Gastrophilus duodenalis, J. B. MENDY (*An. Soc. Rural Argentina, 52 (1918), No. 7, pp. 429–440, figs. 17*).—A report of studies of this horse bot fly which includes a map showing its distribution in Argentina. An account of studies of this species by Dove has been noted (E. S. R., 39, p. 189).

A serious pest to stored wheat, the lesser grain borer (Rhizopertha dominica), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 29 (1918), No. 10, pp. 726–728, fig. 1*).—A brief account is given of this cosmopolitan enemy of wheat, which has been established in Australia in a minor degree for many years and is recorded as a common pest of stored wheat in South Australia. In New South Wales it appears to be largely confined to the vicinity of Sydney.

An account of this pest by Chittenden has been previously noted (E. S. R., 25, p. 663).

Four new African parasitic Hymenoptera belonging to the subfamily Microgasterinæ, A. B. GAHAN (*Proc. U. S. Nat. Mus., 54 (1918), pp. 587–590*).

Beekeeping may increase the cotton crop, R. M. MEADE (*Jour. Heredity, 9 (1918), No. 6, pp. 282–285, figs. 2*).—The investigation here reported upon indicates that the introduction of colonies of bees may prove of distinct advantage in the fertilization of long staple varieties of cotton. "It is evident from the increased yield of bolls secured in the long-pistilled Durango variety through artificial pollination that the presence of additional pollinating insects would aid in reducing the high percentage of shedding."

Descriptions and notes on some ichneumon flies from Java, S. A. ROHWER (*Proc. U. S. Nat. Mus., 54 (1918), pp. 563–570*).

Notes on and descriptions of some sawflies from the Australian region, S. A. ROHWER (*Ann. and Mag. Nat. Hist., 9. ser., 2 (1918), No. 11, pp. 433–440*).

An entomogenous fungus growing from the cocoon of a braconid, G. T. LYLE (*Entomologist, 51 (1918), No. 665, pp. 227–229, fig. 1*).—This note relates to *Isaria arachnophila*, found growing in cocoons of Braconidæ of the aphidivorous genus Praon, undoubtedly *P. volucre*.

A contribution to the biology of fruit-fly parasites in Hawaii, C. E. PEMBERTON and H. F. WILLARD (*Jour. Agr. Research [U. S.], 15 (1918), No. 8, pp. 419–465, pl. 1, figs. 41*).—This report of investigations by the Bureau of Entomology of the U. S. Department of Agriculture deals particularly with the hymenopterous parasites, *Diachasma tryoni*, *Opius humilis*, *D. fullawayi*, and *Tetrastichus giffardianus*. A discussion of the parasitism of the melon fly by fruit-fly parasites, relation of the introduced pupal parasites to the established larval parasites of the fruit fly, *Pachycrepoideus dubius*, occasionally reared from fruit fly puparia, and *Pheidole megacephala* as a predacious enemy of the fruit fly, follows.

A list of seven references to the literature cited is included.

Note on the adult habits of some hymenopterous egg parasites of Orthoptera and Mantoidea, C. T. BRUES (*Psyche, 24 (1917), No. 6, pp. 195, 196, fig. 1*).—This paper, which supplements that previously noted (E. S. R., 38, p. 63), calls attention to the fact that the phenomenon of phoresy appears in members of both the Chalcidoidea and Serphoidea. A drawing is given of *Lepidoscelio viatrix*, a scelionid which attaches itself to the locust *Dichromorpha viridis*.

[Leaf gall on Americana plums], D. B. SWINGLE and H. E. MORRIS (*Montana Sta. Bul. 123 (1918), pp. 173, 180, 181, fig. 1; abs. in Circ. 77 (1918), pp. 158, 163, fig. 1*).—The authors find that *Eriophyes pruni* on plum is easily controlled by spraying with dilute lime-sulphur while the trees are still dormant, and in some seasons when the buds are in the pink, but after the petals fall it is too late to get the best results.

The common cattle tick in Argentina, V. J. JASSCHKE (*An. Soc. Rural Argentina, 52 (1918), No. 6, pp. 346–358*).—This account relates to *Margaropus microplus*.

FOODS—HUMAN NUTRITION.

Foods and their adulteration, H. W. WILEY (*Philadelphia: P. Blakiston's Son & Co., 1917, 3. ed., pp. XIV+646, pls. 11, figs. 87*).—This is a third and revised edition of the work previously listed (E. S. R., 25, p. 263).

Results and expectations of research on fishery problems, P. H. MITCHELL (*Sci. Mo., 6 (1918), No. 1, pp. 76–83*).—The author suggests that research along this line may be of great value in increasing the food supply. He believes that general biological surveys serve to locate and protect fishing grounds, as has been demonstrated in the case of tile fish. Studies on the life history of various species make possible the development of modern methods of culture, as in the case of oysters and lobsters. The need of further study of fish pathology and the general nutritional value and limitations of fish and shell fish is emphasized.

A study of some of the chemical changes which occur in oysters during their preparation for the market, E. E. SMITH (*U. S. Dept. Agr. Bul. 740 (1919), pp. 24*).—An investigation was conducted during the fall and winter of 1914–15 in certain representative oyster houses in Connecticut to determine the amounts of ammoniacal nitrogen, amino acid nitrogen, moisture, total solids, ash, and sodium chlorid present in oysters under the various conditions through which they pass in ordinary commercial practice, and to ascertain the effect of washing and soaking on both the chemical composition and physical condition of the oysters.

From the data presented the author concludes that the determination of ammoniacal nitrogen and amino acid nitrogen is of little value in estimating the amount of decomposition which has occurred, but that the latter is a reliable index of the amount of washing or soaking which the oysters have received.

A marked loss of oyster solids and of ash constituents occurs on washing oysters with fresh water. If oysters are agitated in fresh water, either by mechanical means or by means of a blast of air, a large increase in volume results in a short space of time. This increase is believed to be due to osmotic action.

Bread and the baking industry, R. McD. Allen (*Gen. Fed. (Women's Clubs) Mag., 17 (1918), No. 12, pp. 15–17*).—A general discussion of the baking industry and the nutritive value of bread.

The degree of bolting and food value of wheat, L. Lapicque (*Compt. Rend. Acad. Sci.* [*Paris*], *165 (1917), No. 13, pp. 413–415*).—The comparative food value of wheat, whole wheat, and mixed flours is discussed with particular reference to the data reported by Snyder (E. S. R., 17, p. 481). The author recommends 85 per cent extraction as furnishing a flour of greater food value, all things being considered, than those containing a smaller percentage of the grain.

Direct panification, M. Dolléris (*Vie Agr. et Rurale, 8 (1918), No. 17, pp. 293, 294*).—A method for the utilization of wheat for bread making without the customary milling is described, which is said to be economical and practical for wheat producers and for rural bakeries.

The method consists in a preliminary cleansing of the wheat, followed by soaking it for about 12 hours in water at 50° C. (122° F.). The wheat, which has taken up about 70 per cent of its weight of water, is then crushed by means of a perforated cylinder through which the pulp, but not the bran, can pass. The pulp is then dried and used as ordinary flour in baking.

Analyses by Leprince and Lecoq are reported of wheat and corn products obtained by this method and also of the bread made from them.

On the digestibility of bread.—III, Erythrodextrin in starch hydrolysis, J. C. Blake (*Jour. Amer. Chem. Soc., 40 (1918), No. 4, pp. 623–636, figs. 2*).—A continuation of previous work (E. S. R., 36, p. 661). Partly for the purpose of standardizing amylolytic agents and partly for the chemical study of amylolytic activity, efforts were made to obtain pure erythrodextrin. Starch in one case was moistened with dilute acids and roasted, and in another was boiled with dilute acid.

From the results of experiments the author concludes "that boiled corn starch disintegrates in at least three stages, protein and amylodextrin preceding erythramylum and erythrodextrin in order of formation. These three stages probably correspond with those shown by the 'roasting' process, the final practical disappearance of the amylodextrin in both cases occurring at the third and greatest maximum of the erythrodextrin. They also probably correspond with the three stages of salivary digestion of starch."

The use of calcium glucosates in bread making, G. A. Le Roy (*Compt. Rend. Acad. Sci.* [*Paris*], *165 (1917), No. 13, p. 416*).—The author recommends the use of calcium glucosate instead of limewater, as suggested by Lapicque and Legendre (E. S. R., 40, p. 267), in the preparation of bread from flour of 85 per cent extraction. The glucosates employed are prepared by action in the cold of milk of lime upon commercial glucose. To 100 gm. of flour are added the glucosates obtained from 100 gm. of glucose and 50 gm. of lime. The bread is said to be of even better quality than that made with limewater, the fermentation of the dough apparently being hastened instead of slightly retarded as in the case of limewater.

War bread (dechlorinated calcium bread), R. DUBOIS (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 17, pp. 818–821; abs. in Chem. Abs., 12 (1918), No. 10, pp. 1087, 1088*).—The author suggests the advisability of the manufacture of bread without common salt, on the theory that the daily ingestion of salt in too great amounts tends to increase the catabolism of protein, thus requiring increased ingestion of food, and that it abnormally excites the appetite, experiments having shown that consumption of bread without salt was one-fourth less than that of bread with salt.

The use is also recommended of calcium carbonate (preferably in the form of precipitated chalk) in amounts of 15 to 20 gm. per kilogram of bread. This is considered by the author to be superior to the limewater suggested by Lapicque and Legendre (E. S. R., 40, p. 267) for correcting the acidity of bread made from flour containing large amounts of bran, in view of the possibly injurious action of limewater on yeast.

Limed bread, L. LAPICQUE and R. LEGENDRE (*Compt. Rend. Soc. Biol. [Paris], 80 (1917), No. 19, pp. 896, 897; abs. in Chem. Abs., 12 (1918), No. 10, p. 1088*).—In reply to the article noted above, the authors discuss further the use of limewater in bread making. Destruction of the yeast by limewater is considered possible only when the yeast is mixed directly with the limewater. In practice, the yeast should be added to ordinary water and then worked into the dough which has been prepared with the limewater. The difference in amounts of chemicals added—300 mg. of limewater at most and from 15 to 20 gm. of calcium carbonate for 1 kg. of bread—is considered by the authors to be an argument in favor of the use of limewater.

Food preparations of blood and viscera fermented with yeast, A. GAUDUCHEAU (*Compt. Rend. Acad. Sci. [Paris], 166 (1918), No. 25, pp. 1058, 1059*).—A method is described for the fermentation of blood and visceral organs by yeast in a slightly acid medium in the presence of a small amount of sugar. The fermentation product is said to be of practical use in the making of bread and pastry.

Utilization of honey in the preparation of desserts, P. LEMAIRE (*Vie Agr. et Rurale, 8 (1918), No. 30, pp. 69, 70*).—Recipes are given for various desserts, wines, and liqueurs in which honey is substituted for sugar.

Report of the Federal Trade Commission on canned foods (*Washington: Fed. Trade Com., 1918, pp. VII+103*).—A report on the production and distribution of canned vegetables and canned fruits, prepared as a part of a general food investigation. Recommendations concerning practices and methods used in the production and distribution of canned foods are included.

[Food and drug inspection], C. L. CLAY (*Bien. Rpt. La. Bd. Health, 1916–17, pp. 61–189, figs. 2*).—The results of analyses of various foods and drugs are reported and prosecutions, seizures, and condemnations noted.

Miscellaneous food materials, C. D. WOODS (*Maine Sta. Off. Insp. 87 (1918), pp. 33–60*).—Information is given regarding a number of samples of food products analyzed.

Samples of dairy and creamery butters were examined with a view to framing new standards and definitions. From the examination it appears that creamery butter carries about 5 per cent more water on the average than does dairy butter.

Report of food and drug examinations, C. D. HOWARD (*Quart. Bul. Bd. Health N. H., 5 [1918], No. 6–8, pp. 74–94*).—This is a report of the food and drug examinations conducted by the State of New Hampshire. The text for the new regulations under the sanitary food law is included.

Supplement to Wisconsin dairy and food laws of August, 1913, G. J. Weigle (*Madison, Wis.: State, 1917, pp. 21*).—This supplement (E. S. R., 30, p. 165) contains regulations relating to dairies and their operation, bakeries, and confectioneries. The text of the Cold Storage Act, effective September 1, 1917, is also included.

Commercial stocks of grain, flour, and miscellaneous food products in the United States on January 1, 1919 (*U. S. Dept. Agr., Food Surveys, 2 (1919), No. 16, pp. 8*).—The usual tabular data are reported.

A list of food statistics issued by the Statistical Clearing House, Central Bureau of Planning and Statistics (*Washington: War Indus. Bd. [U. S.], 1918, [2]+463*).—This gives an index to the statistical information on food which has been collected by Government bureaus and certain private agencies.

The business of the household, C. W. Taber et al. (*Philadelphia: J. B. Lippincott Co., 1918, pp. XII+438, figs. 41*).—A chapter on food for the family discusses the composition, selection, cost, and marketing of food with a view to helping in planning the food budget.

Food and the people, L. Waldman (*New York: Rand School Soc. Sci., 1918, pp. 45*).—An analysis of the high cost of living, with an exposition of a measure introduced into the New York State Legislature proposing a commission of three members, including one representative each of organized labor and a farmers' organization, and an expert on the food question, to deal with the problem.

Feeding a nation in peace and war, D. N. Paton (*Jour. State Med., 26 (1918), Nos. 3, pp. 65–76; 4, pp. 111–119, fig. 1*).—The food committee of the Royal Society of Great Britain made an estimate of the food of the nation "as purchased" during the years 1909–1913. It was concluded that the average amount of nutrients available per man per day was protein 113 gm., fat 130 gm., carbohydrate 571 gm, with an energy content of 4,009 calories.

As the war progressed it was found that an increased supply of food was necessary, but that a decrease in shipping facilities tended to decrease the amount available. An estimate of the requirements of the nation at war showed that if the prewar supply were maintained there would still be a surplus. However, the rise in prices accentuated the inequality in distribution.

The author concludes that the part of the State in feeding a nation during wartime is to secure an adequate supply and to see that it is equally distributed. He believes that if rationing is necessary to accomplish the latter it must be on the basis of the energy requirement of the individual.

The nutrition of the people in time of famine and war, Hueppe (*Mitt. Ökonom. Gesell. Sachsen, 1914–15, pp. 25–47*).—This paper discusses the food resources of Germany at the time of publication, and the food requirements of the German people, as well as means to render the resources during the war adequate to the requirements.

Alimentation in time of war, A. Combe (*Comment se Nourrir en Temps de Guerre. Paris: Payot & Co., 1917, pp. 118*).—This book contains a brief introduction in which the needs of the body for the various classes of food are explained, followed by a discussion of the problems of alimentation for people of limited means in time of war. Suggestions are given for diminishing the consumption of meat and fat, for increasing the consumption of carbohydrates, and for modifying the feeding of live stock. A brief discussion of infant feeding in war time is included, together with a table for the modification of milk for infant feeding up to 12 months of age.

How shall we plan our diets? E. V. McCollum (*Gen. Fed. [Women's Clubs] Mag.*, *17* (*1918*), *No. 11*, *pp. 7–10*).—The author points out that a diet consisting of seeds and seed products together with tubers and edible roots will not satisfactorily nourish a young animal during the growing period, as it is deficient in certain proteins, calcium, sodium, chlorin, and fat-soluble A. To secure diets of good quality he advocates the use of either milk or the leaves of plants in liberal amounts. He designates these foods as "protective foods," because they are so constituted as to correct the deficiencies of whatever else is likely to be eaten.

Nutritional physiology, P. G. Stiles (*Philadelphia: W. B. Saunders Co.*, *1918*, *3. ed.*, *pp. 294*, *pls. 4*, *figs. 19*).—This is the third edition of the work previously noted (E. S. R., 35, p. 268). The principal changes are found in the chapters dealing with metabolism. The author believes that the main facts of metabolism admit of simpler and better correlated statement today than they did even five years ago.

Continuation and extension of work on vegetable proteins, T. B. Osborne and L. B. Mendel (*Carnegie Inst. Washington Year Book*, *16* (*1917*), *pp. 324–329*).—This is a progress report of the investigation by the authors of the relative nutritional value of different vegetable proteins (E. S. R., 36, p. 865). Experiments with cottonseed products have been extended and the results previously described confirmed. The work with the soy bean and with yeast as a source of food hormones has also been greatly extended. By-products of the milk industry have been tested with the hope of securing a cheap substitute for the protein-free milk which has been used as a source of water-soluble vitamins and suitable inorganic salts in studying nutrition problems. The results of most of these experiments have been noted from the original sources.

Researches on the toxicity of egg albumin: Influence of the seasons on the sensitiveness of the organism to nitrogen intoxication, F. Maignon (*Compt. Rend. Acad. Sci.* [*Paris*], *166* (*1918*), *No. 22*, *pp. 919–922*; *abs. in Chem. Abs.*, *12* (*1918*), *No. 19*, *pp. 2001*, *2002*).—Experiments with white rats fed upon egg albumin supplemented with sufficient bone ash, sodium chlorid, and ferrous carbonate to prevent demineralization and with sodium bicarbonate to prevent acidosis are reported, from which the author draws the following conclusions:

Egg albumin is powerless to sustain life and maintain a fixed weight in white rats. Rats fed with egg albumin succumb very rapidly in May and October with acute intoxication of the central nervous system, while in August and January they succumb slowly with marasmus.

These results are considered by the author to suggest the seasonal character of the manifestation of certain nutritional diseases associated with nitrogen intoxication, such as eczema, rheumatic affections, etc. The acute form of nitrogen intoxication produced coma, which would indicate that diabetic coma is due not so much to acidosis as to the accumulation of peptids derived from proteins.

A comparative study of the toxicity and nutritive power of food proteins employed in a pure state, F. Maignon (*Compt. Rend. Acad. Sci.* [*Paris*], *166* (*1918*), *No. 24*, *pp. 1008–1011*; *abs. in Chem. Abs.*, *12* (*1918*), *No. 19*, *p. 2002*).—Continuing the study noted above, similar experiments are noted in which the nutritive value of fibrin, casein, and meat powder were tested.

Each of these materials was found to be incapable of sustaining life for long periods. There was no seasonal variation as in the case of egg albumin, and death in every case was due to the exhaustion of reserves and not to chronic intoxication. The average duration of life under this feeding was egg albumin

8, meat powder 19, fibrin 21, and casein 41 days. The rats developed an intense fatty degeneration of the liver on the casein diet, those fed fibrin a less intense deposit, while no deposit of fat was found in the liver cells of the animals fed on meat powder or egg albumin.

The author points out that there seems to exist a direct relationship between the length of life and the ability of the ingested proteins to be transformed into fat, and suggests that the presence of fat renders the organism less susceptible to nitrogen poisoning in the spring and fall.

Influence of the animal species on the toxicity and mode of utilization of food proteins, E. Maignon (*Compt. Rend. Acad. Sci.* [*Paris*], *167* (*1918*), *No. 2, pp. 91–94*).—The experiments noted above were repeated with dogs. The results with egg albumin were similar, but with casein entirely different results were obtained. Constant weight was maintained for a month or more, death finally resulting from acute intoxication. No fatty deposit was found in the liver. With meat powder the dogs were able to maintain and increase their weight.

The explanation advanced regarding the differences between the results obtained with rats and dogs is that the dog, naturally carnivorous, can adjust itself more readily to a protein diet. The nutritive power of a food, as determined by the readiness with which constant weight is established, is not necessarily connected with its toxicity. The toxicity of the same protein varies with the animal species, the variation seeming to be connected with the power of the particular species to transform proteins more or less easily into fat. The author suggests that these facts constitute a new proof of the rôle of fats in the utilization of nitrogenous matter.

The action of symbiotes on the constituents of fats, H. Bierry and P. Portier (*Compt. Rend. Acad. Sci.* [*Paris*], *166* (*1918*), *No. 25, pp. 1055–1057; abs. in Physiol. Abs., 3* (*1918*), *No. 7, p. 366*).—The authors state that they have succeeded in bringing about the transformation of glycerin into dioxyacetone by the action of symbiotes isolated from the testicles of pigeons upon a 4 per cent solution of glycerin in yeast kept at 40° C. for 15 to 20 days. Experiments are also reported in which it is claimed that the process of β-oxidation obtained chemically in vitro by Dakin and in vivo by perfusion of organs has been effected by the action of symbiotes upon butyric acid.

Importance of the ketonic function in metabolism. Its origin by symbiotes, P. Portier and H. Bierry (*Compt. Rend. Acad. Sci.* [*Paris*], *167* (*1918*), *No. 2, pp. 94–96*).—Continuing the investigations noted above, the authors discuss the rôle of the ketonic function in the phenomena of catabolism and anabolism, and report experiments indicating that the symbiotes of mammals and birds are powerful agents of ketonization, acting upon various carbohydrates to form among other products acetyl-methyl-carbinol. It is stated also that under suitable conditions the symbiotes are capable of forming a polysaccharid from sucrose.

The formation of the polysaccharid is said to be accompanied always by the establishment, by means of the symbiotes, of about N/10 alkalinity. With glucose the production of the polysaccharid was very slight, which is considered to be an indication that the levulose molecule plays an important part in the formation of the polysaccharid.

Note on the etiology of scurvy in guinea pigs, A. Harden and S. S. Zilva (*Biochem. Jour., 12* (*1918*), *No. 3, pp. 270–274, figs. 2*).—The antiscorbutic potency of lactose and fructose was tested by administration to guinea pigs previously rendered scorbutic by a diet of crushed oats and bran with a daily ration of 50 cc. of autoclaved milk.

Contrary to the observations of Pitz, previously noted (E. S. R., 39, p. 365), the sugars tested afforded no protection against scurvy. The authors consider that the data tend further to strengthen their belief that any amelioration observed by McCollum and Pitz (E. S. R., 38, p. 568) was due to the enhanced consumption of the raw milk and not to the antiscorbutic potency of the substances tested.

The vitamins, their chemical nature, their importance in metabolism, and their function in the animal organism, C. FUNK (*Amer. Med., n. ser., 11 (1916), No. 11, pp. 751–756*).—This article summarizes some of the latest developments of research on vitamins, and outlines the outlook and plans in this direction for the future.

Some general aspects of the "vitamin" problem, R. R. WILLIAMS (*Amer. Med., n. ser., 11 (1916), No. 11, pp. 756–762, figs. 2*).—The author presents clinical pathological, and chemical evidence against specificity, and discusses the possible nature of the active agents of dietary diseases.

The relation of vitamins to animal growth, A. B. MACALLUM (*Amer. Med., n. ser., 11 (1916), No. 11, pp. 782–785*).—The author believes that the vitamins do not in themselves directly stimulate the growth of the animal cell, but that when present in a diet otherwise adequate they play their part in maintaining metabolic equilibrium.

Observations on the action of tartrates, citrates, and oxalates.—A study in tolerance, cumulation, and the effect of diet, W. SALANT and A. M. SWANSON (*Jour. Pharmacol. and Expt. Ther., 11 (1918), No. 2, pp. 133–145*).—A study of the influence of diet on the toxicity of sodium tartrate, sodium citrate, and sodium oxalate. Diets of cabbage, carrots, hay, and oats were used with rabbits and other laboratory animals. The results are summarized as follows:

"Tolerance to tartrate may be acquired by rabbits on different diets, the doses survived being about two to three times the surely fatal dose. No increased resistance to tartrate was observed in cats that received gradually increasing doses.

"Cumulation was observed in experiments with citrate and oxalate. The resistance to oxalate and citrate in rabbits may be slightly increased by diet.

"The different behavior of tartrate, citrates, and oxalate as regards tolerance and cumulation is held to be unfavorable to the theory which assumes that the physiological effects of their acids and soluble salts are due to calcium precipitation or to the transformation of ionic calcium into nonionized calcium in the cell."

The importance of diet as a factor in the production of pathologic changes, W. SALANT (*Jour. Amer. Med. Assoc., 69 (1917), No. 8, pp. 603–605*).—This is a review of investigations conducted by the author at the Bureau of Chemistry of the U. S. Department of Agriculture and by others in regard to the protective action of diet against drugs and poisons of various kinds.

Nutrition Laboratory, F. G. BENEDICT (*Carnegie Inst. Washington Year Book, 16 (1917), pp. 237–248*).—In this report are given detailed data regarding additions to equipment, cooperating and visiting investigators, investigations in progress, and publications issued during the year by the Nutrition Research Laboratory of the Carnegie Institution.

A portable respiration apparatus for clinical use, F. G. BENEDICT (*Boston Med. and Surg. Jour., 178 (1918), No. 20, pp. 667–678, figs. 3*).—This apparatus dispenses with gas analysis and for the most part with all weighings. According to the author, it has the advantages of portability, simplicity, and rapidity of operation, with a sufficient degree of accuracy to meet the needs of practically all clinical work.

ANIMAL PRODUCTION.

The freemartin: A study of the action of sex hermones in the fetal life of cattle, F. R. Lillie (*Jour. Expt. Zool., 23 (1917), No. 2, pp. 371–452, figs. 29*).—In this paper the author describes the gross anatomy of freemartins and the vascular connections of twin cattle fetuses, and amplifies his previous conclusions (E. S. R., 35, p. 169) that the sterile freemartin is fundamentally a female modified by the sex hormones of the male twin. These, it is shown, are free to circulate in both individuals during fetal life owing to secondary fusions of the chorion and temporary union of the vascular systems. The study is based upon the examination of 55 twin pregnancies secured from a slaughterhouse and 2 freemartins slaughtered after birth. In only two of the uteri examined were the fetuses inclosed in separate chorions. The existence of joint circulation was confirmed in a number of cases by injections.

In the 22 cases, where both ovaries were attached to the specimen, each ovary contained a corpus luteum. A number of gravid uteri containing only one fetus were also collected. In the 45 cases where both ovaries had been preserved, only one ovary in each case showed a corpus luteum. These facts are held to show, as far as they go, that most, if not all, twin pregnancies in cattle are the result of ovulation in both ovaries, and consequently can not be attributed to the partition of single eggs, as had been assumed provisionally by Cole (E. S. R., 35, p. 169) and others.

Of the 55 pairs of fetal twins, 19 were both males, 11 both females, 21 consisted of a male and a freemartin, 3 of a male and an anatomically normal female, and 1 was too young to permit the determination of the sexes. Two of the pairs of male and female were secured early in the investigation before the system of note-taking had been perfected. In each there was a very narrow connection between the chorions, but no record was made as to whether the connection was vascular. In the third case organic connection with the two chorions was entirely lacking. In the other case of entirely separate chorions the twins were both females.

In discussing the reasons why this sort of embryonic sterilization is not more common in mammals, the author points out that chorionic fusion could only occur in cases of diffuse placentation and that there are other quite special conditions. "Such conditions are found only in normally uniparous ungulates in which the ovum grows to an extreme length very rapidly, so that the associated ova meet at an early stage which favors their organic union. Even then vascular anastomosis is not likely to occur to any considerable extent unless the development of the fetal cotyledons is relatively late, so as to be preceded by a condition of general vascularization of the chorion, before the highly specialized circulation of the cotyledons becomes dominant. Such is the condition in cattle." The author suggests that the early development of the cotyledons in sheep may explain why freemartins do not occur in this form.

A microscopic study of the reproductive system of fetal freemartins, Catharine L. Chapin (*Jour. Expt. Zool., 23 (1917), No. 2, pp. 453–482, figs. 16*).—A histological examination of the embryological material collected by Lillie (see above) showed that the interstitial cells of the testis, whose secretion almost certainly determines the production of secondary sexual characters, are produced earlier in fetal life than the cells of the ovary having a corresponding function. In the case of twins joint circulation is set up at a period which, if the sexes are opposite, permits the male hormones to pass into the circulation of the female in time to interfere with the development of the mechanism for the formation of many of the female secondary sexual characters. Therefore, those sexual organs of the freemartin which are present in the indifferent stage develop toward the male condition, while anatomical developments that particularly characterize the later female stages, such as the proliferation of the cords of Pflüger and the union of the Müllerian ducts to form the uterus, do not occur in the freemartin. The great variation found in the reproductive organs of the freemartin is explained by the differences in the exact stage at which the interstitial secretions of the male are introduced into the circulation of the female embryo and in the amounts thus introduced.

The relations between the interstitial gland of the testicle, seminiferous tubules, and the secondary sexual characters, L. LOEB (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 34 (1918), No. 1, pp. 33–48*).—This paper discusses a case of undescended testes in a guinea pig.

Histological study of the testicles, which were found in the normal place of the ovary, showed that spermatogonia were absent and that the seminiferous tubules were lined with a single layer of epithelium, interpreted as cells of Sertoli, and surrounded by an unusual amount of interstitial tissue. Observations on the living animal showed that sexual desire was normal. In spite of enlargement of interstitial gland substance, male secondary sexual characters were absent, there being, indeed, no penis. Microscopic examination of mammary glands showed a typical female appearance.

In an appendix the author compares this case with the findings of Lillie and of Chapin in regard to freemartins, as noted above.

The existence of a typical oestrous cycle in the guinea pig, with a study of its histological and physiological changes, C. R. STOCKARD and G. N. PAPANICOLAOU (*Amer. Jour. Anat., 22 (1917), No. 2, pp. 225–283, figs. 30*).—By using a small nasal speculum to examine the vaginal canal of guinea pigs at frequent intervals, it was found that the vagina of nonpregnant females is filled with fluid for about 24 hours once every 16 days. The fluid is not abundant enough to be detected on the vulva. It is a mucous secretion from the uterus containing a large number of desquamated epithelial cells from the vagina. After about 12 hours the latter become so numerous that the material has a distinct cheese-like appearance. Leucocytes then invade the mass and it is soon disposed of.

Anatomical studies show that ovulation occurs during every one of these periods, and that the actual rupture of the follicle occurs at the time the vaginal accumulation is thick and cheese-like. The corpus luteum is held to control these changes.

A suggestion as to the process of ovulation and ovarian cyst formation, S. S. SCHOCHET (*Anat. Rec., 10 (1916), No. 6, pp. 447–457*).—The liquor derived from mature ovarian follicles of the pig was found capable of digesting ovarian tissue, muscle, ligament, and fibrin. Slight digestive reaction was produced by fluid from ovarian cysts, but not by amniotic fluid or neutral salt used as controls. This indicates that ovulation is not entirely a mechanical process but is aided by the digestive action of the liquor folliculi.

Studies on the mammary gland, I, II, III, J. A. MYERS (*Amer. Jour. Anat., 19 (1916), No. 3, pp. 353–389, figs. 17; 22 (1917), No. 2, pp. 195–223, figs. 12; Anat. Rec., 13 (1917), No. 4, pp. 205–226, figs. 7*).—These anatomical studies were initiated to provide a basis for various lines of experimental work on the mammary gland. The albino rat was the laboratory form selected for study.

I. *The growth and distribution of the milk-ducts and the development of the nipple in the albino rat from birth to ten weeks of age.*—The methods used included serial sections, wax reconstructions, and the whole amounts stained and cleared after the methods of Lane-Claypon and Starling (E. S. R., 18, p. 75).

There are six pairs of nipples, three in the thoracic and three in the inguinal region. Of 100 female rats studied, 80 had normal arrangement of nipples, 12 lacked the right nipple of the second thoracic pair, 7 lacked both of this pair, and one had a fourth thoracic nipple on the left side. A simplified terminology for the mammary ducts is adopted.

Only one primary duct was found to be present in each gland; it branches and rebranches in an intricate manner by the development of lateral buds. It is not certaain whether ducts of the different glands communicate. No true alveoli were observed during the ages covered by this study. Great activity in growth and branching of ducts occurs in the ninth week, which probably corresponds to the age of puberty. A large amount of individual variation was observed in the development of the glands, a matter which must be considered by investigators in conducting physiological experiments.

II. *The fetal development of the mammary gland in the female albino rat.*—Studies of other authors have not dealt with changes in the mammary glands of rats between the sixteenth day of gestation and the time of birth five or six days later. The author confines his attention largely to this period. It was found that mammary pits first make their apparance on the seventeenth day and become more definite later. On the twentieth day in the deepest part of each pit and surrounded by a narrow furrow is a small eminence which after birth develops into the nipple. The milk ducts begin as solid cords of epithelium, projecting inward. On the eighteenth day branching is noted in the primary milk ducts, and by the twentieth secondary ducts are present in all glands with tertiary and terminal ducts beginning to appear in the glands of the inguinal region. At this time the ducts are surrounded by a sheath of fibrous tissue. The lumina of the ducts are formed by rearrangement of cells, resulting in numerous intercellular spaces that later flow together.

III. *A comparison of the mammary glands in male and female albino rats from the late fetal stages to 10 weeks of age.*—Male fetuses of 18 days show no mammary pits, but there is a slight eminence covered with a thickened epithelium. On the twentieth day neither pits nor eminences cover the mammary gland areas, but the ducts come directly to the surface. In the postnatal stages studied no nipples occur on male individuals. From the twentieth day of gestation until the fifth week of postnatal life the milk ducts of the male resemble those of the female but thereafter undergo little development. The number of mammary glands is more variable in the male than in the female.

The relation of age to fertility in the rat, Helen D. King (*Anat. Rec., 11 (1916), No. 5, pp. 269–287, figs. 3*).—Breeding records of 76 females that gave birth to a total of 3,955 young comprised in 585 litters are the basis of this study. All the females considered lived to the age of at least 16 months. The number of litters produced per female varied from 3 to 16, the average being 7.7. As indicated by the tables the median was 7 and the most frequent number, 6.

The young female rat in good physical condition will generally cast her first litter when three months old, and normally produces a litter a month for some time thereafter. Complete cessation of ovulation normally occurs about the eighteenth month of life. The greatest number of litters were cast when the mothers were six or seven months old. The number was slightly lower at the younger ages and decreased sharply after this point. The average size of all litters was 6.7. The largest one contained 16 young. The table shows that the medium size was 7 and the most frequent size, 8, with a secondary mode at 6. The size was greatest when the mothers were four months old, the average then being 7.9. At three months the average was 6.9. The average continued high until the seventh month, when the decline became more marked. After the fifteenth month the average size was well under 4.

The second litter produced by a female was larger than the others, averaging 7.7. The first litter averaged 7.2. The third to seventh pregnancies resulted in litters somewhat below the first litter in size. Thereafter there was a steady decline. In the author's opinion, the age of the mother is more important than the serial number of the pregnancy in determining litter size. The size of her first litter is considered a better index of a female's fertility than the size of the second. Coefficients of variation for litter size at different ages are given. In general they are inversely proportional to the average litter size for a particular age.

The sex ratio of the young was 106.1 males to 100 females. No relationship was noted between the variation in the sex ratio and the age of the mother, except a slight indication that old mothers tended to produce a relatively high proportion of females.

The prolonged gestation period in suckling mice, W. B. KIRKHAM (*Anat. Rec., 11 (1916), No. 2, pp. 31–40*).—In order to discover the causes of the prolonged gestation period found by Daniel (E. S. R., 28, p. 173) in female mice that are suckling young, the author studied the post-partum ovulation and development of ova in two sets of females, one allowed to nurse from 3 to 8 young during pregnancy, the other deprived of their litters immediately after parturition.

Lactating females generally fail to ovulate immediately after parturition. In the case of those that do become pregnant immediately, the course of development of the dividing eggs is the same as in nonlactating females as far as the seventh day, at which time the eggs have reached the blastula stage. In nonsuckling females on this day, the embryos become implanted in the uterus and continue their development rapidly. In suckling females, at least in the ten that were killed and examined during this investigation, the blastulæ remain free in the lumen of the uterus from the sixth to the fourteenth day without undergoing development. On the fourteenth day implantation takes place and growth continues. The embyros of nonsuckling females by this time have the lenses of the eye well developed, future location of legs and ribs clearly indicated, hair and teeth follicles formed, and the blood cells showing signs of hemoglobin.

The further development of the embryos in lactating females is apparently irregular and generally very slow, so that it is impossible to reconcile the available data with the known length of gestation in this class of female.

On the postnatal growth of the body and of the central nervous system in albino rats that are undersized at birth, HELEN D. KING (*Anat. Rec., 11 (1916), No. 2, pp. 41–52*).—It is stated that as a rule a female rat in good physical condition produces only young of normal birth weight and growth capacity when the number in the litter is small or medium. Occasionally, however, undersized individuals occur which, if they survive the first day of postnatal life, grow rapidly for some time, but this acceleration is correlated with early cessation of growth, so that the ultimate body weight and especially the weight of the nervous system is below the standard. The difference, however, is often not sufficient to prevent the animals being classified as "normal" at maturity. Data on the growth of three litters in the Wistar Institute rat colony, containing individuals of this type, are presented.

If the litter is very large or the mother is not in good physical condition during the gestation period, some of her young may be born with their growth capacity so impaired that they remain permanently dwarfed. These are the true "runts." In many cases at least they are not distinguishable from normal rats at birth. In the experience of the workers at the Wistar Institute these runts are invariably sterile.

Some effects of the continued administration of alcohol to the domestic fowl, with special reference to the progeny, R. PEARL (*Proc. Nat. Acad. Sci., 2 (1916), No. 12, pp. 675–683*).—The experimental data included in this report were secured at the Maine Experiment Station during the breeding and rearing season of 1916, and confirm the observations of the 1915 season (E. S. R., 37, p. 370; 39, p. 177) that the prenatal mortality of chicks from alcoholic parents was greater than that of those from normal parents, but that the posnatal mortality was less.

During this year a careful record was kept of all structural abnormalities, however trifling, discovered on the live chicks and those dead in shell. In the series from alcoholic parents the percentage of abnormalities was 10.8; in that from untreated controls it was 10.2. The difference is not considered significant. The hypothesis developed to explain the results is that the alcohol inhaled by the parents has a selective action on the germ cells, eliminating those not capable of giving rise to vigorous chicks.

A side light on the mode of action of alcohol is furnished by additional experiments in which eggs from normal stock were exposed to alcohol fumes in the incubator for periods of one, two, or three weeks from the beginning of incubation. The results are set forth in the following table:

Influence of alcohol on mortality of chicks from alcoholized eggs.

Length of treatment.	Eggs set.	Eggs infertile.	Mortality rate.	
			In shell.	After hatching (30 days).
		Per cent.	*Per cent.*	*Per cent.*
None	390	28.5	38.7	34.1
One week	130	26.2	42.7	28.3
Two weeks	130	26.9	43.2	21.3
Three weeks	130	32.3	60.5	37.5

It is held that the prenatal mortality rate was selective, since, except in the lot exposed for the entire incubation period where treatment was severe enough to injure most of the embryos, the higher the prenatal death rate the lower the mortality among hatched chicks.

Commercial feeding stuffs, 1917–18, C. D. WOODS (*Maine Sta. Off. Insp. 89 (1918), pp. 77–100*).—A report of analyses of about 350 samples of feeding stuffs received from July 1, 1917, to June 30, 1918, including cottonseed meal, linseed meal, gluten feed, gluten meal, dried brewers' and distillers' grains, wheat bran, middlings, red dog flour, hominy meal, corn meal, alfalfa meal, meat scrap, and proprietary and mixed feeds.

[Use of sunflower silage], E. BURKE (*Montana Sta. Rpt. 1917, p. 240*).—The average of four analyses of sunflower silage reported shows water 78.6, ash 1.6, protein 2.2, crude fiber 6.8, nitrogen-free extract 10.3, and ether extract 0.5 per cent. These figures show close resemblance to published analyses of corn silage and confirm the view (E. S. R., 39, p. 182) that this silage is a very satisfactory feed for dairy cattle.

[Alfalfa and sweet clover as pasture], J. A. HOLDEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1917, pp. 15–19, 25*).—From May 15 to August 31, 1917, four lots of 10 hogs each averaging about 105 lbs. in weight, were used in an alfalfa pasture test. As the season was backward and the alfalfa was damaged by grasshoppers, pork production was below normal. Each lot received a daily ration of corn approximately equal to 2 per cent of its weight until the last month, when it was increased to 3 per cent. Lots 1 and 2 each had access to 1 acre of alfalfa, that of lot 1 being cut for hay every 30 days, while that of lot 2 was divided for alternate pasturing and cut every 15 days. The other 2 lots each had 0.5 acre, one of which was also divided for alternate pasturing, but no hay was cut. The difference between lots 1 and 2 at the end of the summer was trifling. The acre belonging to lot 1 yielded 0.69 ton of hay, and to the second lot, 1.02 tons. Each of these lots consumed practically all of the forage on 1 acre pastures. The other two lots made poor gains owing to overpasturing. The divided pasture, however, produced more forage.

Casual observations in previous years had seemed to indicate a preference on the part of the hogs for Turkestan alfalfa over the common variety. Experiments planned to study this point confirmed the observation. In one of these experiments a field containing a quarter acre of Turkestan and 1¼ acres of common alfalfa was fenced into one pasture. Ten sows and their litters were turned in when the alfalfa was about 10 in. high. Previous to this time it had not been possible to detect the dividing line between the two varieties, but after the hogs had been on the pasture only two days the line was very distinct. The Turkestan was soon eaten close to the ground, although to get to it from their house the hogs had to wade through common alfalfa over a foot high.

The pasturing of hogs on the third-year alfalfa plat of one of the irrigated rotations (E. S. R., 39, p. 173) was continued in 1917, and a summary of results together with the averages for 5 years are given. In the early part of the grazing season fall hogs were used, but later were replaced by spring hogs. A 2 per cent ration of shelled corn was also fed. The total gains were 2,644 lbs. per acre in 1917, the five-year average being 3,167 lbs. The corn fed per pound of gain was 2.71 lbs. On the price basis used in previous years the hogs paid the equivalent of $22.63 per ton on the 1917 hay crop, the five-year average being $25.10.

In one of the corn plats of this rotation the corn was harvested by hogs. Three spring shotes were turned into this 0.25-acre plat and after 40 days had gained at the rate of 732 lbs. per acre. On the estimated yield of the corn plat, it required 4.48 lbs. of corn to produce 1 lb. of pork.

Eight lambs were also pastured on a 0.65-acre alfalfa field and received no other feed. In 139 days they made a gain equivalent to 278 lbs. per acre. On this basis 1 acre of alfalfa should carry 12 yearling lambs through the summer in a thriving condition. It is noted that lambs pastured on the second year's growth of sweet clover made a gain of 312 lbs. per acre.

A test with 4 heifers pastured on 1.32 acres of sweet clover for varying periods is also briefly noted.

Chopped soapweed as emergency feed for cattle on Southwestern ranges, C. L. Forsling (*U. S. Dept. Agr. Bul. 745* (*1919*), *pp. 20, pls. 4*).—Satisfactory results from feeding soapweed (*Yucca elata*) to cattle on the Jornada Range Reserve, N. Mex., in 1918 are reported. The plants, which have very thick stems, are cut down with an ax and run through a chopping machine. The cost of preparation and transport to the placing of feeding was $2.27 per ton. It was fed with cottonseed meal in the proportion of 15:1, the daily ration for healthy cows being from 15 to 20 lbs. per head. A large number of cows in process of starvation because of the scarcity of forage on the range after the

1917 drought were brought back to good condition with this feed. Analyses are reported which show that the chopped soapweed has a chemical composition comparable to native forage grasses and some of the poorer hay crops. Indiscriminate cutting is to be avoided, as the plant requires perhaps 10 years to attain a size suitable for profitable cutting.

Beef cattle, W. E. JOSEPH (*Montana Sta. Rpt. 1917, pp. 232–234*).—A lot of cows wintered for 160 days on straw alone showed greater loss in weight than lots fed hay in addition, but soon picked up on pasture and produced strong and healthy calves. Calves wintered on clover hay did not do so well as those receiving an oats and barley mixture with the hay, but after the following grazing season there was little difference between the groups.

Pasturing sheep on irrigation ditches, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1917, pp. 33, 34, fig. 1*).—A test conducted in cooperation with the U. S. Reclamation Service in 1917 showed that sheep can be used successfully to keep down vegetation in irrigation ditches. The ditch used was about one-half mile long, was thoroughly fenced, and contained about 2¼ acres well grown with Bermuda grass. Thirty-one sheep grazed the grasses so short that the opportunity for settling and depositing of silt was reduced to a minimum. Ordinarily the removal of this deposit and the clearing out of weeds are the two most expensive items in the upkeep of an irrigation ditch. In addition the sheep returned a small profit on mutton and wool.

Pasturing alfalfa with hogs, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1917, pp. 21–23*).—The pasturing tests of 1916 (E. S. R., 39, p. 479), were repeated with some variation in 1917. On March 1, 16 grade Duroc-Jersey shotes averaging 58 lbs. were turned into third-year Peruvian alfalfa on a 0.75 acre plat, fenced for alternate pasturing. They were fed a daily ration of 2 lbs. of cracked milo maize for each 100 lbs. of live weight. When removed after 120 days they had gained in weight the equivalent of 1,869 lbs. per acre. For a week in May the supplemental grain ration was stopped and the hogs allowed on an adjoining field of barley which, however, they ate sparingly. During the week they lost 84 lbs. and the original system was resumed. The grain fed per pound of gain was 2.41 lbs.

Twelve younger shotes, averaging about 38.5 lbs., were placed on the same pasture July 31 and fed a 2 per cent supplemental ration of rolled barley for 98 days. They gained the equivalent of 878 lbs. per acre and required 3.24 lbs. of grain per pound of gain. The alfalfa suffered from over-pasturing during the extreme heat of summer. With pork at 7 cts. and grain at 1 ct., the prices previously used, the alfalfa pasture during the whole season gave a net return of $117.55 per acre.

On November 6 the hogs that had been carried through the second pasture period were turned into a field of mature Dwarf milo maize which they cleaned up in 14 days. The per-acre production of pork was 357 lbs., which was a return at the rate of $31.33 per ton for grain that was worth at least $65 on the market.

Kansas State Live Stock Registry Board, C. W. MCCAMPBELL (*Kansas Sta. Insp. Circ. 8 (1918), p. 149*).—This publication contains a list of all the stallions licensed in Kansas during the calendar year 1918, the text of the State law requiring registration and licensing, an account of the proceedings of the annual meeting of the Kansas Horse Breeders' Association and several of the addresses delivered there, and a statistical discussion showing that in 1910 when the registration law went into effect only 40.8 per cent of the licensed stallions were pure bred, whereas in 1918 the percentage was 64.2.

Licensed stallions in Utah during the season of 1918, W. E. CARROLL (*Utah Sta. Circ. 35 (1918), pp. 3–24*).—This is the customary list of licensed stallions and jacks arranged by counties.

Feeding [the backyard poultry flock], W. F. SCHOPPE (*Montana Sta. Circ. 79 (1918), pp. 30–32*).—Brief suggestions are given.

DAIRY FARMING—DAIRYING.

Farm profits and factors influencing farm profits on 460 dairy farms in Sussex County, N. J., F. APP (*New Jersey Stas. Bul. 320 (1917), pp. 7–108, pls. 3, figs. 7*).—Sussex County is on the northern boundary of New Jersey, and has been an agricultural settlement since its settlement. It is a natural grass country, too stony in places for cultivation. Formerly it produced considerable quantities of grain and a large amount of butter. With improved transportation, dairy activities have changed from butter-making to production of market milk, of which 13,000,000 gal. were sold in 1910. The milk is shipped to the New York City district and is mostly of grades B and C. The crops of this area are largely those raised for forage to feed dairy cattle. Most of the necessary concentrates are purchased. The cows are mainly grade Holsteins.

The survey reported in this bulletin was conducted during the 12 months of 1914, a year in which the milk situation is considered to have been normal, and covered 300 farms operated by their owners and 160 operated by tenants. Of the latter, 95 were share tenants, 65 cash tenants, and 21 labor-share tenants. The farms are all highly specialized for milk production. In the owner farms, the milk receipts averaged $2,100, while the crop receipts were only $123. In the tenant farms the disproportion was still greater. The average production on the owner farms was 3,072 qt. of milk per cow and on the tenant farms 3,136 qt. The State average at the time was 2,088 qt. Nearly 25 per cent of the capital was invested in live stock.

The factors whose influence on profits is investigated include land tenure, capital per farm, number of crop acres per farm and per cow, relative crop yield (crop index), number of cows per farm, production per cow, proportion of receipts from live stock, percentage of crop acres in hay, corn, small grains, and fruit, acres of pasture per cow, number of chickens kept, possession of a silo, and the distance from the railroad. In an elaborate series of tables the mutual relations of practically all of these are considered, as well as the relations of each to labor income, inventory value of lands, buildings and stock, work units per man and per horse, total expenses, labor expenses, receipts per farm, etc. Tables do not give averages alone, but in every instance show the influence of change in one factor of the variables considered in relation to it. The chief measure of success is taken to be the operator's labor income, and for each of the more important factors there is a table showing essentially the correlation between the factor and the labor income. The investigation thus treats the farm business as a unit and does not deal with dairying as a separate enterprise, except in one section devoted to the cost of milk production.

In the author's judgment, the major factors of success on these farms are in the order of their importance milk production per cow, number of cows per herd, and crop acreage per farm. Owner farms of good and better than the average in respect to all three of these produced an average labor income of $1,270. Those deficient in any one item produced a labor income of $565. Those below the average in two, netted $369, and those below in all three $8. The corresponding figures for the tenant farms are $1,263, $661, $462, and $173, respectively.

The great influence of the production capacity of the individual cow on the labor income, as well as the relation of production to the other two major factors, is indicated in the following table:

Milk yield per cow; its influence on labor income, and its relation to size of herd, and area cultivated.

Yield of milk per cow.	Owners.				Tenants.			
	Number of farms.	Cows per farm.	Crop acres per farm.	Labor income.	Number of farms.	Cows per farm.	Crop acres per farm.	Labor income.
Quarts.								
2,000 or less	29	11.5	52.0	− $125	11	25.2	57.2	$260
2,001 to 2,500	61	19.0	56.9	+ 161	24	25.8	76.4	194
2,501 to 3,000	78	21.2	58.8	406	43	25.8	75.9	383
3,001 to 3,500	62	21.3	60.0	468	37	28.5	68.1	644
3,501 to 4,000	40	19.1	57.2	738	19	27.0	73.2	898
4,001 to 4,500	15	23.2	64.9	1,083	15	25.1	69.1	991
4,501 to 5,000	10	30.9	63.1	1,613	7	22.7	59.1	610
5,001 and over	5	20.6	55.8	1,652	4	23.0	94.5	1,293
Average	....	20.3	58.2	457	....	26.3	71.7	557

The high-producing cows tended to belong to the larger herds especially on the owner farms, but their tendency to occur on farms of larger crop acreage was not marked. In fact one of the author's tables indicate that the number of crop acres per cow steadily decreases with increased size of herd. Greater efficiency in the utilization of man and horse labor is associated with the bigger herds and the larger farms, and this is an important item in their success. A relatively large proportion of crop acres in small grains was profitable mainly because of decreased necessity of purchasing concentrates. An increased percentage of area devoted to raising corn did not result in lessened purchasing of concentrates and did not materially increase the labor income. The relatively few farms where corn, small grain, or hay were sold yielded considerably larger labor incomes than the others.

The crop acreage on tenant farms was larger than on owner farms, but the relative value was about equal, averaging about 36 per cent. The owners had 29 per cent of their farm area in permanent pasture, the tenants 21 per cent. The labor income of 28 per cent of the owners and 12 per cent of the tenants was zero or negative.

In the opinion of the author, these farms are too highly specialized in the production of market milk. The growing of orchard fruits could be profitably extended and would result in a more efficient use of labor. Poultry raising also deserves consideration as a desirable adjunct to dairying. Dairying as followed on these farms increases soil fertility, but most of them would be benefited by a more extensive use of lime, which could easily be secured locally. A reorganization of the crop systems of these farms is advocated and a 5-year rotation suggested.

A group of 160 farms where 98 per cent or more of the receipts were from cows was selected for a special study of the cost of producing market milk. The amounts of feed and labor required to produce 100 lbs. of milk was found to be grain 39.7 lbs., silage 31.95 lbs., hay and forage 59 lbs., pasture 1.85 days, and man labor 2.81 hours. The amounts required to keep a cow for a year were grain 2,577 lbs., silage 2,075 lbs., hay and forage 3,832 lbs., pasture 121 days, and man labor 182.6 hours. The credits for calves sold and for manure not produced on pasture covered about two-thirds of the other costs, not counting managerial charges. In 1914 the cost of producing a quart of milk was 4.28 cts. and in 1917 it would have been 6.17 cts.

Straining milk, E. KELLY and J. A. GAMBLE (*U. S. Dept. Agr., Farmers' Bul. 1019 (1919), pp. 14, figs. 14*).—Besides a discussion of the significance and sources of sediment in milk and a warning that straining does not result in a bacteria-free product, this publication contains a summary of tests of the efficiency of several types of strainers in removing sediment. The most efficient strainer examined was composed of a layer of absorbent cotton inclosed by cheesecloth. Almost equally effective was filter cloth, which can be purchased from dairy supply houses and if properly sterilized and cared for may be used repeatedly. Several thicknesses of cheesecloth have a certain value in removing sediment, but the wire strainer used on 35 per cent of the farms (about 40,000) from which reports were received was very unsatisfactory.

Cooling milk and storing and shipping it at low temperatures, J. A. GAMBLE and J. T. BOWEN (*U. S. Dept. Agr. Bul. 744 (1919), pp. 28, figs. 21*).—The experimental work reported deals with the efficiency of cooling devices of various constructions and in different locations and the value of insulation on cans used for storage and transportation purposes, with special reference to prompt cooling at the farm. The cooling devices dealt with are tanks containing ice and noncirculating water, into which cans of milk are placed.

Reports received from some 40,000 dairies in 32 States indicate that about 80 per cent of farms producing market milk use some sort of cooling tank. About 19 per cent of the tanks were of metal, 25 per cent of wood, 31 per cent of concrete, and 25 per cent of material not specified. Very few tanks were insulated.

Cooling in a tank is at an end when milk and water are of uniform temperatures. In an ideal tank permitting no absorption of outside heat, the end temperature is a weighted average of the initial temperatures of water, milk can, and milk, the weights being proportional to the specific capacity of each substance to absorb heat. The measure of tank efficiency proposed is the ratio (expressed as percentage) of this theoretical temperature to the actually observed end temperature, the latter always being higher owing to radiation from the surroundings. Directions are given for constructing a concrete tank with insulating substances imbedded in the walls that is 97 per cent efficient.

Experimental tanks were constructed of uniform size to test the relative efficiency of four different materials, when tanks are either sheltered or unsheltered from the sun, covered with a wooden lid, or uncovered. Hourly changes in temperature in the tanks during the progress of experimental cooling are shown by graphs, while the heat absorbed expressed as British thermal units and the relative loss in cooling effects expressed in pounds of ice are given in tables. In the order of increasing efficiency the materials used were galvanized iron, solid concrete 4 to 5 in. thick, 1 in. wood not insulated, and 1 in. wood lined with 2 in. of cork. The results show clearly the value of a simple board covering and the importance of having the tank indoors, the logical place being the milk house. The added expense of insulation in most cases would soon be compensated for in the saving of ice. In building a tank it is recommended that it be divided into a larger and a smaller compartment so as to allow the economical cooling of different quantities of milk. A tank holding 3 or 4 gal. of water for each gal. of milk is more efficient in the use of ice than a larger tank. When the water supply is of low temperature, precooling results in economical use of ice and rapid lowering of the temperature of the milk to 50° F. Rapid cooling is also greatly aided by putting ice in the tanks some time before the cans of milk are added.

Six 10-gal. cans were used to study methods of holding and transporting milk. Insulated cans (kind of insulation not mentioned) held milk at a low temperature considerably longer than any of the other kinds. The can covered with a 1 in. jacket of felt held milk cool as long as a can with an ice compartment and several times as long as a plain can. The same cans filled with milk cooled below 45° F. were sent on long railroad journeys, from Washington, D. C., to New Orleans and from Chicago to Washington. Temperature changes in the milk were noted at frequent intervals. The results are shown graphically in a series of charts. The insulated and felt covered cans were the most satisfactory in retaining a low temperature.

Survival of typhoid bacilli in sour milk, PENELOPE MARSH (*Amer. Jour. Pub. Health, 8 (1918), No. 8, pp. 590–593*).—Tests indicate that *B. typhosus* is sensitive to acidity and is usually destroyed in milk in a short time at about the degree of acidity occurring in fresh buttermilk as obtained in the New York market. Buttermilk would seem to be free of danger as a means of distributing *B. typhosus* or *paratyphosus* or *B. dysenteriæ* in the ordinary course of events.

The economical use of fuel in milk plants and creameries, J. T. BOWEN (*U. S. Dept. Agr. Bul. 747 (1919), pp. 47, figs. 14*).—The continued high price of coal makes the efficient use of fuel in commercial plants a matter of great importance. This bulletin presents material dealing with fuel efficiency in creameries collected by the Dairy Division of the U. S. Department of Agriculture, and includes a study of conditions in 206 creameries where steam is used exclusively for both power and heating. These plants were visited and information secured on the quantity of butter made, kind and amount of fuel, size and type of boiler and engine, methods of firing, and condition of engine, piping, and all steam apparatus. These data are used as a basis for definite recommendations. Instructions for the building of boiler settings and furnaces are given in detail, together with illustrations and diagrams and tables of dimensions. Suggestions as to methods of firing furnaces and the elimination of air leaks and heat losses from bare pipes are given. The author recommends the more extended use of exhaust steam instead of live steam for heating wash water and for pasteurization, and provides several diagrams showing how exhaust steam can be successfully utilized.

The final section deals with the distribution of heat energy from combustion of coal in the boiler furnace of an average gathered-cream plant making approximately 500,000 lbs. of butter per year. It is shown that in such a plant only 6.3 per cent of the total heat units are actually consumed in useful work, and plans are presented by the use of which the heat loss in such a plant would be so reduced that less than 50 per cent of the original heat units would be necessary.

Twelfth annual conference of the American Dairy Science Association (*Jour. Dairy Sci., 1 (1918), No. 5, pp. 375–445, fig. 1*).—This conference was held at Columbus, Ohio, October 22, 1917. Reports submitted by chairmen of five committees are published, together with notes of the discussions that occurred after the reports were read. These were as follows: Legal Limits for Butter, by B. D. White; Bacteriological Methods for Market Milk Analysis, by R. S. Breed; State and National Brands for Butter and Cheese, by M. Mortensen; Dairy Farm Score Card, by E. Kelly; and Statistics of Production and Marketing of Dairy Products, by R. C. Potts.

VETERINARY MEDICINE.

Observations and experiments on intestinal trichinæ, B. SCHWARTZ (*Jour. Agr. Research [U. S.], 15 (1918), No. 8, pp. 467–482, figs. 3*).—This is a report of investigations of the Bureau of Animal Industry of the U. S. Department of Agriculture which have led to the following summary and conclusions:

"The larvæ of *Trichinella spiralis* do not linger in the stomach of the host after they are freed from their capsules, but pass into the small intestine. The passage of the larvæ through the stomach does not stimulate them to further growth and development, and a brief sojourn in the intestine is insufficient to initiate those processes which lead to sexual maturity. Larvæ from the intestine that have not yet been stimulated to further development become tightly coiled when removed from the host and placed in a physiological salt solution, but those which have been stimulated to development apparently lose the power of becoming tightly coiled under similar conditions. Larvæ which have been stimulated to further development in the intestine will molt even after being removed from that organ. The molting process may be hastened by high temperatures and suppressed by low temperatures. Larvæ which have not yet been stimulated to further development in the small intestine can not be caused to molt by a high temperature.

"With the beginning of development in the small intestine the larvæ lose the power of surviving for considerable lengths of time outside of the host. They afterwards become more persistent, however, in direct proportion to their increasing age. When removed from the host within 24 hours after artificial infection intestinal trichinæ often undergo spontaneous disintegration, which may be due to the sudden change of environment, lack of food, or possibly the liberation of toxic substances which affect the parasites while in an artificial medium. Larvæ which molt after removal from the host have been observed occasionally to decrease in size. It is suggested that the dwarfed condition is possibly due to lack of food.

"After the first and subsequent molts the tolerance of the larvæ to various toxic agents is replaced by a marked sensitiveness to such agents, which decreases, however, with advancing age. Under the influence of potassium cyanid the worms undergo disintegration and exhibit susceptibility to the poison along the major axis, which in the growing forms appears to be greatest in regions where growth takes place most rapidly. Modifications in the permeability of the cuticle do not appear to be directly responsible for the changes in susceptibility. The changes probably result from a reorganization of the protoplasm coincident with growth, differentiation, and age. Attempts to induce molting in the larvæ which have been decapsuled by artificial digestion and afterwards kept in vitro under various conditions have thus far failed to yield successful results."

A study of the character of the feces due to various foods in connection with anthelmintic investigation, M. Wigdor (*Amer. Jour. Vet. Med., 13 (1918), No. 9, pp. 441–444*).—"Soft light-colored plentiful feces are indicative of a bread diet. Dark fairly hard feces in comparatively small amounts are indicative of a raw meat diet. Very dark fairly soft feces in small amounts are indicative of a finely chopped cooked meat diet. (This seems to be especially true when the meat is fed while still warm.) Clay-colored, brittle feces in small lumps are indicative of some bone constituent in the diet.

"Therapeutic doses of oil of chenopodium or distillation products of oil of chenopodium, when given with castor oil, usually cause greenish, fluid feces, regardless of the diet.

"Excessive or lethal doses of chenopodium constituents cause constipation, in spite of therapeutic doses of castor oil, defecation being suppressed for a period of one or more days or the feces being hard and dark."

The rôle of immunity in the conduct of the present war, J. A. Kolmer (*Jour. Immunol., 3 (1918), No. 5, pp. 371–374*).—This is a brief discussion of the contributions of the science of immunity to the diagnosis and treatment of various diseases of particular importance in the present war, together with a statement of a few of the unsolved problems.

A method of preparing bacterial antigens, J. C. SMALL (*Jour. Immunol., 3 (1918), No. 5, pp. 413–422; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 26, p. 2179*).—The essential qualifications of an ideal bacterial antigen are discussed, and a method is outlined which is said to yield efficient antigens.

The method consists essentially of the extraction of the fat-like substances from dried bacteria by chloroform and ether. The residue is then freed from traces of these solvents and suspended in sterile salt solution. A dry antigen preparation is also described which can be stored for use over long periods of time without becoming anticomplementary, as is often the case with stock antigen suspensions. For this preparation the bacteria are extracted as described above, and after the last washing with ether the bacterial residue is dried, intimately mixed with 8.5 times its weight of sodium chlorid, and reduced in a mortar to a very fine powder. For use the powder is suspended in distilled water in the proportion of 0.95 gm. of the powder to 100 cc. of water.

The disinfection of pathogenic bacilli by the cinchona alkaloids, R. BIELING (*Biochem. Ztschr., 85 (1918), No. 3–4, pp. 188–211, figs. 4*).—The author summarizes the work of other investigators on the disinfecting action of the homologues of the hydroquinone series with from 5 to 8 carbon atoms in the side chain, and reports the results of a study of the effect of these disinfectants on the bacilli of diphtheria, tetanus, and anthrax. While all these organisms are destroyed by very high dilutions of the higher homologues of hydroquinone, the maximum effect on the different organisms was not always produced by the same compounds. The theory of their action as specific rather than nonspecific disinfectants is discussed.

The resistance of the glanders bacillus to calcium hypochlorite, B. COHEN (*Jour. Infect. Diseases, 24 (1919), No. 1, pp. 51–55, fig. 1*).—The author's studies indicate that *Bacillus mallei* is, if anything, more sensitive than *B. coli* to dilute solutions of calcium hypochlorite. He concludes that it may be effectively used in the disinfection of horse troughs as a harmless prophylactic measure in glanders infected regions.

The differentiation and distribution of the paratyphoid enteritidis group.—V, Occurrence in the human intestine, E. O. JORDAN and E. E. IORNS (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 537–542*).—This is in continuation of the studies previously noted (E. S. R., 39, p. 587).

Further observations on hemolytic streptococci in milk, D. J. DAVIS (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 559–561*).—This is a report of observations carried on in continuation of those previously noted (E. S. R., 35, p. 680), in which hemolytic streptococci of the *Streptococcus lacticus* type were found in dairy milk in 23 of 92 samples. "In this series they were far more common in nonpasteurized than in pasteurized milk. They are less virulent for rabbits than the hemolytic streptococci of human origin. Two strains were found with moderate pathogenic power for rabbits.

"While, in general, one may be practically sure that organisms of the [*S.*] *lacticus* type are not dangerous to man, still individual organisms or strains of human-milk, or bovine origin suspected of being responsible for sore throats or other infections in man should be carefully studied and compared with a view to finding specific common characters."

Studies in the metabolism of pathogenic actinomycetes (streptothrices), I, S. A. WAKSMAN (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 547–554*).—"Blood agar is a very good medium for the growth of pathogenic actinomycetes, a good growth being obtained in 24 to 72 hours when incubated at 37° C. [98.6° F.]

"The production of hemolysis of the blood on blood agar, the liquefaction of blood serum, the clotting and subsequent peptonization of the milk, [and] the liquefaction of gelatin, run parallel. The organism that produces most hemolysis produces liquefaction of the blood serum and gelatin and a greater digestion of the milk proteins. The organism that does not produce any hemolysis of the blood does not liquefy the blood serum and the gelatin, does not clot the milk, and has only a small action on the milk proteins. These characters can be used advantageously in the identification and classification of the actinomycetes. Some pathogenic actinomycetes grew readily on synthetic mediums."

A case of rat bite fever, RUTH TUNNICLIFF and KATHERINE M. MAYER (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 555–558, pl. 1*).—It is pointed out that a streptothrix (*Streptothrix muris-ratti*) has been isolated from the blood of three patients with rat-bite fever by three separate investigators and observed in the fresh blood in a fourth case by Tileston (E. S. R., 35, p. 487). Organisms, culturally and morphologically similar, have been found in bronchopneumonia by the senior author (E. S. R., 36, p. 678). Another streptothrix (*S. putorii*) has been isolated by Dick and Tunnicliff from the blood of a patient bitten by a weasel (E. S. R., 39, p. 889). In the latter case the clinical picture was similar to that of rat-bite fever, although the streptothrix differed both culturally and morphologically from *S. muris-ratti*.

In the present paper the authors report upon a fatal case which occurred in Chicago, in which the streptothrix was found to be more closely related culturally and morphologically to *S. putorii* than to *S. muris-ratti*. The chief points of interest in this case are the presence of a streptothrix in the polymorphonuclear leucocytes during life, in blood cultures after death, in smears of bone marrow, and possibly in the ganglion cells near the suprarenals.

A note on bleeding guinea pigs and on preserving sheep's erythrocytes, J. J. WENNER (*Jour. Immunol., 3 (1918), No. 5, pp. 389–393; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 26, p. 2179*).—The author, at the Connecticut Storrs Experiment Station, describes a method for bleeding guinea pigs in which the blood is obtained from a partial incision in the jugular vein. After from 10 to 15 cc. of blood has been drained from the vein, cotton is pressed into the wound and the animal placed on its back until the flow of blood stops. The cotton is then removed and the wound treated with alcohol and closed.

The method is said to yield practically as large a quantity of blood as when the animal is bled to death, and to have the further advantage that this amount may be obtained repeatedly from the same animal.

The method of preservation of sheep's erythrocytes by the use of formalin, essentially as described by Bernstein and Kaliski (E. S. R., 29, p. 676), is also described.

An improvement in the method of isolating and recovering the bacillus of cattle abortion through guinea pigs, E. W. SMILLIE (*Jour. Expt. Med., 28 (1918), No. 1, pp. 585–605, figs. 2*).—The method employed by the author for the cultivation of *Bacillus abortus* is described in detail, and experiments undertaken for the purpose of determining the possibility of shortening the life period of the inoculated guinea pig without impairing the chances of obtaining cultures are also described.

The spleen was found to be the organ in which the bacteria are regularly present and in largest numbers. The number of living bacteria in the spleen of the guinea pig is larger between the third and fourth weeks than later, although the macroscopic lesions become more pronounced as the bacteria decline.

The author suggests that for a diagnosis based on the isolation of *B. abortus* guinea pigs should be killed between the third and the fourth week, while for a diagnosis based on characteristic lesions they should be killed later, preferably aften seven or eight weeks.

The survival of the hog-cholera virus in laboratory animals, particularly the rat, C. TenBroeck (*Jour. Expt. Med.*, *28* (*1918*), *No. 6*, *pp. 749–757*).—This is a report of an investigation of the effect of hog-cholera virus on various laboratory animals. The method employed was to inoculate several animals of a given species in one or more ways, and after seven days to determine whether the virus was still present in their bodies by inoculation of susceptible pigs.

Attempts to demonstrate the virus of hog cholera after intravenous and intra-abdominal inoculations were unsuccessful in the case of rabbits, guinea pigs, and pigeons. It was proved, however, that the virus can be found in the bodies of white rats for at least seven days after either intra-abdominal or intracerebral inoculations. Passing one strain of virus alternately through pigs and rats for three transfers in each species did not change the virulence for swine nor cause the virus to become virulent for rats. Attempts to introduce the virus into the body of the rat by feeding virulent material and an attempt to pass the virus through one lot of rats to another were unsuccessful.

From these observations the conclusion is drawn that the rat does not play a part in the transmission of hog cholera.

A study of paratyphoid bacilli isolated from cases of hog cholera, C. TenBroeck (*Jour. Expt. Med.*, *28* (*1918*), *No. 6*, *pp. 759–777*).—During the course of experimental work on hog cholera, paratyphoid bacilli were isolated from 16 per cent of the hogs. Culturally these organisms were found to be the same as paratyphoid bacilli isolated from man and different in many respects from hog cholera bacilli. In their agglutination in sera produced by the injection of living cultures one of the cultures corresponded to *Bacillus enteritidis*, while five apparently formed a class by themselves, resembling paratyphoid B more closely than hog cholera bacilli, but different from both in the type of clumps formed and in absorption experiments. When injected into rabbits they produced an immunity to the hog cholera bacillus, while paratyphoid B does not.

The author considers it probable that some of the cultures that are described as hog cholera bacilli belong to this group. Whether the ingestion of pork containing these bacilli would cause disease in man has not yet been determined.

A study of the changes in virulence of the pneumococcus at different periods of growth and under different conditions of cultivation in media, A. B. Wadsworth and Mary B. Kirkbride (*Jour. Expt. Med.*, *28* (*1918*), *No. 6*, *pp. 791–805*).—In this paper are presented the results of a preliminary study of the essential relation between the different phases of growth and the degree of virulence of the pneumococcus.

It was found possible, by rapid transfers alone, not only to maintain the virulence for mice of the pneumococcus in artificial media, but also to restore a certain degree of virulence to cultures previously rendered avirulent by less rapid transfers in the same medium. For these results the presence of enriching fluids such as blood or serum was not required. Attenuated cultures which had been shown to be avirulent for mice at the 24-hour period of growth exhibited marked pathogenicity if injected during or especially at the commencement of the period of maximum growth, when the growth energy may be considered at its height.

The authors consider it improbable that the close relation between the vegetative power or growth energy of the pneumococcus and its pathogenic power is peculiar to this organism, but that it forms the basis not only of the essentially parasitic but also of the more special toxicogenic activities of the bacteria.

A further consideration of complement fixation in tuberculosis, V. H. Moon (*Jour. Amer. Med. Assoc., 71 (1918), No. 14, pp. 1127-1133*).—The work of various investigators on the complement fixation test for tuberculosis is reviewed, and reports are given of results obtained by means of the test in 156 tuberculous cases, of which 133 gave positive tests.

The conclusion is drawn that complement fixation in tuberculosis should be regarded as an established technique, well past the experimental stage, and of particular value as an aid in the early diagnosis of the disease. The author considers that a freshly prepared antigen containing living, virulent bacilli is superior to one containing dried organisms, although the latter will keep indefinitely.

A contribution to the study of the complement fixation reaction in tuberculosis, M. A. Wilson (*Jour. Immunol., 3 (1918), No. 5, pp. 345-350; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 26, p. 2178*).—This is a preliminary report, in which are described the author's method of standardizing the complement, the preparation of tuberculosis antigen, and the diagnostic test for tuberculosis.

It is pointed out that not all guinea-pig serums are efficient for tuberculosis complement fixation, and that consequently the serum from each guinea pig should be tested for fixability with tuberculosis antigen plus tuberculosis serum before pooling the complement for diagnostic tests.

Attention is called to the discovery of von Wedel that some serums from active tuberculosis cases gave a negative complement fixation reaction when the test was made on the first day after bleeding and a positive reaction a week later, having been kept in the ice box during the interval. Although this early negative phase was not demonstrated in the serums from all tubercular cases, the percentage was so large that it is considered advisable to make the later test before the tuberculosis antibody content of all serums can be determined.

The antigen used by the author consists of a suspension of tubercle bacilli killed with heat, extracted with alcohol and ether, and dried.

A contribution to the study of the complement fixation reaction for tuberculosis, H. von Wedel (*Jour. Immunol., 3 (1918), No. 5, pp. 351-369; abs. in Jour. Amer. Med. Assoc., 71 (1918), No. 26, pp. 2178, 2179*).—A brief review is given of some of the more important investigations of the past few years on the complement fixation test for tuberculosis, and results are reported of a study of the test with the use of the perfected Wilson antigen, noted above.

Data are reported from 1,078 complement fixation tests on 200 specimens of blood serum taken from cases with no clinical history of tuberculosis and from patients with active, inactive, and primary pulmonary tuberculosis. As a result of this study the following modifications of the original complement fixation tests are recommended:

"Pooled complement from at least six guinea pigs should be used in making the tests, or the complement from single pigs should be tested for its complement fixation value with known positive sera. Double the original Wassermann amount of patients' serum should be used. No report should be made until the sera have been tested, after having been kept under sterile conditions in the ice chest for from four to six days, preferably six days."

With these modifications the results seem to indicate that "100 per cent of nontubercular cases will give absolutely negative results, nearly 100 per cent of the primary and active cases will give positive results with the exception of the dying cases, and about 25 per cent of the partially inactive and inactive cases will give only weak positive results."

The tubercle bacillus antigen was found to be not anticomplementary in four times the amount capable of producing positive complement fixation with sera from the great majority of cases with active tuberculosis.

Further studies on brisket disease, G. H. Glover and L. E. Newsom (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 7, pp. 409–413, pls. 3*).—This is a report of investigations at the Colorado Experiment Station in continuation of those previously noted (E. S. R., 37, p. 690).

The authors' studies of 45 cases "tend to show that normal animals living in a high altitude have a heavier heart than those living near sea level; that animals affected with brisket disease had dilated, flabby, and heavy hearts; that they have a high percentage of red corpuscles; that they show generalized edema and enlarged and sclerosed livers, such as one would expect in cardiac weakness; that they usually recover when shipped to lower altitudes, but seldom do if they remain at the higher levels; and that the feed is not a factor; that animals from low altitudes are more often affected than natives; that calves sired by bulls from low altitudes are more likely to be affected than those sired by native bulls; that the higher the altitude the more prevalent is the disease.

"We therefore have no hesitancy in concluding that the malady is due to failure of acclimatization at high altitudes. The remedy lies not in drugs, but in breeding a hardier strain of cattle which can accustom themselves to the rigorous conditions incident to an existence at these extreme altitudes."

Gastrointestinal lavage in dogs: Its value in removing worms and in other respects, M. C. Hall and M. Wigdor (*Jour. Amer. Vet. Med. Assoc.*, *52* (*1918*), *No. 4, pp. 443–456*).—"Experimental investigations of various procedures which may be regarded as gastrointestinal lavage in the sense in which the term is now used among American veterinarians, or some modification of that procedure, have been made by us in 12 cases. We conclude from these tests (1) that gastrointestinal lavage, like most of the medicinal anthelmintics, has not the entirely dependable efficacy which is usually credited to it by those who use it. (2) It has a certain limited efficacy in removing worms and it might be of value in anthelmintic treatment in one of several ways: By mechanically removing part of the worms present at times, or all of them less frequently by removing material that interfered with the action of medicinal anthelmintics, or by employment as a means of administering medicinal anthelmintics in properly selected cases. Its anthelmintic value is less than that of properly selected medicinal anthelmintics in suitable doses. (3) It probably has greater value in cases of poisoning in dogs or cats, animals which are often poisoned, where the lavage can be given in time to wash out some or all of the poison from the digestive tract before the absorption of a lethal dose. Where it could be applied promptly we would regard it as a procedure of great value. (4) It is temporarily very depressing and may at times cause rupture of the intestinal walls from the water pressure or hemorrhage of the stomach from protracted forcible emesis. (5) The treatment is easy and rapid with some dogs but slow and tedious with others.

"Investigations based on the weights of 200 dogs indicate that for practical purposes the weight of the average dog is about 10 kg. [22 lbs.]; investigations based on the above and on the measurement of 25 dog stomachs indicate that the gastric capacity of the average dog is about 1 liter [1.06 qt.] and that the gastric capacity of the average dog per kilogram of body weight is about 100 mils [0.106 qt.]. The exact computed weight is a little over 10 kg. and the exact computed capacity and capacity per kilogram are a little less than these figures."

An epizootic of poliomyelitis among dogs, H. GREELEY and W. L. JOHNSON (*Med. Rec. [N. Y.], 92 (1917), No. 20, pp. 839–842, figs. 6; abs. in Jour. Trop. Med. and Hyg. [London], 21 (1918), No. 3, pp. 34–36*).—The authors report upon a small epizootic among collie dogs at Jamaica, N. Y., in which the lesions found in the central nervous system were similar to those which are found in cases of poliomyelitis in man. A Gram-negative, pleomorphic bacillus was isolated, a culture of which upon intravenous inoculation into a young dog daily for four successive days resulted in the appearance of typical symptoms (paraplegia and fever) and lesions.

In referring to a similar epidemic reported by Pierson among Eskimo dogs (E. S. R., 30, p. 781), it is pointed out that the collie and Eskimo dogs are near relatives.

The anatomy of the domestic fowl, B. F. KAUPP (*Philadelphia and London: W. B. Saunders Co., 1918, pp. 373, pl. 1, figs. 88; rev. in Cornell Vet., 9 (1919), No. 1, pp. 63–65*).—The subject is dealt with under the headings of osteology (pp. 17–55), arthrology (pp. 56–69), myology (pp. 70–134), splanchnology (pp. 135–168), the urogenital system (pp. 169–189), the ductless glands (pp. 190–205), angiology (pp. 206–263), neurology (pp. 264–302), esthesiology (pp. 303–308), structure of appendages (pp. 309–317), and embryology of the chick (pp. 318–353), and includes an outline for laboratory study of the chick and a bibliography of 19 titles.

Observations on an outbreak of favus, B. A. BEACH and J. C. HALPIN (*Jour. Agr. Research [U. S.], 15 (1918), No. 7, pp. 415–418, pl. 1*).—This is a report of studies of favus, due to *Achorion schönleinii*, made at the Wisconsin Experiment Station, in which State several severe outbreaks of the disease have occurred among poultry during the last few years.

The experiments show that "favus is primarily a wound-infection disease of the unfeathered parts of the head. It occurs usually as an enzootic. An ointment composed of vaseline and formaldehyde is an effective remedy. Infection by the digestive tract is impossible. Intravenous inoculations are incapable of starting infections. The organism isolated and studied by us is specific, as shown by the fact that typical cases of the disease were produced in hens inoculated with laboratory cultures."

A chromogenic bacillus from a case of roup, B. F. KAUPP (*Jour. Infect. Diseases, 23 (1918), No. 6, pp. 568–571*).—This is a report of studies made at the North Carolina Experiment Station of a new chromogenic bacillus which was obtained in an almost pure culture in smears from the lower third of the trachea of a fowl affected with roup. This bacillus, to which no name is given, is highly pathogenic for rabbits, killing of septicemia in from 10 to 20 hours, and shows some pathogenic properties for fowls when injected into injured tissues.

RURAL ENGINEERING.

Legislation concerning water rights, O. W. ISRAELSEN (*Utah Sta. Circ. 38 (1918), pp. 3–26, fig. 1*).—This circular brings out the salient points of legislation in the Western States concerning water rights for irrigation. It is brought out that nearly every available means of increasing the water supply of Utah and of other Western States is in some degree dependent on water rights. It is the opinion of the author that legislation concerning water rights, to be complete, must provide for (1) the acquirement of new rights, (2) the defining of rights which have vested through use, and (3) the public distribution of water according to established rights. Rights to water which have become vested through use before laws governing the acquirement of rights were enacted are now defined (1) by the courts, called the Colorado system; (2) by administrative boards, called the Wyoming system; and (3) by administrative boards and courts, called the Oregon system. Eight States, including Utah, follow the Colorado system, three follow the Wyoming system, three the Oregon system, and three have not yet provided special procedure for defining water rights. The Colorado system, as followed by Utah, has been practically inoperative during a period of 15 years. It is believed that if the public were represented in all proceedings for the purpose of defining vested water rights, the permanency, or period of endurance, of each decree could be greatly increased and the ultimate cost of litigation thereby decreased, thus better protecting the interests of both the individual and the public.

On the basis of this study of legislation, it is suggested that public distribution of water should be improved (1) by making safe and adequate financial provision for the employment of water commissioners, (2) by preventing divided jurisdiction of streams, and (3) by standardizing and keeping permanent and accurate records of water deliveries.

Border irrigation experiments, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1917, pp. 14–17*).—Experiments on the Umatilla Experiment Farm near Hermiston, Oreg., to ascertain the best length and width of borders are reported.

It was found that the 175-ft. border was irrigated as economically as the 100-ft. border in 1916. In 1917 the 100-ft. border was irrigated with 1 acre-ft. less water than the 175-ft. border. The smallest average application in the width-of-border experiments was 3.48 acre-in. on the 20-ft. border, and the largest 4.64 acre-in. on the 30-ft. border.

Irrigation requirements, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1917, pp. 34, 35*).—Tabular data showing the water requirements of the entire Yuma project for the year 1917, as accounted for by the U. S. Reclamation Service, are given. The average amount of water applied to each acre irrigated on the project was 3.7 acre-ft., as compared with 3.2 acre-ft. during 1916.

Ground water in Reese River Basin and adjacent parts of Humboldt River Basin, Nev., G. A. WARING (*U. S. Geol. Survey, Water-Supply Paper 425–D (1918), pp. 95–129, pls. 6, fig. 1*).—This report deals with the ground water of an area about 150 miles long and from 12 to 30 miles wide in the central part of Nevada, and discusses the physiography and geology of the area and its relation to ground-water supplies.

Data on the quality of the ground water indicate that dug wells furnish water which is generally satisfactory for domestic use, but is only good or fair for irrigation and poor for use in boilers. The water from springs is usually satisfactory for domestic use and poor for boilers, but is better than that from dug wells for irrigation. The deeper drilled wells, if properly cased to exclude water from near the surface, yield water that is more satisfactory for general uses than either dug wells or springs.

Some data on artesian conditions in the valley are included.

Ground water in Quincy Valley, Wash., A. T. SCHWENNESEN and O. E. MEINZER (*U. S. Geol. Survey, Water-Supply Paper 425–E (1918), pp. 131–157, pls. 2, figs. 2*).—This report deals with the ground water supplies of an area of 600 square miles a little south and east of the center of the State of Washington, the floor of which is a nearly smooth plain. The topography consists essentially of great expanses of nearly level or gently sloping ground, interrupted by hills and by deep trench-like valleys.

The depth to water in the valley was ascertained at about 250 widely distributed points. It was found that in general the depth to water varies with the elevation of the land surface. In a part of the sand-dune area the ground water comes to the surface in many springs, and in a large part of the area water is less than 50 ft. below the surface. Throughout much of the sandy country in the south-central part of the basin the water ranges from 50 to 100 ft., and from 100 to 150 ft. in the west-central part.

It is concluded in general that the quantity of water underlying the valley is large, but that the annual intake of water is not more than 24,000 acre-feet. The quantity which can safely be pumped annually is less than this amount, and conditions indicate that it will be impossible to irrigate the entire basin with water obtained from this source. It is considered unwise at present to increase the area to be irrigated by underground water by more than a few thousand acres.

Analyses of 13 ground waters and 6 surface waters indicate a very favorable condition of the ground waters. Of the ground waters, 11 of the samples are classed as good and 2 as fair for irrigation. Most of the waters are good or fair for domestic use, but two are classed as bad.

Public Roads (*U. S. Dept. Agr., Public Roads, 1 (1918), No. 6–8, pp. 48, pl. 1, figs. 30*).—This number of this periodical contains a tribute by A. D. Williams to the late Logan Waller Page, director of the Bureau of Public Roads, several articles of rather general interest to highway engineers, and the usual data as to the Federal and road projects.

A poultry house for the backyard, W. F. SCHOPPE (*Montana Sta. Circ. 79 (1918), pp. 25–30, figs. 2*).—The small poultry house here described and diagrammatically illustrated, is designed to suit Montana conditions.

Commercial room brooder for chicks, MR. and MRS. G. R. SHOUP (*Washington Sta., West. Wash. Sta. Mo. Bul. 6 (1919), No. 10, pp. 141–147, figs. 6*).—This brooder and its construction are described.

RURAL ECONOMICS.

Rural life, C. J. GALPIN (*New York: The Century Co., 1918, pp. XVII+386, pl. 1, figs. 114*).—Chapter 1 of this book is an inventory of the physical and semiphysical features, residential, occupational, institutional, and urban influences acting in the farm environment. Chapter 2 discusses the influences and circumstances which tend to make the rural psychology what it is.

In chapter 3, first discussing three widely known theories of the rural social problem, the author states his own conception, as follows: "How shall the rural population liberate itself from the restrictions and repressions upon its manner of life and labor . . . so as greatly to extend its acquaintance with persons and increase its contacts with the human mind?" He points out two schools of thinking on rural matters, ruralist and rurbanist, the former advocating self-sufficing farmer groups and farmer institutions in competition with urban business. The latter, being based upon present tendencies, would attempt new adjustments of the farm to the town cluster, with elimination of discrimination against the social interests of the farmer.

In the chapter on the structure of rural society the social anatomy is so dissected as to show the structure of the trade zones, banking zones, local newspaper zones, village milk zones, village church, high-school, and library zones, and school districts. One figure illustrates the theoretical form of an agricultural community as a circle, with the agricultural city as its center, having a radius somewhat longer than half the distance between any two centers.

The organized social life of the farmer is narrowed down to the limits of the school district or neighborhood, and he is without a legal community commensurate with the structure of urban communities. The author recommends, then, the readjustment and adaptation of the institutions of that socio-economic unit, the trade zone, or, as he names it, the borough. The farm woman as home maker, interpreter of family and child psychology, housekeeper, and cooperator, and the child, through whom new and progressive ideas are often accepted into the home, must both be given the benefits of modern science, the one by means of labor-saving devices which will prevent her chronic fatigue and the other by a broadening of his school life and opportunities.

Chapter 7, on rural relations of high schools, offers one solution for the problem of meeting the needs of rural adolescents. Maps are given showing areas of high-school influence in Wisconsin and rural relations of two high schools are described in detail. The discussion of rural social centers, country clubs, country fêtes, and country churches cites many examples of what is being done in hamlets and in the open country through these agencies.

Chapter 12 develops the idea of the survey and statistical method of rural study. The author shows how a force at hand, school teacher and pupils, is available for surveying the school district, and recommends the method of the work and the making of maps locating each farm and showing social features. Surveys of boroughs and rural parishes are discussed in the same way to show how they may be made and how utilized.

The last two chapters are devoted respectively to a discussion of legislation affecting rural education and rural local government and the need for new rural population classifications in the census, and to outlining study problems as applications of the 13 preceding chapters.

Mobilizing the rural community, E. L. Morgan (*Mass. Agr. Col. Ext. Serv. Bul. 23 (1918), pp. 54, figs. 26*).—The bulletin presents the three forms of rural organization which have been used in the State of Massachusetts, two of them, that with a community leader and the one the author calls the group plan, leading up to the third, the community council plan. Steps in the inauguration of the latter are a preliminary conference of a few organization representatives, the first community meeting and appointment of committees, subsequent meetings, and the annual community meeting.

The author declares that in undertaking similar work in other towns one must keep in mind that farm production and farm business have a large place, that the work of organization must be thoroughgoing and well balanced, time, money, and brains being devoted to it, and that progress will not come about of itself. One must know of the town under consideration, its future, the spirit of the people, whether or not the farmers are making money, and whether or not farm bureaus, the county Y. M. C. A., the agricultural college, and other sources of assistance are being taken advantage of. The work in several communities has been written up as illustrative of achievement in the line of organization.

The home of the countryside (*New York: Association Press, 1917, pp. X+149*).—In this book are edited discussions heard at the fifth country life conference of the county work department of the International Committee of the Young Men's Christian Association. At this meeting the Young Women's Christian Association also had an official part.

The day of the country church, J. O. Ashenhurst (*New York and London: Funk & Wagnalls Co., 1910, pp. 208*).—The discussion follows the usual channels, urging the responsibility of the church in the spiritual life of the country and suggesting needed institutional methods, cooperation, and evangelism, as well as remedies for the handicap of denominationalism. Chapters are devoted to the Sunday school, to the idea of a church plant of three units—a place of worship, a parsonage, and a parish house—and to church finance on a business basis.

[Some of the economic phases of the report of the Agricultural Commission to Europe], R. A. PEARSON ET AL., W. A. TAYLOR, and T. F. HUNT (*In Rpt. Agr. Com. Europe. Washington: U. S. Dept. Agr., 1919, pp. 28–31, 32–34, 41, 42, 45, 69–72, 79*).—These sections of this report embody observations of the Agricultural Commission to Europe (E. S. R., 39, p. 703) on questions of economic interest, namely, measures to increase agricultural production in Italy, including increase in acreage, mechanical plowing, activities of the labor office, and the provisions for rural credits; Government price fixing in England; estimates of the relative influence of war upon the agriculture of the United Kingdom and of France; wheat requirements and production in the United Kingdom and France and in Italy and Belgium; and notes on the possible shift in agricultural prosperity that may result from new international relationships.

Now and then, or notes on the society and its work in 1897 and in 1918, J. B. HARRISON (*Timehri, Brit. Guiana, 3. ser., 5 (1918), pp. VII+LXXXI*).—This article discusses the growth of the work carried on by the Royal Agricultural and Commercial Society of British Guiana during the last 21 years. The phases considered include agricultural education, exhibitions, and industries; adulteration of foodstuffs; soils; and irrigation. The principal crops discussed are feeds, coconuts, cacao, coffee, fruits, and Para rubber.

How Holland will dispose of the Zuider Zee, R. G. SKERRETT (*Sci. Amer., 119 (1918), No. 13, pp. 251, 261, figs. 2*).—The author states that on June 14, 1918, a bill was passed in Holland embodying plans to drain the Zuider Zee and thus add 523,440 acres of land to the total area. The author states that 90 per cent of this bottom is covered with silt and cultivable clay, which will increase the farming and cattle raising area by 480,000 acres and will accommodate an industrial population of about 250,000. The cost, magnitude, and results of the reclamation are also discussed.

Economic problems of technical agriculture, G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ., 10 (1918), Nos. 109, pp. 17–27; 110, pp. 105–115; 111, pp. 197–208; 112, pp. 305–315; 113, pp. 385–395; 114, pp. 486–494*).—These articles discuss some of the principal economic questions of agriculture in Spain. Some of the reforms suggested by the author are conservation and improvement of the herds, the intensification of wheat cultivation through irrigation and credit, the necessity of simultaneous local politico-administrative reforms in agriculture, the increased cultivation of cotton and the development of cotton textiles in Spain, the enlargement of the various branches of horticulture, and official educational institutions to promote Spanish agriculture.

Present agricultural problems and colonization in Algeria, G.-J. STOTZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 33, pp. 153–160*).—The author discusses the agricultural productivity of Algeria in the light of the economic rebuilding of France. He compares Algeria with other countries, and finds that it compares favorably with Australia, Argentina, Canada, and the United States in the possibilities of production of cereals. He maintains that with proper organization, a modification of methods, and a maximum utilization of the rainfall, agricultural production, both vegetable and animal, can be greatly increased until northern Africa takes a high place among the more recently developed nations.

Agricultural production for 1919, with special reference to crops and live stock (*U. S. Dept. Agr., Off. Sec. Circ. 125 (1919), pp. 27*).—This report, similar to one previously noted (E. S. R., 38, p. 896), includes a review of the essential facts of agricultural production in the United States in 1918, taken from the annual report of the Secretary of Agriculture dated November 15, 1918 (see p. 493), also notes on exports of farm products in 1918 and estimates of the world's requirements of cereals and miscellaneous crops for 1919 and for the years 1919 and 1920.

The live-stock program is considered in the light of available and prospective feed supplies and demands for the product. The supply of seed for the leading staple crops is reported adequate and generally well distributed. Questions of fertilizers (see p. 421) and the labor supply are also discussed.

[Report of] the farm management department, E. L. Currier (*Montana Sta. Rpt. 1917, pp. 248–252*).—A preliminary summary of conclusions drawn from studies conducted on wheat farms in the Gallatin Valley and the Judith Basin to determine the cost of growing wheat and the relation of the wheat enterprise to farm organization in Montana, and from similar studies of organization on the sugar-beet farms in the region adjacent to Billings, is given.

Farming as a business, W. A. Ostrander (*S. Dak. Col. Agr. Ext. Circ. 10 (1918), pp. 31, fig. 1*).—This circular is a copy of an account kept by a farmer in South Dakota, covering his farm business in 1917–18, with summaries of various enterprises taken from the record of sales, expenses, and inventories.

Opportunities afforded the railroads of the United States for profitable agricultural development work, T. F. Powell (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 451–456*).—Various methods which the railroads might use to cooperate more closely with farmers in marketing and distributing agricultural products are discussed. A bibliography is appended.

Great central markets for live stock and meats, L. D. Hall (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 335–341, fig. 1*).—This article contains a brief history of the rise and growth of great central markets for live stock, also statistics showing the number of cattle received annually at the principal markets at 10-year intervals from 1870 to 1910. The author states that the chief problems in live-stock marketing are the wide market fluctuations and the difficulty in financing live-stock paper; that though the cost of production is higher than formerly, the central markets have helped to stabilize the expense of marketing; and that the cost of selling compares favorably with that incurred in the sale of any other farm product.

The meat problem, Moussu (*Rec. Méd. Vét., 93 (1917), No. 17, pp. 481–492*).—The author maintains that the problem of furnishing meat to both civilians and soldiers has become increasingly difficult in France. He suggests the construction of regional abattoirs with refrigeration to take care of the cattle from the vicinity, and the inaugurating of a regular service of refrigerating wagons capable of conserving all perishables to the end of the route, notwithstanding unexpected delays. During the winter season, the author suggests, it is possible to supply the front with meat slaughtered behind the lines even without refrigeration wagons, provided that the meats are transported hanging, and he states that there already exist models of wagon bodies which are easily adaptable to this method of transporting meats. He attributes many of the problems that have arisen to lack of sufficient organization.

Truck marketing on a large scale under cooperative principles, N. P. Wescott (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 341–349*).—This article discusses methods of cooperative associations for truck marketing, with special reference to the operations of the Eastern Shore of Virginia Produce Exchange.

Improved transportation service for perishable products, G. C. White (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 400–425*).—This article discusses the principal factors in efficient transportation of perishable products.

The author states that mechanical refrigeration has not proved practical, economical, or efficient, and that there is need for improvement in mechanical appliances for handling ice and in the location and proper construction of icing platforms. Fish, milk, live poultry, and live stock each require a type of vehicle and other facilities different from those required by fruits and vegetables, and there is a lack of special market trains for fruits, vegetables, and dairy products. Other reforms in transportation management are also discussed, and a bibliography is appended.

The economic value of the auction as a distributor of perishable commodities, V. K. McElheny, jr. (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 740–748, pls. 2, fig. 1*).—The author explains the prejudice against auction sales of fruit and gives data on the large proportion of foreign auction markets. He discusses the distinctive characteristics of the auction method and maintains that the auction is an increasingly necessary factor in distribution. Among the advantages claimed for this method he enumerates the following: It relieves a glutted market, returning full market value for all grades when the crop is short; it insures stability of price and speed in delivery; it widens the area of distribution and gives equality between large and small growers; it prevents combinations of buyers; and is suitable for both perishables and other kinds of food products.

Influence of supply on prices, A. U. Chaney (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 735–740*).—The author discusses the principal factors which cause supply to influence price and the need of improved and economical methods of marketing. He contends that these improvements can be effected through a system of jobbers with large capital, through national standardization of weights and containers, and through close cooperative control of the supply and Government regulation of distribution, thereby insuring stability of values.

Car-lot distribution, J. S. Crutchfield (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 425–430*).—This article explains the methods of car-lot distribution in vogue for fruits, and emphasizes the many advantages of a standardized product.

The effective use of the Panama Canal in the distribution of products, C. J. Brand (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 911–915*).

The extent and possibilities of cooperation, C. E. Bassett (*Proc. 2. Pan Amer. Sci. Cong., 1915–16, vol. 3, pp. 456–459*).—The author states that cooperation as an economic principle is a corrective measure that will do much to place the agricultural industry in this country upon a solid basis, that successful marketing of a highly specialized crop grown in a narrowly restricted area is largely limited by the willingness of producers to stand together under all discouragements, and that several States have secured legislation that fixes the simple standards of cooperation and provides for the control and protection of cooperative organizations. He also discusses the methods of management, financing, standardizing, auditing, etc., that have proved successful in this country.

Fourth annual report of the Cooperative Organization Branch [Saskatchewan], 1917–18, W. W. Thomson (*Saskatchewan Dept. Agr., Ann. Rpt. Coop. Organ. Branch, 4 (1918), pp. 44, pl. 1, figs. 2*).—This report continues the data regarding cooperative organizations in Saskatchewan previously noted (E. S. R., 38, p. 90), adding statistics for the year ended May 1, 1918.

Agricultural credit societies (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Lucia, 1917–18, pp. 28–34*).—This article is the second annual report of the agricultural credit societies of St. Lucia, dealing with the year 1917–18. There is a list and a short description of the new organizations, and statistics of the produce shipped. The report states that these societies have had a marked uplifting effect upon the peasantry, and that there has been no difficulty in collecting moneys due.

The New Jersey Patriotic Farmers Fund, H. MEIXELL, JR. (*N. J. State Research, 5 (1918), No. 6, pp. 53–59*).—An account of the extension of the New York Patriotic Farmers' Fund plan to New Jersey, Oregon, southern California, Michigan, and two counties in Connecticut.

The adaptation of share leasing to modern joint-stock agricultural societies, A. M. DES ROCHETTES (*Jour. Agr. Prat., n. ser., 31 (1918), No. 19, pp. 373, 374*).—The author outlines the theory of a combination of labor and capital, including money and land, into agricultural societies operating on a share-leasing basis. He shows the advantages of such a combination in the possibility for diversified activities in addition to the actual farm operations; for the employment of disabled soldiers and the widows and orphans; the stability of labor; and the sharing by the laborer of the profits of his labor.

Monthly Crop Report (*U. S. Dept. Agr., Mo. Crop Rpt., 5 (1919), No. 1, pp. 8*).—This number reports, as usual, the estimated farm value of important products for December 15, 1918, and January 1, 1919, average prices received by producers, and range of prices of agricultural products at important markets. It contains, in addition, detailed estimates of stock and prices of potatoes, a summary table of estimated value of farm products, 1879 to 1918, inclusive; index numbers of total crop production, prices, and values; and estimates, by States, of the total hay production and the yield per acre in 1918.

A special article is given on the change of yield per acre from year to year, which gives tables for (1) the percentage of increase or decrease in yield of the principal crops per acre in the United States from 1866 to 1917, (2) the percentage of increase or decrease in yield of corn per acre in Virginia, Iowa, and Kansas for the same period, (3) the mean percentage of increase or decrease in yield per acre of the principal crops in the United States by periods of years, and (4) the range of percentage of change of yield per acre of the principal crops. "The more dependable crops, as they are geographically distributed, are sweet potatoes, rye, hay, and rice; of medium dependency are barley, buckwheat, cotton, oats, corn, and winter wheat; of less dependency flaxseed, potatoes, and spring wheat."

Brief articles on the trend of prices, amount of clover sown in winter wheat, and the production of cane sugar and cane sirup in 1918 are also given.

AGRICULTURAL EDUCATION.

Agriculture as presented by some of the State normal schools, O. H. FRAZEE (*School Sci. and Math., 18 (1918), No. 9, pp. 820–827*).—This is a summarized report based upon information received from 80 State normal schools in response to a questionnaire concerning instruction in agriculture.

The data show that 22 schools require agriculture in all courses, six describing the required work as agriculture, nature study, or gardening. Of these schools, 18 are west of the Mississippi River. Agriculture is required in rural and graded school courses in 24 normal schools which, with four exceptions, are situated in the North Central States. Five schools require agriculture in the regular course, three require it in agricultural and advanced courses only, and two in science and household arts only. Agriculture is reported as elective in two schools and not required for any course in 18 schools, one of which, however, makes it a requirement for admission, and 50 per cent of these are located in the North Atlantic States. The most frequent explanation offered by schools not requiring agriculture for any course is that their students are largely from the cities.

The data show further, approximately, that 10 schools require agriculture for 12 weeks, 11 for 18 weeks, 4 for 24 weeks, 24 for 36 weeks, 4 for 48 weeks, and 8 for 72 weeks or more. Of these 8 schools, 2 require agriculture for four years and one requires agriculture each term in its five-year course. Of the schools offering agriculture, 15 place it in the first year, 15 in the second, 9 in the third, 14 in the fourth, 1 in the fifth, 7 require it every year, and in 15 schools it is optional with the student as to which year he pursues it.

With reference to the course in agriculture offered for six weeks or more, it is shown that general agriculture (including elementary agriculture) is taught for six weeks or more in 44 schools, animal husbandry in 20 schools, soils in 18, farm crops and cropping in 13, horticulture in 13, gardening in 10, agronomy in 8, dairy husbandry in 7, feeds and feeding in 6, farm management in 6, plant propagation (including plant breeding) in 7, poultry in 4, stock judging, weeds, and rural economics in 3 each, farm mechanics and forestry in 2 each, and methods in agriculture, economic entomology, bacteriology, plant pathology, and agricultural chemistry in 1 school each. There is overlapping in the courses to some extent. Data are also given with reference to courses in other departments that are prerequisite to agriculture.

It is found that 63 normal schools prepare teachers of agriculture for rural schools, three preparing them for rural schools alone; 60 may prepare teachers of agriculture for graded as well as rural schools; and 38 may prepare agricultural teachers for high schools in addition to the preparation of teachers for the elementary schools. There seems to be a definite movement in the North Central, South Central, and Western States to prepare teachers of agriculture for high schools.

Seventy per cent of the replies received favor the training of teachers in normal schools in the art and science of agriculture, while 10 per cent did not favor such training. Four schools favor such training in the science of agriculture only, two in the art of agriculture only, and two schools hold that special schools (preferably normal schools) should be delegated to do the work in agriculture.

With reference to the approximate value of material equipment for agriculture it is shown that one normal school has an estimated material equipment of $100,000, 5 have approximately $50,000 each, 7 have $10,000 each, 8 have $5,000 each, 9 have $1,000 each, 14 have $500 each, 6 have $100 each, and 5 report little or nominal equipment. Twenty-two schools report that there is no coordination of the work of the school and the agriculture of the community; 10 schools do club work, or cooperate with the county agent; nine schools do certain types of practical work, such as soil testing, determining species of insects, suggesting building plans, etc.; six schools do extension work, including lectures and experiments; and one school does supervision work in the teaching of agriculture in district schools.

"The replies are practically unanimous in the belief that the function of agriculture in the normal school is to develop in the minds of young men and women a point of view with respect to the problems of rural communities. This would include a training which would emphasize, first, the art and science of agriculture; second, an appreciation and understanding of rural problems; and third, practical problems. . . . The sentiment of the majority seems to be reflected in the thought that agriculture has a 'relatively growing importance' in the normal curriculum. . . . With reference to desirable changes, the sentiment, aside from those having in mind purely local matters of administration, is, first, that the subject needs to be vitalized in the curriculum; second, that it should be more generally required; third, that it should be taught in the training school."

Agricultural textbooks for our public schools, H. NESS (*Science, n. ser., 48 (1918), No. 1246, pp. 484–486*).—In the author's opinion, it is expected in the greater number of the textbooks on agriculture for the public schools that "the pupils . . . cover more agricultural subjects, frequently crowded together in an incoherent way and stripped of all philosophical connective tissue, than any student in the State agricultural colleges, where he has a four years' course with specialists for teachers, supplied with all the equipments for demonstration." He finds many of these books both too bulky and too dry for digestion, and recommends a return to the idea of "a book about agriculture," giving up the idea of productive agriculture for the public schools. Such a book should deal with agricultural botany and zoology, including a history of the practical phases of the evolution of farm animals and plants under domestication. The practical operations and the history of their evolution he would subordinate to what might be called the scientific aspects, yet diligently drawing upon them for the elucidation of the latter.

A year's work in vocational agriculture, J. D. BLACKWELL and R. G. BRESSLER (*Dept. Ed. Tex. Buls. 93 (1918), pp. 49; 94 (1918), pp. 65*).—These bulletins are the first two of a series of four to be prepared for teachers of vocational agriculture in Texas. The first, dealing with plant production, contains a suggested weekly program; explanation of home project work; outlines of proposed courses of study for vocational agricultural schools and for departments of vocational agriculture; lists of required reference books and bulletins and laboratory equipment; a plan for cataloguing agricultural bulletins; brief outlines of 160 lessons, including laboratory exercises, in plant production, soils and fertilizers, and field crops; study outlines for plant production projects, including corn, cotton, peanut, and potato projects; and explanatory report blanks.

The second bulletin deals with animal production, and contains outlines of a proposed four-year course in vocational agriculture, including a half year's work in general animal husbandry and a half year's work in poultry and dairying; 96 lessons and 64 laboratory exercises in general animal husbandry, 64 lessons and 31 laboratory exercises in dairying, 32 lessons and 16 laboratory exercises in poultry husbandry; study outlines for pig, baby beef, dairy herd, egg production, and poultry raising projects; an explanation of home projects, a list of required reference books and bulletins, and project report blanks.

[Suggested outlined courses of study in plant production and southern field crops] (*Vocat. Div. Pub. Ed. [Miss.], 1918, Memo A, pp. 16; Memo B, pp. 15; Memo C, pp. 21*).—These pamphlets contain suggested outline courses in plant production for consolidated schools and plant production and southern field crops, respectively, for agricultural high schools. Each course consists of a year's work on a seasonal sequence basis, that in southern field crops representing the second year's work for the agricultural high schools. With each lesson or topic, assignments or suitable subject matter for students to read have been indicated. Productive Plant Husbandry, by K. C. Davis, is the basal text for the first year's course, and Southern Field Crops, by J. F. Duggar, for the second year's work. Exercises for laboratory or practical work are included.

Household physics: Its nature and presentation, E. V. FLOYD (*Teaching [Kans. State Normal School], 4 (1918), No. 43, pp. 15–18*).—The author defines household physics as a first-year course in physics adapted to the needs of women, the purpose of which is primarily to teach the student to reason about her physical environment. It is held that the entire field of elementary physics, as well as that of college physics, can be outlined and studied in terms of problems, to illustrate which 12 problems in the field of light are enumerated for study. One of these, the problem of illuminating homes, is outlined to indicate what may be done in the classroom.

Principles of chemistry applied to the household, Hannah T. Rowley and Helen W. Farrell (*Boston: The Boston Cooking School Mag. Co., 1918, pp. XIII+284, figs. 100*).—Part 1 of this elementary text deals with the principles of chemistry centering around the idea of chemical change, which are applied in part 2 on the chemistry of foods and cleaning. Experiments and references to literature, a supplement containing general information on household substances and additional experiments, directions for laboratory work, a table of food values, etc., are included.

A course of study in nature study for the first six grades of the elementary schools (*Bul. Bd. Ed. Mass., No. 14 (1916), pp. 31, pls. 12*).—This is a seasonal outline in nature study for grades 1 to 6, inclusive, including a study of flowers, trees, seasonal conditions, birds, animals, insects, and indoor and outdoor gardening. Special emphasis is given to home gardens, distribution gardens, and tree gardens, and it is suggested that the distribution gardens may easily become adjuncts of the home gardens, enabling the teacher to help the pupils to start at school many kinds of flowers, fruits, and vegetables for them to carry to their home gardens at the proper season. The more important plants which may be utilized in this way are suggested for the various grades. It is found that in the method of teaching nature study in general three stages of development may well be recognized, viz, (1) in the lower grades, acquaintance making and experience getting through sense perceptions, in which play instincts may be utilized to great advantage; (2) in intermedinate grades, emphasis placed upon activities directed toward special ends, in which work with gardens and pets is specially important; and (3) in the upper grades, similar work with a broader scope, the economic or vocational relations being considered. A list of books for reference and the study of nature are appended.

Type problems in farm arithmetic, E. W. Ackert (*State Normal and Indus. School [Ellendale, N. Dak.] Bul., 18 (1918), No. 1, pp. 15*).—This is a compilation of type problems in shipping grain, etc., dockage, feeds and feeding, interest, concrete, and roads offered in the short course in farm engineering by the North Dakota State Normal and Industrial School at Ellendale.

MISCELLANEOUS.

Report of Agricultural Commission to Europe, W. O. Thompson et al. (*Washington: U. S. Dept. Agr., 1919, pp. 89*).—This includes reports of the chairman and various individual members of this commission (E. S. R., 39, p. 703), together with its suggestions and recommendations. Portions of the reports dealing with fertilizers and various economic questions are noted on pages 421 and 487 of this issue.

Annual Reports of the Department of Agriculture, 1917 (*U. S. Dept. Agr. Rpts. 1917, pp. VII+499*).—This contains the reports of the Secretary and heads of bureaus and other administrative officers. The various reports are also issued as separates.

The work of the Scottsbluff Reclamation Project Experiment Farm in 1917, J. A. Holden (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1917, pp. 28, figs. 2*).—This report includes a summary of meteorological observations from 1911 to 1917, a review of agricultural conditions on the project, and a report of the work on the experimental farm during 1917. The experimental work reported is for the most part abstracted elsewhere in this issue.

The work of the Umatilla Reclamation Project Experiment Farm in 1917, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1917, pp. 30, figs. 6*).—This report includes a summary of meteorological observations from 1912 to 1917, a review of climatic and agricultural conditions on the project, and a report of the work on the experimental farm during 1917. The experimental work reported is for the most part abstracted elsewhere in this issue.

The work of the Yuma Reclamation Project Experiment Farm in 1917, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1917, pp. 45, figs. 17.*)—This report includes a summary of meteorological observations from 1910 to 1917, a review of agricultural conditions on the project, and a report of the work on the experimental farm during 1917. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-first Annual Report of Maryland Station, 1918 (*Maryland Sta. Rpt. 1918, pp. X+270, figs. 58*).—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, 1918; and reprints of Bulletins 209–218, previously noted.

Twenty-fourth Annual Report of Montana Station, 1917 (*Montana Sta. Rpt. 1917, pp. 209–272, fig. 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1917, and a report of the director on the work and publications of the station. 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., 6 (1919), No. 10, pp. 138–152, figs. 8*).—This contains brief articles on the following subjects: Experiments with Fertilizers, by E. B. Stookey (see p. 422); Commercial Room Brooder for Chicks, by Mr. and Mrs. G. R. Shoup (see p. 485); Some Methods of Poultry Disease Prevention, by W. T. Johnson; and Pruning Old Neglected and Young Fruit Trees, by J. L. Stahl.

List of available publications (*West Virginia Sta. Circ. 29 (1918), pp. 4*).—The available station bulletins and circulars and extension circulars are listed and briefly described.

NOTES.

Arizona University.—The State allotment for county scholarships has been increased from $150 to $500 each, available for tuition, room, and board at the university for the year following award. Examinations are to be held annually to select one beneficiary from each county. Agriculture is among the sciences which may be offered as subjects in the examination.

California University and Station.—Among the members of the staff who have recently returned from military service are W. B. Herms, associate professor of parasitology; G. R. Stewart, assistant professor of agricultural chemistry; A. W. Christie, instructor in agricultural chemistry; and W. D. Norton, H. E. Drobish, and F. T. Murphy, assistants in agricultural extension.

Connecticut Storrs Station.—Leslie E. Card, assistant poultry husbandman, resigned April 1 to take up graduate work at Cornell University.

Florida Station.—A cooperative arrangement has been entered into with the Bureau of Public Roads of the U. S. Department of Agriculture for installing a plant with the view of ascertaining the value of sewage when applied to the sandy soils at the station.

A better fruit campaign was held under the auspices of the extension division, February 10 to 26. This campaign afforded opportunity for the station workers to present information relative to their Adams fund projects on citrus problems to growers in various parts of the State, and was found very helpful in establishing a clearer comprehension of the various problems under way.

Miss Evelyn Osborn has been appointed assistant entomologist beginning March 1. William N. Ankeney of the Bureau of Plant Industry of the U. S. Department of Agriculture has been given headquarters at the station while studying vegetable diseases in the State.

Georgia College and Station.—Lewis A. Zimm, instructor in forestry and plant pathology at Cornell University, has been appointed extension forester in the college.

The station has arranged a cooperative feeding project with the Bureau of Markets of the State Department of Agriculture, in which a study will be made of the influence of certain feeds on the softness and other qualities of pork. D. G. Sullins, swine specialist at the Connecticut College, has been appointed animal husbandman, beginning March 15.

Idaho University and Station.—The various State administrative departments have been reorganized under a recent act of the legislature into nine State departments. One of these is agriculture, which is further administered by directors of markets, animal industry, plant industry, and fairs. A board of agricultural advisers is also provided. The duties of the new department cover a wide range, among them that of cooperation with the college of agriculture and station and the Federal Government, and it is announced that close cooperation with the college and station has already been agreed upon.

The legislature made much more liberal provision for the college of agriculture and station than ever before. The aggregate for the ensuing biennium, including Federal funds, will be $175,290. In addition there are certain supplementary funds of $15,000 for a poultry house and $5,500 for miscellaneous repairs.

The principle of supplementing the Federal funds for general station work was recognized by the State for the first time, with an initial appropriation of $15,000 available for any form of experimental work as well as $5,000 for studies of insect pests and $1,500 for a soil survey. It is planned to use the increased general funds for work in animal husbandry, irrigation, and several other lines.

The substations also received increased appropriations. The allotment for the work at Caldwell was increased from $7,800 to $20,200; that at Aberdeen from $5,000 to $7,650; the high altitude substation from $3,500 to $11,000; and the Sandpoint substation from $5,000 to $13,150.

Herbert P. Davis of the Dairy Division of the U. S. Department of Agriculture has been appointed professor of dairying in the college and vice director and dairyman in the station, beginning May 1. Charles W. Hungerford of the Office of Cereal Investigations of the Department has been appointed plant pathologist of the station to take up work with diseases of cereals, potatoes, and various other fruits. W. V. Halverson has been appointed assistant in bacteriology, chiefly for the Adams fund project dealing with the relation of soil nitrates to the inoculation of legumes.

Illinois University.—The department of animal husbandry has announced an eight-day course in feeding pure bred sheep for show and sale, beginning August 6. Students must furnish and maintain their own sheep during the course.

Purdue University and Station.—The friendly suit by the university against the State of Indiana to establish a settlement regarding certain disputed appropriations has been settled by the State Supreme Court according to a compromise proposed by the State officials and the trustees. The university will receive the special appropriations granted for the station and extension department, amounting to $121,000 a year, together with $10,000 a year for three years in payment of expenses during the period of the contest.

The station has been given a 400-acre farm in northern Indiana by William E. Pinney. This farm will be known as the Pinney-Purdue Farm, and will be used to study agricultural problems of northern Indiana and to further better country life. Mr. Pinney has also given the institution another tract of 67 acres to be known as the Pinney-Purdue Experiment Field, which will be operated for soil fertility tests.

A contract has been awarded for building a large horse barn and a cattle barn for the use of the department of animal husbandry. These will be brick and concrete structures. A modern farm cottage has been completed for the use of the farm foreman, using an approved design for buildings in a model rural community.

The school of agriculture has recently completed a fruit growers' course, three tractor short courses, and a poultry course. These short courses were all very successful.

Capt. Frank G. King and Lieuts. G. P. Walker, and W. P. Hayes have returned from military service. C. F. McIntosh, assistant county leader, has been appointed a member of the Federal Board for Vocational Education to succeed Charles A. Greathouse. Dr. Max W. Gardner has been appointed associate in botany to take up pathological studies in vegetable crops. Dr. Arthur T. Evans has been stationed at the institution for histological work in the corn investigations which are being conducted in cooperation with the Office of Cereal Investigations of the U. S. Department of Agriculture.

Kansas College and Station.—The legislature has just made the largest appropriations for the institution yet granted. For the ensuing biennium $1,675,500 has been authorized, in addition to the grant for extension work to meet the requirements of the Smith-Lever Act, and liberal appropriations for the various substations. The appropriation for the college represented an increase of $400,000, or approximately 33 per cent, while the annual station allotment is increased from $40,000 to $50,000. Among the new items is $10,000 for a hog plant and equipment.

Dr. R. R. Dykstra, professor of surgery and acting head of the department of veterinary medicine, has been appointed head of the department.

Kentucky University and Station.—Dr. Fred E. Mutchler, director of agricultural extension, has resigned effective June 30 to accept a commercial position. In the station, A. L. Brueckner, on leave for military service, has resumed his position as assistant in animal pathology, and N. M. Cregor has been appointed assistant in bacteriology.

Maine Station.—The legislature has appropriated $5,000 for the years 1919 and 1920 to aid in the maintenance of the Highmoor farm.

Massachusetts College and Station.—Special six weeks' short courses in agriculture and horticulture for returning soldiers and sailors, held in February and March, were so successful as to lead to their repetition from April 14 to May 24, with courses in soils and fertilizers, field crops, types and breeds of live stock, poultry husbandry, farm management, farm machinery, fruit growing, and dairying. Special provision is expected to be made during the summer term beginning June 30, and at subsequent dates if there is sufficient demand.

J. C. McNutt, head of the animal husbandry department, has been granted six months' leave of absence to organize the work in animal husbandry for the Army Overseas Educational Commission. J. C. Graham, poultry husbandman, has been granted a year's leave of absence, which he will spend at the Red Cross Institute for the Blind at Baltimore, Md., where he is to head the agricultural division and develop courses of training adapted to the needs of the blind along agricultural lines. R. B. Cooley, of the extension department of Rhode Island College, has been appointed animal husbandman in the extension department, beginning April 1.

Minnesota University and Station.—The legislature has passed a law making it mandatory upon county commissioners to appropriate for the support of county agricultural extension and home demonstration work whenever a county farm bureau has been organized and requests the appropriation, and raising the maximum limit of the sum which may be so appropriated to $3,000 in each county. An appropriation of $86,000 to provide the State's share of the expenses of county agent work has been provided.

Henry W. Vaughan, professor of animal husbandry and assistant animal husbandman at the Iowa College and Station, has been appointed professor of animal husbandry and animal husbandman, beginning July 1. Adele Koch has been appointed home economics lecturer in agricultural extension.

Albert Hoversten has resigned as superintendent of the Waseca substation and has been succeeded by Robert E. Hodgson, a 1918 graduate of the college. A. C. Heine has been appointed instructor in agricultural engineering at Morris.

Missouri University and Station.—Dean F. B. Mumford has been appointed agricultural representative on a Commission of American Universities to visit France, with a view to cementing more closely educational and economic relations. M. F. Miller has been designated as acting dean of the college of agriculture and director of the station during his absence.

D. J. Griswold has resigned as research assistant in animal husbandry, effective April 30, to become animal husbandman at the Mississippi Station, vice H. K. Gayle, whose resignation has been previously noted. He has been succeeded by John H. Longwell, now research scholar of animal husbandry.

Miss Helen Johann, research assistant in plant pathology, resigned April 15. Elmer M. McDonald, assistant professor of farm crops, returned March 1 from national service; A. J. Durant, instructor in veterinary science, on February 17; and R. R. Hudelson, assistant professor of soils, on February 15. Horace A. Gardinell has been appointed extension instructor in horticulture, beginning March 1.

A request from the Federal Board for Vocational Education that the college of agriculture offer a special short course for disabled soldiers, beginning March 1 and continuing for seven weeks, has been agreed to.

Cornell University.—The annual Farmers' Week, held February 10 to 14, had a registration in excess of 4,000 persons, the largest yet recorded.

John L. Stone, connected with the farm crops work of the institution since 1897, and professor of farm crops since 1907, retired February 15. The death is noted of John Hallock Bromley of the department of soil technology on December 20, 1918, at the age of 33 years, and of W. I. McCann, extension instructor in pomology, on November 18, 1918.

Miss Martha Van Rensselaer, professor of home economics, has returned to the college of agriculture after ten months' service at Washington, D. C., as head of the home conservation division of the U. S. Food Administration.

North Dakota College and Station.—R. C. Doneghue has resigned as agronomist to become county agent at Macomb, Ill. Dr. H. L. Walster, assistant professor of soils in the Wisconsin University and Station, has become agronomist to the station and chairman of the agronomy department of the college, beginning in April.

J. L. Tompkin has resigned the secretaryship of the State Stallion Board to become assistant animal husbandman in the station. A. F. Yeager, whose resignation from the Pennsylvania College has been previously noted, has been appointed horticulturist of the station, beginning March 15. L. T. Anderegg has been appointed assistant chemist.

Ohio State University.—Henry W. Schuer, instructor in farm crops, has resigned to engage in farming. H. D. Munroe, superintendent of egg-laying contests at the Connecticut College, has been appointed instructor in poultry husbandry in extension work beginning February 10.

Oklahoma College.—The legislature has just authorized the provision of two scholarships for each county of the State. This law is reported to have been enacted largely as an outgrowth of extension work in the State. The bill as originally drafted required that candidates must be members of boys' and girls' clubs in extension work, and while this provision was eliminated an examination is provided which calls for an equivalent training. Both boys and girls are eligible to compete for the scholarships.

Pennsylvania College.—The trustees have asked the legislature for appropriations for the ensuing biennium aggregating $3,300,842. Among the items are $1,250,000 for general maintenance, $1,625,000 for six new buildings, among them agriculture and domestic science, and $370,482 for agricultural extension work.

A. F. Mason, assistant professor of horticultural extension, resigned March 10 to become extension specialist at Rutgers College. L. W. Morley, assistant in dairy husbandry at the Missouri University and Station, has been appointed instructor in dairy husbandry extension beginning March 15, and E. A. Siegler, instructor in plant pathology, beginning March 1.

South Dakota College and Station.—The legislature has appropriated funds for the purchase of 240 acres of additional land for the institution. A portion of this land will be used for experiments in breeding and feeding live stock.

The live-stock pavilion is nearly completed. It is a fire-proof one-story structure with seating capacity for 500 students, the classrooms being so arranged as to be readily thrown together around the judging ring and form a large amphitheater.

Reginald Sherwood, sugar beet expert, has returned from military service.

Tennessee Station.—F. J. Gray of the Mississippi College has been appointed assistant chemist. W. A. Holding, assistant chemist, has resigned.

Utah Station.—The station has received a $20,000 appropriation from the legislature for studies on underground water development. Investigations previously conducted by the station and the U. S. Department of Agriculture have shown that vast areas of arid land in the southwestern part of the State contain sufficient underground water for irrigation, and the experimental work to be undertaken under this special appropriation will be to determine the best type of well and equipment for various sections of the State. One well is now being driven in Iron County and others will soon be started in different sections of the State.

Wyoming Station.—Dr. Cecil Elder has been appointed research assistant in pathology.

International Association of Poultry Instructors and Investigators.—A meeting of this organization was held in London, March 11 to 15, with delegates from Holland, Cyprus, the Transvaal, New Zealand, Canada, Scotland, Australia, France, Belgium, England, and the United States. Edward Brown, of England, was elected president, and W. A. Lippincott, of the Kansas College and Station, succeeded Dr. Raymond Pearl, formerly of the Maine Station, as secretary. Dr. Pearl was made the first fellow of the association, in recognition of his services as secretary since the organization of the association in 1912.

On invitation of the Netherlands Government a World's Poultry Congress is to be held at The Hague in 1921 under the auspices of the association.

Philippine College of Agriculture and Experiment Station.—Three additional agricultural schools have been authorized by the Philippine Legislature. The College of Agriculture had its appropriation largely increased and provision was made for the establishment of an experiment station in connection with it.

Considerable progress is already reported in the development of the station. A tract of about 200 hectares (nearly 500 acres) of good agricultural land adjoining the land of the College of Agriculture at Los Baños is being acquired. Permanent poultry houses have been built and material secured for a barn and other farm buildings. Two laboratory buildings are projected, one to house the department of entomology and plant pathology, and the other the department of chemistry. Considerable live stock and machinery have already been secured.

New Agricultural School in Lyon, France.—According to a vice-consular report, definite steps have been taken to establish a large agricultural school in the city of Lyon. It has been decided to purchase two large estates comprising some 293 acres for this purpose, at a cost of about $81,060. It is estimated that the expense of buying the property, putting it in shape, etc., will amount to about $125,450. Modern machinery is to be installed and special attention given to practical instruction.

Rothamsted Library.—The Carnegie Trust has donated $1,500 to the library of the Rothamsted Station for the purchase of reference books. A similar donation was made two years ago for the same purpose.

Capt. Rupert Guinness has given the library, which already possessed an unusual collection of early printed books on agriculture of the fifteenth and sixteenth centuries, a copy of the first and second printed books on the subject, namely, the volume on agriculture, by Crescentius, printed at Augsburg in 1471, and Jensen's edition of the Latin agricultural writers, printed at Venice in 1472.

Miscellaneous.—The Macdonald Institute of Agriculture and Plant Experiment Station, near Johannesburg, South Africa, was formally opened August 21, 1918, by Dr. William Macdonald. The present equipment consists of a residence and 40 acres of land, but it is proposed to erect an agricultural building and students' dormitory at an early date.

The American Association of Agricultural Engineers met in Chicago, Ill., December 30, 1918, to January 1, 1919. The officers elected include the following: President, Raymond Olney of St. Joseph, Mich.; vice-presidents, L. F. Seaton of the University of Nebraska and H. E. Murdock of the Montana College; and secretary-treasurer, F. W. Ives of Ohio State University.

The laboratory of forest pathology of the Bureau of Plant Industry of the U. S. Department of Agriculture, has been transferred from Missoula, Mont., to Spokane, Wash., where permanent quarters have been provided in a fireproof building. A permanent field station and a forest pathological museum are also to be established.

A Scientific Research Association has been formed in Great Britain, originating at Cambridge University. Among the objects in view are the formulation of an extensive plan for the endowment of research by the State, and the impressing upon the public the importance of scientific research and the value of the scientific method in the national life.

The Board of Agriculture and Fisheries of Great Britain has recently purchased a farm at Ormskirk, Lancashire, for experimental work with potatoes. Contributions from private individuals are being secured for equipment, the cost of which is estimated at from $25,000 to $50,000.

Science reports that a tract of five farms, aggregating over 1,000 acres of land and with a set of buildings on each farm, has been given by P. W. Sprague, of Boston, to the Maine Agricultural and Industrial League. It is expected to utilize the property as a demonstration farm.

A. J. Galbraith, professor of chemistry at Manitoba Agricultural College, died toward the end of 1918. At the time of his death he was engaged on a soil survey of Manitoba.

The residuary estate of the late Horace G. Fletcher, student of dietetics, who died January 13, 1919, has been left to Harvard University, the income to be used to "foster knowledge of healthful nutrition."

A Chamber of Horticulture for Great Britain was formally inaugurated at London, December 2, 1918.

E. H. Thompson has resigned as assistant chief of the Office of Farm Management of the U. S. Department of Agriculture, to engage in farming.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Chief, Office of Experiment Stations.*
Associate Editor: H. L. KNIGHT.

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Agricultural Education {A. DILLE. MARIE T. SPETHMANN.
Indexes—AMELIA B. DEANS.

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[1] On leave of absence for military service.

METEOROLOGY.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

U. S. Department of Agriculture—Con.

U. S. Department of Agriculture—Con.

[1] Printed in scientific and technical publications outside the Department.

EXERIMENT STATION RECORD.

Vol. 40. **Abstract Number.** **No. 6.**

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The physiochemical state of the proteins in cow's milk, L. S. Palmer and R. G. Scott (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 271–284*).—Experiments are reported in which fresh skim milk, skim milk preserved with 5 per cent chloroform, skim milk preserved with 0.05 per cent formaldehyde, and the lactic acid whey from fresh skim milk were filtered through Pasteur-Chamberland filtering tubes under pressure. The total protein passing through the filters was determined by precipitation with Almen's tannic acid reagent, and the nonprotein nitrogen in the filtrate from the precipitate thus formed.

The amount of noncasein protein recovered in the filtrate did not in any case exceed 10 per cent of the noncasein protein in the original milk, and in most cases was considerably less than this figure. There was also only a partial recovery of the nonprotein nitrogen of the original milk in the experiments with chloroformed and formaldehyde-treated milk. From these results, which are not in agreement with those obtained by Van Slyke and Bosworth (E. S. R., 32, p. 607), the authors conclude that the variation in the size of the pores of different Pasteur-Chamberland filters shows the fallacy of drawing conclusions regarding the true state of solution of noncasein proteins of milk based on filtration studies of this character.

Data are also presented which show that chloroform left in contact with milk greatly depresses the amount of protein which can be recovered from casein filtrates by this method, probably by a partial precipitation of heat-coagulable protein. This is thought to explain the fact that chloroformed milk apparently allows less heat-coagulable protein to pass through the Pasteur-Chamberland filter than sour milk or milk preserved by formaldehyde.

The state of proteins in cow's milk, L. L. Van Slyke and A. W. Bosworth (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 285, 286*).—In reply to the preceding paper, attention is called to the fact that the finer filters employed by Palmer and Scott would require passage through them of a greater volume of liquid for saturation, and that the first 100 cc. or so of the filtrate should consequently have been discarded before drawing samples for analysis.

It is also pointed out that the action of chloroform on milk is a progressive one, and that, therefore, the changes noted in the preceding work at the end of seven days are not comparable to those which might have taken place in filtrations lasting from 12 to 36 hours.

Globulin of the coconut (Cocos nucifera).—I, Preparation of coconut globulin. Distribution of the basic nitrogen in coconut globulin, C. O. JOHNS, A. J. FINKS, and C. E. F. GERSDORFF (*Jour. Biol. Chem.*, *37* (*1919*), *No. 1, pp. 149–153*).—A method of preparing coconut globulin from coconut press cake is described and the following analyses of the globulin reported:

Analysis of coconut globulin (Van Slyke method): Amid N 7.99 per cent, humin N adsorbed by lime 1.41, humin N in amyl alcohol extract 0.11, cystin N 0.96, arginin N 29.5, histidin N 3.68, lysin N 6.41, amino N of filtrate 45.44, and nonamino N of filtrate 4.6. Basic amino acids in coconut globulin: Cystin 1.44 per cent, arginin 15.92, histidin 2.42, and lysin 5.8.

The free amino nitrogen as determined with the Van Slyke microapparatus was found to equal nearly one-half the lysin nitrogen.

Determination of the distribution of nitrogen in certain seeds, J. F. BREWSTER and C. L. ALSBERG (*Jour. Biol. Chem.*, *37* (*1919*), *No. 3, pp. 367–371*).—This is the report of an investigation conducted at the Bureau of Chemistry of the U. S. Department of Agriculture of the applicability of the Van Slyke method of protein analysis to the direct analysis of seeds.

To determine the possible effect of plant nucleic acid on the results of such an analysis, yeast nucleic acid was hydrolyzed 25 hours with 20 per cent hydrochloric acid and subjected to the usual procedure. The analysis reported indicates the presence of 15 per cent of arginin nitrogen. As yeast nucleic acid does not contain arginin, its presence in the hydrolysate is thought to be due to decomposition of the guanin, adenin, and cytosin of the nucleic acid, and to indicate that in the determination of the distribution of the nitrogen in materials containing nucleic acid by the Van Slyke method erroneous results may be obtained because some of the purin and pyrimidin nitrogen appears in the arginin fraction.

A table is given of the nitrogen distribution in certain seeds and seed products as determined by the Van Slyke method, the results of which agree fairly well with those previously reported by Grindley, Slater, et al. (E. S. R., 34, p. 412).

Ash absorption by spinach from concentrated soil solutions, R. H. TRUE, O. F. BLACK, and J. W. KELLY (*Jour. Agr. Research* [*U. S.*], *16* (*1919*), *No. 1, pp. 15–25, figs. 2*).—In connection with a study of spinach blight conducted cooperatively by the Bureau of Plant Industry of the U. S. Department of Agriculture and the Virginia Truck Station spinach plants were grown on the grounds of the Truck Station at Norfolk in beds given heavy treatments of fertilizer salts, singly and in mixtures. The plants were divided into roots and tops and the ash constituents were determined, both as percentages of dry material and as percentages of the total ash. The results, which are presented in tables and graphs, are summarized as follows:

The best results were secured in plats receiving a complete mixture having a basic or neutral character in the soil (sodium nitrate, basic slag, and potassium sulphate); next best with acid phosphate and with sodium sulphate; poor in plats receiving heavy treatments of sodium chlorid, sodium nitrate, and acid complete mixture (1 to 2 tons per acre); poorest with potassium chlorid.

"A study of the ash showed the highest total ash in the tops in plats with sodium chlorid, calcium carbonate, acid phosphate, and manure; lowest with potassium chlorid and basic complete mixture. The highest ash was in roots accompanied with acid phosphate and manure, the lowest with potassium chlorid and sodium salts. General excellent condition of the crops does not parallel high ash absorption, the best and poorest plats having plants with low ash.

"Ash constituents fall into two groups: (1) Those present in quantities that show relatively little variation whatever be the chemicals added to the soil—lime, magnesia, phosphorus pentoxid, sulphur trioxid, manganous oxid, alumina, and ferric oxid; and (2) those which show great fluctuations in the quantity present—silica, potash, and soda. In the first group the plants seemed to be able to get the required quantity of constituents mentioned from the soil of all plats studied whatever was offered in excess, and reached an equilibrium that was little affected by the varying conditions. In the second group wide variations occur, sometimes with an increase of the ions offered in excess, as in sodium chlorid and sodium nitrate, sometimes by the absorption of something else, as increase in silica in plats receiving calcium carbonate and acid phosphate.

"Manganous oxid is the only constituent regularly present in greater proportion in the roots than in the tops.

"In some cases the high absorption of one constituent is accompanied by the low absorption of another, and vice versa. Such reciprocal pairs are silica and potash, soda and lime, and potash and magnesia. The silica-potash ratio is relatively steady. When silica equals 1, potash varies between 1.16 and 2.18 in the tops and between 1.83 and 2.32 in the roots, except when the substance added to the soil is high in calcium, when the value of potash becomes less than unity in both tops and roots.

"The soda-potash ratio is much more variable, being always more than 1 in both tops and roots. When mixtures of salts are added to the soil, potash rises to very high relative values.

"There is a suggestion that sodium may perform some functions also performed by potassium, indicating the possibility that sodium might in part replace potassium in fertilizers.

"The calcium-magnesium ratio in spinach, both in leaves and in roots, is exceptional in having a value greater than unity. The only exception is seen in the tops of plants receiving a heavy treatment with calcium carbonate. This fact seems to suggest the practical importance of magnesium salts as fertilizers for spinach."

Bacteriological studies on alfalfa silage, O. W. HUNTER (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 11*, *pp. 571–592*, *figs. 3*).—This is a report of bacteriological studies made in connection with the investigations at the Kansas Experiment Station on alfalfa silage (E. S. R., 37, p. 709). Three series of studies were made, the first two on samples of the silage obtained under aseptic conditions from the experimental silage of 1914 and 1915, previously described (E. S. R., 37, p. 671), and the third on green and cured alfalfa stored in sterile milk bottles with and without carbohydrates. Chemical analyses were also made of the bottled silage in order to determine the effect of carbohydrates on the quality of the silage.

The results obtained from the first two studies indicate that alfalfa when siloed alone undergoes a typical silage fermentation which is caused by microbial flora, and is practically identical with that obtained from silage made from the common forage crops. The final product is of very poor quality. When a fermentable carbohydrate is added to the alfalfa at the time of siloing, a good quality of silage is produced, although but little difference can be noted between the microbial flora of such silage and that of silage made from alfalfa alone.

Similar results were obtained in the third series of experiments. The chemical data indicate that silage produced from alfalfa with a carbohydrate supplement has a higher acid content than the alfalfa alone. More amino nitrogen and more ammonia were formed in the alfalfa silage than in the alfalfa and carbohydrate silage, indicating that the carbohydrate serves as a protein sparer. The theory is advanced that proteolytic action, which is responsible for the offensive odors characteristic of the alfalfa silage, results, in part at least, from the ability of the acid producers to utilize protein as a source of energy in the absence of available carbohydrates.

Studies on pepsin.—I, Chemical changes in the purification of pepsin, L. Davis and H. M. Merker (*Jour. Amer. Chem. Soc., 41 (1919), No. 2, pp. 221–228*).—The literature on the chemical composition of pepsin is reviewed, and an investigation is reported of the changes taking place in the purification of pepsin with the view of throwing light on its chemical composition. Chemical analyses were made of samples of pepsin of proteolytic strength of 1:2,000 up to 1:40,000, the results of which are summarized as follows:

"The purification of pepsin seems to consist in the elimination of secondary protein derivatives including α-amino acids. Calcium and sulphur appear to be unaltered as a result of purification, but phosphorus is materially reduced. Chlorids are seemingly entirely removed. Aqueous solutions of pepsin, after purification, show no material change in optical activity. A sample of high digestive power (1:40,000) shows a reaction very nearly neutral. Pepsin tends to approach nearer to the actual character of a protein (possibly a glycoprotein) with increasing proteolytic activity."

Influence of hydrogen-ion concentration upon enzymic activity of three typical amylases, H. C. Sherman, A. W. Thomas, and M. E. Baldwin (*Jour. Amer. Chem. Soc., 41 (1919), No. 2, pp. 231–235, fig. 1*).—In continuation of investigations on amylases and related enzyms (E. S. R., 39, p. 669), determinations are reported of the H-ion concentration which induces optimum activity of pancreatic and malt amylases and that of *Aspergillus oryzæ* (prepared from taka diastase), and of the limits of H-ion concentration within which any enzymatic activity is shown. The H-ion concentration was determined by the use of the Clark cell and rocking electrode.

Pancreatic amylase was found to be active between the limits of pH 4 to 10 with optimum activity at about 7, the solutions commonly considered neutral showing under similar conditions a pH value of 5.8. Malt amylase was active between pH 2.5 and 9, with optimum activity at 4.4 to 4.5. The amylase of *A. oryzæ* was active from pH 2.6 to 8, with optimum activity at about 4.8.

The activities of the three amylases throughout the range of H-ion concentration in which activity was found are summarized by means of curves. The influence of concentration of electrolyte, as distinguished from concentration of H-ion alone, appeared greatest in the case of pancreatic amylase and least in the case of the amylase of *A. oryzæ*.

The effect of neutral salts upon the activity of ptyalin, E. W. Rockwood (*Jour. Amer. Chem. Soc., 41 (1919), No. 2, pp. 228–230*).—In continuation of work previously noted (E. S. R., 37, p. 204) on auxo-amylases or activators of amylolytic enzyms, a study is reported of the effect of small amounts of ammonium and other neutral salts upon the activity of ptyalin.

Variations in ptyalin activity in the presence of these salts were found to be a function of the anion. The effect was greatest with chlorids, bromids, and nitrates; considerable with sulphates and thiocyanates; and slight with fluorids, acetates, and tartrates. The nature and valence of the cation appeared to have no effect. As a possible reason for the variations produced by the anion, a colloidal change in either the starch or the albumin of the saliva or in both is suggested.

The preparation of metol (N-methyl-p-amidophenol sulphate), R. N. Harger (*Jour. Amer. Chem. Soc., 41 (1919), No. 2, pp. 270–276*).

Course of reaction in explosions of dilute CS_2-air mixtures, G. R. STEWART and J. S. BURD (*Jour. Indus. and Engin. Chem., 11 (1919), No. 2, pp. 130–133*).—This is the report of a laboratory study of the combination products of carbon bisulphid, made at the California Experiment Station in connection with investigations on the control of ground squirrels by fumigation methods (E. S. R., 40, p. 350).

Combustion of carbon bisulphid in dilute mixtures with air was found to result always in the formation of carbon dioxid, carbon monoxid, sulphur dioxid, and some residual carbon bisulphid. The character of the resulting gas mixture, quantitatively considered, was found to depend more upon the initial carbon bisulphid concentration than upon variation in the reaction.

Color in relation to chemical constitution, E. R. WATSON (*New York and London: Longmans, Green & Co., 1918, pp. XII+197, pls. 15, figs. 52*).—In this volume, which is one of the monographs on industrial chemistry edited by E. Thorpe, an attempt has been made to give a brief and connected account of the main lines on which research and discussion have taken place with regard to the relation between color and chemical constitution and the principal theories which have been proposed as to the nature of the vibrations to which ordinary color is due. An extensive bibliography is appended.

Laboratory apparatus for rapid evaporation, E. C. MERRILL and C. O. EWING (*Jour. Indus. and Engin. Chem., 11 (1919), No. 3, pp. 230, fig. 1*).—The apparatus, devised by the authors at the Bureau of Chemistry of the U. S. Department of Agriculture, employs air from a blast which is first passed through a screw-capped brass cylinder, packed with cotton, which filters out any particle that might contaminate the residue during the operation, and then through a 2-m. coil of 0.6 cm. copper tubing which rests on the steam pipes in an ordinary steam bath. This is connected with individual blowers supported over the respective holes in the steam bath and provided with glass stopcocks, so that as many as are desired can be used simultaneously.

The apparatus is said to be specially useful for the rapid top evaporation of solutions which are apt to decrepitate. By insulating the beaker from the bath, a rapid evaporation at a low temperature can be made of solutions of materials which are apt to volatilize, polymerize, or decompose at higher temperatures.

An improved automatic burette, G. J. HOUGH (*Jour. Indus. and Engin. Chem., 11 (1919), No. 3, p. 229, fig. 1*).—The author at the Bureau of Soils of the U. S. Department of Agriculture has devised an automatic burette, the principal merits of which are said to be that it requires no bracket or support to hold it in the solution reservoir and that it can be cleaned quickly and used for some other solution. The base of the burette consists of a tube surrounded by a much larger tube, which fits into the rubber stopper of the solution reservoir. This outer jacket is connected with a T-shaped tube, to one outlet of which is attached a rubber pressure bulb. The other outlet is closed by the finger when pumping air into the reservoir. A hole in the outer jacket serves to equalize the pressure in the reservoir.

A diagram is given of the apparatus, with accompanying dimensions.

Colorimetric scale for the rapid estimation of free hydrochloric acid by means of a solution of brilliant green, M. DELORT and ROCHE (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 12, pp. 646–649; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 674, II, p. 450*).—The scale is prepared by mixing in varying proportions a nonfiltered 1 per cent hydro-alcoholic solution of methylene blue, a filtered 5 per cent aqueous solution of neutral potassium chromate, and a nonfiltered 0.1 per cent hydro-alcoholic solution of eosin. These are placed in sealed tubes and kept as a permanent scale of colors, which match those produced by mixing equal volumes of a 0.02 per cent solution of brilliant green with gastric juice containing six different concentrations of free hydrochloric acid (0.025 to 0.2 per cent).

Accurate determination of soil nitrates by phenol disulphonic acid method, H. A. Noyes (*Jour. Indus. and Engin. Chem., 11 (1919), No. 3, pp. 213–218*).—As a result of a study at the Indiana Experiment Station of errors in the colorimetric (phenol disulphonic acid) method for determining soil nitrates, the following modified procedure is recommended:

The soil solution is prepared by shaking thoroughly 50 gm. of the soil with 200 cc. of distilled water and filtering several times through a good grade of filter paper. Five cc. of the clear filtrate is pipetted into small evaporating dishes and evaporated to dryness on a steam bath. When cool, 1 cc. of the phenol disulphonic acid solution, prepared according to Chamot, Pratt, and Redfield (E. S. R., 26, p. 110), is added drop by drop to the dry residue, rotating the dish so that the acid comes in contact with all the residue. After standing 15 minutes 15 cc. of cold distilled water is slowly added, after which by means of a wash bottle having a fine jet, dilute (4 to 8 per cent) ammonium hydroxid is added until the yellow color is permanent. The solution and a standard, prepared from 5 cc. of a potassium nitrate solution containing 0.0001 gm. of nitrate per cubic centimeter and treated like the soils undergoing the tests, are washed into cylinders for a Schreiner colorimeter, made up to the 100 mm. mark, and compared in the colorimeter.

Experimental data are given indicating that the method as outlined is adapted to the accurate determination of soil nitrates in large as well as in small amounts.

The use of small aliquots of the water extract reduces the amounts of interfering salts, prevents heat reactions with the sulphuric acid, and thereby increases the accuracy of the determination. Chlorids were found to have no effect on the determination. Calcium hydroxid was found to be the best precipitant of colored water-soluble organic matter as well as of interfering inorganic substances, such as soluble iron compounds.

The solvent action of dilute citric and nitric acids on rock phosphate, J. A. Stenius (*Jour. Indus. and Engin. Chem., 11 (1919), No. 3, pp. 224–227*).—An investigation is reported from the Ohio Experiment Station of the possible value of dilute citric and nitric acid solutions as substitutes for neutral ammonium citrate solutions for determining the availability of phosphorus in rock phosphate.

Both acids were found to possess too high a solvent power to discriminate between the available and nonavailable phosphorus. An additional objection to the use of citric acid is that basicity has a decidedly depressing influence on the solvent power, which can not be entirely overcome by the addition of an extra amount of citric acid equivalent to the basicity. With nitric acid, however, it was found that the effect of basicity could be wholly overcome by adding exactly the amount of nitric acid corresponding to the bases present.

The author concludes that while neutral ammonium citrate can not serve as a means for measuring the absolute amount of available phosphorus, it probably gives a sufficiently reliable indication of the available phosphorus of rock phosphate and the changes in availability due to sulfofication and other processes. The necessity, however, is pointed out of making two determinations, one at the beginning and one at the end of the experiment, and of maintaining absolutely uniform conditions.

Contribution to the study of the Adamkiewicz reaction and of the transformation of glyoxylic acid into formaldehyde, E. VOISENET (*Bul. Soc. Chim. France, 4. ser., 23 (1918), No. 8, pp. 361–369; abs. in Analyst, 43 (1918), No. 512, p. 386*).—Experiments are described which indicate that the violet coloration in the Adamkiewicz reaction is due to formaldehyde rather than to glyoxylic acid. In place of glyoxylic acid, recommended by Hopkins and Cole (E. S. R., 13, p. 522), the author suggests the use of formaldehyde in a 1 per cent solution with sulphuric or hydrochloric acid, followed by the addition of a drop of 1 per cent nitrite solution.

The determination of lactose, E. HILDT (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 21, pp. 756–759*).—The author recommends the use of a catalyzer such as benzene sulphonic acid for hydrolysis of the lacto-serum in the procedure for determining lactose in lacto-serum by the reducing power after inversion. The time required for complete hydrolysis is said to be less than when mineral acids are employed as catalyzers, and the danger of destruction of the galactose and glucose formed on hydrolysis is avoided.

Determination of lactose in mixtures with sucrose and invert sugar, J. GROSSFIELD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 7–8, pp. 249–256*).—The author has derived formulas and constructed tables by means of which lactose and sucrose can be determined in the same sample from the values obtained on polarization and reduction after inversion. The method is said to be applicable to the analysis of sweetened and condensed milk and other milk products.

The determination of fructose in the presence of aldoses, A. HERZFELD and G. LENART (*Ztschr. Ver. Deut. Zuckerindus., No. 749, 11 (1918), pp. 227–234*).—This is an application to the determination of fructose in sugar beets and beet juices of the procedure described by Wilson and Atkins (E. S. R., 37, p. 10) for the estimation of mixtures of four or more carbohydrates by quantitative oxidation with bromin.

It was found that the lead acetate used for clarifying the solution to be tested apparently acted as a catalyzer, reducing the oxidation period to within 24 hours.

Determination of acidity and titrable nitrogen in wheat with the hydrogen electrode, C. O. SWANSON and E. L. TAGUE (*Jour. Agr. Research [U. S.], 16 (1919), No. 1, pp. 1–13, figs. 6*).—This paper presents the results of a study at the Kansas Experiment Station of the H-ion concentration of extracts of ground wheat at different temperatures and periods of time. Determinations were also made of the amino nitrogen by the Sörensen formaldehyde method and of the total and inorganic phosphorus.

Fifty gm. of finely ground Kansas hard wheat was weighed into a quart Mason jar and heated to the temperature used in the extraction. Five hundred cc. of carbon dioxid-free water, previously heated to the temperature employed, was then added with 5 cc. of toluene as a preventive of bacterial action. The whole was thoroughly shaken, placed in a thermostat, and the shaking repeated at frequent intervals during the time of extraction, at the end of which time the contents of the jar were centrifuged and filtered. The filtrate was used for determinations by means of the hydrogen electrode of the H-ion concentration or the pH value of the extract, the amount of N/20 $Ba(OH)_2$ used to titrate to the absolute neutral point of pH=7, to the point of color change for phenolphthalein or pH=8.3, to the point of color change for thymolphthalein or pH=9.3; the amount of alkali necessary to reneutralize after the addition of neutral formaldehyde; the total phosphorus in the extract; and the phosphorus precipitated by magnesia mixture. Extractions were made at temperatures of 5, 20, 40, and 50° C. and at the following time periods: 5, 30, and 60 minutes; 2, 4, 8, 16, and 24 hours.

The temperature at which the extraction was made and the duration of the digestion period did not influence appreciably the H-ion concentration, although the quantity of N/20 $Ba(OH)_2$ necessary to change the concentration to a definite point was within certain limits proportional to the duration of the digestion. This is thought to indicate that the H-ion concentration of the water extract of wheat is definite in amount and is not changed during the extraction in proportion to the time. The conditions for ionization are not present until an alkali is added. Ionization then takes place, and the amount of standard alkali necessary to lower the H-ion concentration to a given point bears a proportionate relation to the temperature and duration of the digestion period.

The amount of amino nitrogen was found to reach the maximum at 20° in about 8 hours and at 40° in 2 hours. At 20° the amount of phosphorus in the extract precipitated by magnesia mixture averaged about half of the total, while at 40° practically all of the total phosphorus was converted into forms that are precipitated by the magnesia mixture.

Total phosphoric acid and lecithin phosphoric acid content of various kinds of peas, P. Halász (*Biochem. Ztschr., 87 (1918), No. 1-2, pp. 104-106*).—Analyses are reported of the total and lecithin phosphoric acid content of several varietes of peas. It is pointed out that the green chlorophyll-containing peas are rich in lecithin and poor in starch, while the yellow varieties contain less lecithin and more starch. The total phosphoric acid is also higher in the green than in the yellow peas.

Carbon dioxid determination in baking powders, H. Schellbach and F. Bodinus (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 6, pp. 236-240*).—A method for the determination of carbon dioxid in chemicals, baking powders, etc., is described. This consists essentially in the volumetric determination of the carbon dioxid set free by a 5 per cent phosphoric acid solution and collected in 33 per cent potassium hydroxid solution.

Carbon dioxid determination and valuation in baking powders, J. Tillmans and O. Heublein (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 7-8, pp. 257-266, figs. 2*).—This is a criticism and discussion of the article noted above. The method described by Schellbach and Bodinus is considered inaccurate.

A further contribution to the microscopic investigation of coffee substitutes, C. Griebel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 6, pp. 233-235, figs. 3*).—The microscopic characteristics are described of the seeds of serradella (*Ornithopus sativus*), which has been used in Germany as a coffee substitute.

Contribution to the microscopic investigation of coffee substitutes, C. Griebel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 7-8, pp. 272-277, figs. 3*).—The substitutes discussed in this article are the seeds of the corn spurrey (*Spergula arvensis*) and the false acacia (*Robinia pseudo-acacia*). The former contain starch, while the latter are free from starch but contain protein and fat.

Witgatboom: A substitute for chicory, J. McRae and A. Kloot (*Analyst, 43 (1918), No. 512, pp. 373, 374*).—A description is given of two varieties of witgatboom (white-hole tree), and chemical analyses are reported of the dried and roasted roots, which are used in South Africa as a substitute for chicory. The roasted product is said to grind more easily than chicory and to possess a sweetish taste without any bitter aftertaste.

Methods for the quantitative determination of the nonprotein nitrogenous constituents of milk, W. Denis and A. S. Minot (*Jour. Biol. Chem.*, *37* (*1919*), *No. 3*, *pp. 353–366*).—The methods described include determinations of total nonprotein nitrogen, urea, creatinin and creatin, amino nitrogen, and uric acid.

In the procedure for the total nonprotein nitrogen, the proteins and fat are first removed by heating the sample with copper sulphate in a solution made 0.005 normal with sulphuric acid. After filtering, a small amount of ammonia-free formaldehyde is added to the filtrate to prevent the formation of insoluble amino copper compounds, and the lactose is then precipitated with cupric hydroxid prepared with calcium hydroxid instead of sodium hydroxid, on account of the readiness with which an excess can be removed by precipitation with oxalic acid and potassium oxalate. Slight modifications found necessary with human milk consisted of the omission of the sulphuric acid from the copper sulphate solution and the addition of a small amount of a 10 per cent solution of disodium phosphate. In both cases the nonprotein nitrogen was determined by methods similar to that described by Folin and Denis (E. S. R., 36, p. 316) for the total nitrogen in urine.

For the determination of creatinin and creatin, the colorimetric picric acid method of Folin was found to be satisfactory after a preliminary precipitation of the lactose by calcium sulphate and calcium hydroxid. The amino nitrogen was determined by the Van Slyke nitrous acid method, employing the micro apparatus. Copper acetate and acetic acid were found to be the most satisfactory protein precipitants with the subsequent addition of potassium oxalate to remove excess of calcium salts. With human milk, copper acetate and disodium phosphate were employed. Uric acid was determined by precipitation with alkaline zinc acetate, nickel acetate, as suggested by Curtman and Lehrman (E. S. R., 40, p. 16), having been found to possess no advantage over zinc acetate.

The technique of all the determinations is described in detail, and a table is given of the results obtained from three samples of cow's milk and three of human milk. The average results are as follows:

Nonprotein nitrogenous constituents of milk.

Kind of milk.	Quantity per 100 cc. milk.					
	Total non-protein N.	Urea N.	Amino N.	Pre-formed creatinin.	Creatin.	Uric acid.
	Mg.	*Mg.*	*Mg.*	*Mg.*	*Mg.*	*Mg.*
Cow	23.0	9.3	4.24	1.42	2.37	1.5
Human	33.0	12.6	7.21	1.50	3.50	2.5

The microanalysis of malted milk, C. W. Ballard (*Jour. Amer. Pharm. Assoc.*, *7* (*1918*), *No. 4*, *pp. 326–333*, *figs. 8*).—The author describes the microscopical characters of skimmed milk, whole milk, and malt powders and of dried malt extract, and the characteristic elements in the standard processed malted milk in which enzymic action has taken place, in the so-called mixed malted milk prepared by mechanically mixing certain quantities of powdered milk with malt or malt preparations, and in the substitute or spurious malted milks.

It is stated that a microanalytical determination of a malted milk can be completed by an experienced worker in less than one hour, and that from such an analysis can be determined what kind of milk and malt has been used and whether the sample is a standard processed article or an imitation mixture.

A tabulation of 24 microanalyses of milk is reported, of which 16 were found to be mixed and 8 processed.

Reduction of the quantity of humin nitrogen formed in the hydrolysis of the nitrogenous constituents of feeding stuffs, H. C. ECKSTEIN and H. S. GRINDLEY (*Jour. Biol. Chem., 37 (1919), No. 3, pp. 373–376*).—Certain modifications of the previously noted (E. S. R., 36, p. 205) application of the Van Slyke method of protein analysis to the determination of the nitrogenous constituents of feeding stuffs are described which are said to obviate the interference of some of the nonprotein nitrogenous constituents and to lower considerably the amount of humin nitrogen. The details of the method are as follows:

"Weighed quantities of the feeding stuff are extracted with ether in Soxhlet extractors and then with cold absolute alcohol on Buchner funnels. The residues thus extracted are digested for 15 hours three or four times with 0.1 per cent solution of hydrochloric acid until all the starch has been converted into sugars. The residues insoluble in 0.1 per cent hydrochloric acid are boiled with 20 per cent hydrochloric acid until the proteins which they contain are completely hydrolyzed.

"The filtrates from the residues insoluble in 0.1 per cent hydrochloric acid are neutralized with sodium hydroxid, then faintly acidified with acetic acid, allowed to stand overnight, and then filtered. The filtrates from the precipitated proteins are concentrated in vacuo to small volumes and precipitated by the addition of five volumes of absolute alcohol. After standing overnight the precipitated proteins are removed by filtration and washed with 83 per cent alcohol.

"The filtrates from the proteins precipitated by alcohol are concentrated to small volume and enough concentrated hydrochloric acid is added to make a 5 per cent solution. The solutions are then boiled until hydrolysis is complete. The proteins separated above by neutralization and by the addition of alcohol are boiled with 20 per cent hydrochloric acid until hydrolysis is complete."

Each of the three hydrolyzed solutions thus obtained is filtered and the insoluble humin substances repeatedly digested with 0.1 per cent hydrochloric acid and then thoroughly washed with hot water. The nitrogen in these residues is considered to represent the insoluble humin substances.

The following results for humin nitrogen expressed in percentage of total nitrogen in the feeding stuff were obtained: Corn 3.2, wheat 3.4, oats 4.5, and barley 3.9.

[Treatment of massecuites], G. SCHECKER (*Ztschr. Ver. Deut. Zuckerindus., No. 758 (1918), II, pp. 359–372*).—The author has computed a table in which, knowing the Brix reading and coefficient of purity, the temperature can be determined at which the mother sirup of the massecuite of the proper ratio nonsugar: water for complete crystallization produces saturated molasses. At a lower temperature, the molasses is supersaturated, and it is necessary to add water before centrifuging. At a higher temperature, a completely crystallizable exhausted molasses can no longer be maintained. This temperature has been named the critical temperature of the massecuite.

The derivation of the table and its application are described in detail.

Juice clarification and decolorization with a new carbon, S. S. PECK and A. ADAMS (*Sugar [New York], 21 (1919), No. 3, pp. 132, 142, 143*).—A new decolorizing carbon is described which is said to have given excellent results on a laboratory and small factory scale.

The carbon, which has been patented in most sugar countries, is made by treating a mixture of molasses and kieselguhr with sulphuric acid, baking in suitable containers until the reaction is complete, and then washing the resulting carbon free from acid. The best results have been obtained by using it as a filtering layer instead of mixing the liquor to be decolorized with the carbon and then removing the carbon by filtration. It is said that along with the partial removal of color there is an almost complete removal of the flavors peculiar to raw cane juice, and of most of the scale-forming material. The filtered juice is said to evaporate very rapidly.

The preparation and restoration of carbon filters for the purification of sugar, DAUDE (*Ztschr. Ver. Deut. Zuckerindus., No. 750, II (1918), pp. 251–273, figs. 12*).—This is a review of German patent literature on carbon filters for sugar purification.

The utilization of seeds of pears and apples for the extraction of oil, A. TRUELLE (*Vie Agr. et Rurale, 9 (1919), No. 6, pp. 101–105, figs. 2*).—The author reviews the literature on the subject, and concludes that while the content in oil of apple and pear seeds is comparatively high, the extraction would not be practical under normal conditions.

METEOROLOGY.

Periods of plant growth and rest (*U. S. Dept. Agr., Nat. Weather and Crop Bul., No. 33 (1918), pp. 2, 3, 7, fig. 1*).—A chart, showing the general rest periods of most plants in different sections of the United States, as determined by the average time in months between the first month in fall and the last in spring, inclusive, with a mean temperature below 49° F., is given and briefly discussed.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 5 (1918), Nos. 9, pp. 202, pls. 5, figs. 2; 10, pp. 202, pls. 5, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1918, respectively.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and A. L. CHANDLER (*Massachusetts Sta. Met. Buls. 361–362 (1919), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1919, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological records for 1917 (*New York State Sta. Rpt. 1917, pp. 711–722*).—Tables are given showing tridaily readings at Geneva, N. Y., of standard air thermometers for each month of the year; daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings for the year; monthly and yearly maximum and minimum temperatures from 1883 to 1917, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

The exceptional drought of the summer of 1918 in the Gironde region, M. F. COURTY (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 30, pp. 846, 847*).—It is shown that the drought of the summer of 1918 was the most severe and disastrous that has occurred during the period of 70 years, 1849–1918.

[Meteorological review for the region of Paris], C. FLAMMARION (*Ann. Astron. et Mét. [Paris], 55 (1919), pp. 203–205, 305–338, figs. 13*).—Tables are given which show the normal daily temperature of each month based upon the records of the Paris observatory for the 50 years 1841–1891, and monthly and annual temperature and precipitation 1873–1918. The climatology of 1917 in the region of Paris, including a summary of observations on pressure; temperature of the air, soil, and subterranean waters; precipitation; humidity; and sunshine, is reviewed. A comparison is made of the character of the seasons in different years from 1891 to 1917, inclusive. A similar comparison is made of the winters of 45 years, 1873–1918. A special article on a remarkable hailstorm, which occurred July 29, 1917, in the region of Provins, is included. It is shown that the winter of 1880 was extremely cold, those of 1891 and 1895 were very cold, and those of 1888 and 1917 were also below the normal in temperature. The winter of 1877 was extremely warm and those of 1883, 1884, 1897, 1899, 1910, 1912, 1913, 1915, and 1916 were very warm. The summers of 1891, 1903, 1907, 1909, 1910, 1912, 1913, and 1916 were cold, while those of 1893, 1901, 1904, and especially 1899, 1900, and 1911 were very hot. The summer of 1911 was the hottest recorded. The summer of 1917 was cool.

SOILS—FERTILIZERS.

Soluble salt content of soils and some factors affecting it, M. M. McCool and C. E. Millar (*Michigan Sta. Tech. Bul. 43 (1918), pp. 47, figs. 4*).—Investigations embracing several classes of soils are described in which a study was made of salt movements, rainfall, and the soluble salt content of soils, the effect of crops on salt movement, the effect of plant growth on the soluble salt content of soils, the influence of different conditions of moisture and temperature on the rate of formation of soluble salts in cropped and virgin soils, and the soluble salt content of field soils at different seasons of the year. Considerable tabulated data are presented and fully discussed. The conclusions reached may be summarized as follows:

The translocation of salts is said to be due mainly to water movements. In the presence of large quantities of salt a movement to areas of lower concentration was observed even when water movements were prevented, higher soil moisture contents aiding this movement. Since the soluble salt content of field soils was found to be relatively low, it is deemed probable that plants are supplied with food elements by diffusion from local areas around the roots only.

The accumulation of soluble salts on the surface of uncropped areas is held to indicate that when water movements occur in the soil the salts are carried along with it. That these movements do not occur at any great depth was indicated by observations which revealed but little movement of water from the subsoil to the feeding zone of the roots. It appeared to be unlikely that any considerable quantity of soluble material was supplied to plants from depths below those of root penetration. It was found that the quantity of soluble salts in greenhouse soils might become too great for proper plant development, and that plant growth might be inhibited in muck soils by an accumulation of soluble substances in the upper layers.

Data obtained in these investigations are also said to show that plants may materially reduce the soluble salt content of the soil. Laboratory studies indicated that the constituents of cropped soils went into solution at a somewhat slower rate than those of corresponding virgin soils. The rate of solution of the soils studied was found to be governed to some extent by temperature, being more rapid at 25° C. than at temperatures approaching 0° C. The moisture content of the soil appeared to have a marked effect on the rate of solubility. It is believed, too, that biological activities play an important part in these phenomena. Under laboratory conditions the concentration of the soil solutions at all moisture contents was usually lower after 30 days than after 10 days, thought to be due possibly to the reabsorption of the soluble material by the soil, to the utilization of the salts by organisms, and to the formation of less soluble compounds.

The concentration of the soil solution in the soil was variable, differing somewhat in several soils with the seasons, rainfall, at different depths, and with plant growth. It is thought probable that "variations in the concentration of the soil solution in some instances at least, have not been sufficiently considered in biological studies where conclusions have been drawn based upon the results obtained from studies of the water extracts of soils. Moreover, it does not seem possible to determine the fertilizer needs of soils by obtaining water extracts and growing plants therein. The seasonable variation in the soluble salt content of soils doubtless plays an important rôle in the results obtained from the use of fertilizers."

Effect of carbon disulphid and toluol upon nitrogen-fixing and nitrifying organisms, P. L. Gainey (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 11, pp. 601–614*).—Continuing previous investigations at the Kansas Experiment Station (E. S. R., 30, p. 717), and using similar methods, the author studied more specifically the effect of carbon disulphid and toluol on the nitrogen-fixing and nitrifying organisms of soils under varying conditions of moisture.

The conclusions reached were that "carbon disulphid and toluol when applied to soils in sufficient quantities will destroy Azotobacter group of organisms and check the accumulation of nitrate nitrogen, and possibly will destroy the nitrifying organisms. The quantities necessary to produce such effects vary quite widely, depending among other things upon the quantity of moisture present. Apparently if the quantity of carbon disulphid or toluol is sufficient to have any effect upon Azotobacter they are usually completely destroyed. On the other hand, there is a great difference in the quantity necessary to destroy nitrifying organisms and that necessary to check their activity. There are nitrogen-fixing organisms other than Azotobacter present in soils which are not destroyed with 10 cc. of carbon disulphid or toluol [to 50 gm. of soil] even when the moisture content of the soil is high. Following treatment with carbon disulphid and toluol there is no appreciable accumulation of ammonia unless nitrification has been checked. There is no evidence in these experiments to show that treatment with antiseptics stimulates the nitrifying organisms, and there is little evidence to indicate a stimulative effect upon the ammonifying or nitrogen-fixing organisms."

Influence of higher plants on bacterial activities in soils, T. L. Lyon (*Jour. Amer. Soc. Agron.*, *10* (*1918*), *No. 9, pp. 313–322*).—In this paper, presented as the presidential address before the 1918 meeting of the American Society of Agronomy (E. S. R., 40, p. 299), the author briefly reviews experimental work dealing with the immediate effect of growing plants on certain bacterial processes in the soil. Particular reference is made to the nitrogen transformations. The necessity is pointed out for improved methods in studying the chemical and biological changes occurring in the soil for a proper solution of the problem.

Bacteria of frozen soils in Quebec, I, II, J. Vanderleck (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 11* (*1917*), *Sect. IV, pp. 15–37, pls. 4, figs. 3; 12* (*1918*), *Sect. IV–V, pp. 1–21, figs. 6*).—Investigations begun during the winter of 1914–15 are described in which observations were made upon the number of bacteria occurring in a cultivated soil, under a sod, in soils from various localities, in soil from a plat covered with snow and in which a gradual horizontal penetration of frost had taken place, and in soil from an exposed hilltop. The weather conditions during the winter of 1914–15 and 1915–16 are said to have been rather unfavorable for these observations, while the winter of 1916–17 was much more favorable. Based largely on the results obtained during the latter season the following conclusions have been reached:

The number of bacteria increased rapidly during January in all soils, both frozen and unfrozen, where raw material was available for bacterial decomposition, this increase failing to materialize where raw material was absent. A moderate increase in numbers amounting to from two to four times the original number occurred in frozen soils during March. Severe frosts checked any bacterial development in frozen soil. A high soil moisture content counteracted the frost action, while a low moisture content aided in the depression of bacterial development. A sudden, severe frost killed most of the bacteria in the exposed soil. A decrease in the numbers of bacteria was observed when the soil thawed, while an increase in soil moisture was usually followed by an increase in the number of bacteria.

The work was continued along the same general lines during the winter of 1917–18 and observations made every two weeks of the bacterial content of the different soils. Results confirming those noted above were obtained. A superficial examination is said to indicate that ammonification and denitrification are produced by extra-cellular and nitrification by intra-cellular enzym action, which is held to mean that the first mentioned processes could continue in frozen soils even when further bacterial development was halted, while the latter would be impossible.

Champaign County soils, C. G. Hopkins, J. G. Mosier, E. Van Alstine, and F. W. Garrett (*Illinois Sta. Soil Rpt. 18 (1918), pp. 61, pls. 3, figs. 15*).—Champaign County, situated in the east-central part of the State, comprises an area of 988 square miles. The topography of the region varies from flat to slightly rolling, while a few small areas occurring along the streams are too steep for cultivation. The entire county was covered first by the Illinois, then by the Wisconsin glaciation, the drift and loessial strata ranging in depth from 95 to 300 ft., with an average depth of 200 ft. over the entire area. The county is divided into six drainage areas including the Sangamon Basin, the Kaskaskia Basin, the Embarrass Basin, the Little Vermilion Basin, the Salt Fork Basin, and the Middle Fork Basin.

The soils of the county embrace upland prairie, upland timber, terrace, and swamp and bottom-land soils covering, respectively, 92.2, 4.89, 2.39, and 0.52 per cent of the total area. The fertility content and needs and methods of management of the various soils are discussed.

The value of manure on Indiana soils, A. T. Wiancko and S. C. Jones (*Indiana Sta. Bul. 222 (1918), pp. 20, figs. 6*).—Field tests in progress at the station since 1890 and on six outlying experiment fields for shorter periods of time are described, in which manure has been used in varying amounts and on different crops grown continuously and in rotation.

On the basis of the results obtained, it is concluded that farm manures are now worth twice as much as before the war. Crop increases valued from $2 to $8, or more, per ton of manure applied were secured according to the fertility of the soil and the crops grown, while the average return on the different experiment fields reported amounted to $5 per ton. Light applications made every 3 or 4 years are deemed much more profitable than heavy applications at longer intervals. Reinforcing manure with phosphates is also recommended. The sources of waste and loss in manure through improper methods of handling on the farm are indicated, and measures for conserving manure discussed.

The book of the Rothamsted experiments, A. D. Hall, revised by E. J. Russell (*London: John Murray, 1917, 2. ed., rev., pp. XL+332, pls. 8, figs. 37*).—This is the second edition of the work previously noted (E. S. R., 17, p.

542). It includes a continuation of the tables for a further decade and the necessary alterations in the text. The deductions drawn in the first edition have remained essentially the same. Two new chapters have been added, one by A. D. Hall, on the secondary effects of manures on the soil, comprising an account of investigations made by the author at Rothamsted, and the other by E. J. Russell, on the biochemical processes in the soil, containing a summary of investigations made during the past 10 years.

Woburn pot-culture experiments, 1917, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 78 (1917), pp. 232–243, pls. 6; Woburn Expt. Sta. Rpt., 1917, pp. 14–25, pls. 6*).—This describes the continuation of work previously noted (E. S. R., 39, p. 116).

Additions of 0.1 and 0.2 per cent barium as sulphate, carbonate, hydrate, and nitrate, and of 0.05, 0.1, and 0.2 per cent as chlorid were made to a light, sandy loam soil sown to wheat. Even in the higher amounts the sulphate, carbonate, and hydrate are said to have produced no bad effects, but appeared to be slightly stimulating. Barium nitrate proved injurious at the 0.1 per cent rate of application and at the 0.2 per cent rate destroyed the crop altogether. The chlorid appeared to be harmless if used at a rate not exceeding 0.05 per cent barium, but was decidedly toxic in greater amounts.

Further observations on the relative influence of caustic lime and carbonate of lime on an acid soil are said to confirm previous conclusions that calcium oxid was superior to calcium carbonate, and that an application of 3 tons of calcium oxid per acre or the equivalent of 4 tons of calcium oxid as the carbonate will give the best results.

Although failing to show any effect the first year applications of 10 cwt. (0.5 ton) feldspar per acre, both with and without salt and lime, resulted in increased yields of clover the second year after application, amounting to from 28.6 per cent of the untreated check for feldspar alone to 36.5 per cent for feldspar and lime (5 cwt.). An application of potassium sulphate containing an amount of potash equivalent to that found in the feldspar was followed by an increase of 37.4 per cent. Somewhat similar experiments with mustard and barley failed to show any beneficial effect from the use of feldspar the first year.

Continuing observations on the relative value of ordinary nitrolim, granular nitrolim having 70 per cent of its nitrogen as dicyandiamid, and dicyandiamid alone, applications were made to barley and mustard both at the time of seeding and as a top-dressing. In every case ordinary nitrolim appeared to be superior to the granular form, while dicyandiamid was decidedly injurious to barley and still more so to mustard.

Niter-cake applied to barley at rates varying from 5 cwt. to 2 tons per acre is said to have produced no injurious effects. Superphosphate prepared from niter-cake gave practically the same results with both barley and peas as an equivalent amount of ordinary superphosphate.

Cooperative fertilizer experiments with cotton, corn, sweet potatoes, and Irish potatoes, 1908–1917, G. S. Fraps (*Texas Sta. Bul. 235 (1918), pp. 125*).—Supplementing work previously noted (E. S. R., 35, p. 531), this bulletin contains a report of the experiments up to 1918. when the work was temporarily discontinued. In all 151 experiments with cotton, 153 with corn, 54 with Irish potatoes, 23 with sweet potatoes, and 8 miscellaneous tests are briefly discussed, and tabulated data presented showing the yields of the different crops for the various fertilizer treatments. Analyses are also given of a number of surface soils and subsoils on which the tests were made. The conclusions reached may be summarized as follows:

Acid phosphate produced a gain in 75 per cent of the cotton experiments, cottonseed meal in 68 per cent, and potash in 58 per cent. Where gains occurred applications of from 150 to 200 lbs. of acid phosphate produced average gains of from 50 to 185 lbs. of seed cotton per acre; applications of from 30 to 100 lbs. of cottonseed meal, gains of from 20 to 105 lbs.; and applications of from 5 to 25 lbs. of muriate of potash, gains of from 20 to 140 lbs.

Acid phosphate is deemed to be the most certain and the most profitable fertilizer for both cotton and corn, while a mixture of equal parts acid phosphate and cottonseed meal (containing about 8 per cent available phosphoric acid and 3.5 per cent nitrogen) applied at the rate of from 150 to 200 lbs. per acre appeared to be the best mixed fertilizer for these crops. If 300 lbs. or more are to be used on cotton, it is suggested that the fertilizer contain about 5 per cent phosphoric acid and 4 per cent nitrogen. The use of potash in mixed fertilizers is regarded as inadvisable except where the soil is known to be deficient in potash. In such cases a mixture containing 8 per cent phosphoric acid and 3 per cent each nitrogen and potash is recommended for application to cotton or corn at the rate of from 150 to 200 lbs. If larger applications are to be made, it is recommended that the percentage of phosphoric acid be reduced and that of nitrogen and potash increased. Barnyard manure produced average gains of from 107 to 227 lbs. of seed cotton per acre, and is also said to have given good results with corn, the effects of the manure continuing over several years.

In 16 experiments with cotton the phosphoric acid of rock phosphate was found to have about 22 per cent of the effect of that in acid phosphate. The use of hydrated lime on cotton resulted in an average decrease of about 6 per cent in 20 tests. Where an equivalent amount of sodium nitrate replaced one-half the cottonseed meal, the yields of cotton were slightly lower than for sodium nitrate alone.

The use of cottonseed meal was followed by gains in 87 per cent of the Irish potato tests, of acid phosphate in 72 per cent, and of potash in 52 per cent. Where gains occurred, 400 lbs. of cottonseed meal produced gains of from 18 to 28 bu. per acre; 300 lbs. of acid phosphate from 10 to 24 bu., and 20 lbs. of sulphate or muriate of potash from 6 to 10 bu. A mixture of 100 lbs. of acid phosphate with 200 lbs. of cottonseed meal is said to be the best average fertilizer for both Irish and sweet potatoes. The use of potash is deemed advisable only when the soil is known to be deficient in that ingredient, and then in combination with acid phosphate and cottonseed meal. Manure applied to Irish potatoes at the rate of 20 loads per acre showed average gains of from 3.9 to 4.5 bu. per acre the first 2 years and from 31 to 38 bu. the last 4 years. Replacing one-half the cottonseed meal by an equivalent amount of sodium nitrate gave practically the same results as where cottonseed meal was used alone.

In the sweet potato tests 65 per cent showed gains with acid phosphate and cottonseed meal and 56 per cent with potash. Where gains occurred, 300 lbs. of acid phosphate showed gains of from 19 to 71 bu. per acre, 400 lbs. of cottonseed meal from 8 to 47 bu., and 40 lbs. of muriate of potash from 15 to 60 bu.

Production and consumption of potash [in the United States], D. F. Houston (*U. S. Senate, 65. Cong., 3. Sess., Doc. 396 (1919), pp. 3*).—It is stated that the information in the possession of the U. S. Department of Agriculture "indicates a production in the United States during 1918 of about 53,600 tons of actual potash (K_2O). Of this amount, approximately 28,000 tons were produced from the brine lakes of western Nebraska, 11,000 from Searles Lake, Cal., and 2,600 from alunite. . . . A conservative estimate would probably show about 5,000 tons of K_2O from kelp and 7,000 tons from all other sources, including cement mills, blast furnaces, sugar mill wastes, and wood ashes." Data furnished by producers indicate that about 60,000 tons of potash salts containing approximately 15,000 tons of actual potash was in storage January 1, 1919.

The estimated possible production of plants now in operation or ready for operation in the United States is 100,000 tons of actual potash. The estimated potential production from cement mills is 100,000 tons of actual potash. "By alterations now being made in one of the plants at Searles Lake, it is estimated that the production from this source will be increased to something like 60,000 tons K_2O a year. The installations in western Nebraska, operating on the brine lakes of that region, are capable of largely increased production, while a complete utilization of the kelp beds on the Pacific coast and the installation of apparatus for recovering potash from the gases of blast furnaces would undoubtedly furnish a very heavy tonnage of potash."

Domestic production of potash in 1918, W. B. HICKS (*U. S. Geol. Survey Press Bul. 399 (1919), p. 1*).—The indicated production in the United States in 1918 is 192,587 short tons of materials containing 52,135 short tons of actual potash (almost double that of 1917), of which 39,255 tons were obtained from natural brines, 2,619 from alunite, 1,429 from dust from cement mills, 4,292 from kelp, 3,322 from molasses distillery waste, 761 from Steffens waste water, 365 from wood ashes, and 92 tons from other sources. The products as prepared for market contained 12,614 tons of potash as muriate, 894 as low-grade chlorid, 3,188 as sulphate, 31,311 as crude sulphate and carbonate, 365 as crude carbonate and caustic potash, 2,896 as potash char, ash, and ground kelp, and 867 tons as cement and blast furnace dust, alum, and raw and calcined alunite.

Producers' reports indicate 60,426 tons of crude potash in storage on January 1, 1919.

The estimated capacity of American potash plants is given as 100,000 tons of actual potash, distributed as follows: Natural brines from Nebraska lakes 50,000 tons, from other sources 28,000; alunite 4,000, dust from cement mills 3,500, kelp 5,500, molasses distillery waste 4,000, Steffens waste water 3,000, wood ashes 1,000, and potash from other sources 1,000 tons.

Some general information on lime and its uses and functions in soils, M. M. MCCOOL and C. E. MILLAR (*Michigan Sta. Spec. Bul. 91 (1918), pp. 21, figs. 12*).—This is a rather popular account of the functions and uses of lime in Michigan, including information regarding sources of lime in the State.

Inspection of commercial fertilizers, H. D. HASKINS, L. S. WALKER, and H. B. PIERCE (*Massachusetts Sta. Control Ser. Bul. 9 (1918), pp. 73*).—This reports the actual and guarantied analysis of 596 official samples of fertilizers and fertilizer materials, including wood ashes and lime compounds and representing 372 brands collected during 1918. The chemical character and cost of crude stock materials are indicated, and the quality of the nitrogen, phosphoric acid, and potash contained in mixed goods discussed.

The text of the amended fertilizer law is included.

Analyses of commercial fertilizers, P. H. WESSELS (*Rhode Island Sta. Insp. Bul., 1918, Oct., pp. 14*).—This reports the actual and guarantied analyses of all the brands of commercial fertilizers, limes, and wood ashes found on sale in Rhode Island during 1918. Of the samples examined 74 per cent equaled or exceeded the guaranty, while 16 per cent fell below the guaranty by less than 0.3, and 10 per cent by 0.3 or more.

AGRICULTURAL BOTANY.

Cytokinesis of the pollen mother cells of certain dicotyledons, C. H. FARR (*Mem. N. Y. Bot. Gard., 6 (1916), pp. 253–317, pls. 3, fig. 1*).—The author reviews the literature of the subject, dealing with cell division in plants and animals and discussing theories and terminology regarding cell division, particularly quadripartition in cryptogams and higher plants.

The greater part of the work here reported was done upon the pollen mother cells of *Nicotiana tabacum*. In addition to this, comparative observations were made on a number of other plants. These observations are discussed at some length as regards the various changes or relations noted and their probable significance.

The existence of a form of division by furrowing in certain cells of higher plants suggests the possibility of ultimately harmonizing the usual division by cell plates in these forms with the division by so-called constriction in the higher animals. Both lower plants and lower animals show types of cell division more or less intermediate between these two extremes. Observed facts emphasize the contention that botanists have no right to consider the protoplast alone as the cell, the growing and dividing cell of the higher plants rather constituting a unit comprising both protoplast and cell wall.

The relations of the spindle fibers to cell-plate formation and to the nuclei favor the idea that the cell plate is primarily of nuclear origin.

Cell division by furrowing in Magnolia, C. H. Farr (*Amer. Jour. Bot.*, *5* (*1918*), *No. 7*, *pp. 379–395*, *pls. 3*).—Following up the work noted above, the author reports a study based upon cultivated varieties of Magnolia grown at Cinchona Station, Jamaica, making use of the methods employed in the former investigation.

While in Nicotiana neither a cell plate nor a furrow can be observed to form between the first and second nuclear divisions, in Magnolia the formation of both these structures is initiated, though neither is completed before the homœotypic karyokinesis. The changes observed are described in detail with discussion and suggestions. Evidence pointed out is thought to indicate that the nuclear membranes are important factors in the process of furrowing.

Some factors affecting inulase formation in Aspergillus niger, V. H. Young (*Plant World*, *21* (*1918*), *Nos. 4*, *pp. 75–87*; *5*, *pp. 114–133*).—The author's study of the effect of age and carbohydrate nutrition on the enzym content of a fungus has been confined almost entirely to inulase as produced in *A. niger*. This organism produces inulase in appreciable quantities under all conditions here employed, the quantitative rate of increase culminating at the period of sporulation and rapidly declining thereafter to zero. Though this enzym is formed when other carbohydrates are used as the sole source of carbon, it is produced most abundantly in the presence of inulin, soluble starch being next to inulin in this respect, and glucose being least efficient.

Substances closely related as to chemical structure appear to be more efficient in stimulating enzym formation than are those not closely related. The increase or decrease in the production of inulase caused by changing the amount of inulin in the culture medium is by no means proportional to such variation. Inulase production did not appear to be affected by glucose in the presence of inulin, nor did it appear to be in any way a starvation phenomenon.

The biology of Oidium lactis, G. Linossier (*Compt. Rend. Soc. Biol.* [*Paris*], *80* (*1917*), *No. 9*, *pp. 429–435*).—Two groups of studies are briefly noted. The author has drawn the conclusion that (excepting for the increase of some mineral substances which appear to act as catalyzers, exerting when present in very small proportion their maximum effect in the presence of different nutrients which can be completely utilized) the growth of *O. lactis* is proportional to the amount of nutrient supplied thereto up to a certain point. Beyond this, the rate of increase of utilization diminishes in comparison with the amount of nutrient supplied until a maximum point of utilization is reached. Beyond such a maximum point, injurious effects were observed which were particularly noticeable in case of nitrogenous materials, this fact recalling the effects of excess nitrogenous alimentation in case of animals.

The response of Pilobolus to light, R. PARR (*Ann. Bot.* [*London*], *32* (*1918*), *No. 126, pp. 177–205, figs. 4*).—The author gives an account of a series of studies attempting to supply in work with Pilobolus the alleged lack of accurate determination of the quantity and quality of the light employed in such work, so as to ascertain the relation between light and heliotropic response.

Pilobolus responds to light from all portions of the visible spectrum, the presentation time gradually decreasing from red to violet and varying inversely as the square root of wave frequency but not directly as the value of the energy from different portions of the spectrum. The product of the square root of wave frequency by the presentation time decreases as does energy value within the spectrum, and it is approximately constant for a given source of light. The relation of special energy to the presentation time may be expressed approximately by the Weber-Fechner or the Tröndle formula if wave frequency be made a function of the constant.

The structure of the integumentary system of the barley grain in relation to localized water absorption and semipermeability, E. J. COLLINS (*Ann. Bot.* [*London*], *32* (*1918*), *No. 127, pp. 381–414, figs. 14*).—It is claimed that the general surface of the barley grain admits only a small part of the water absorbed by the seed. Special areas readily admitting water occur in the germinal portion of the grain, and here is thought to be located the structure concerned in the selective permeability expressed in comparatively free admission of water along with practical exclusion of mineral acids and most salts. Such solutes as acetic acid and iodin, recorded as passing freely into the grain, really pass through the restricted area near the germinal portion. Nitric acid enters as the result of selective action, neither destroying the enveloping membrane nor impairing the efficiency of the selective structure. Perfect impermeability to any solute was not observed. The initial concentrating effect of barley upon dilute sulphuric acid gradually decreases until the acid is below its initial concentration. Arrest of penetration of silver nitrate and of sodium chlorid occurs at the outer cuticularized wall of the tegmen. This membrane behaves as does ordinary cuticle in regard to penetration by water and solutes.

The initial uptake of water supplies the need of the embryo, the grain coverings insuring sufficient conduction of water to where it can be readily absorbed by the embryo. The subsequent distribution of liquid in the endosperm is precisely the path of enzym disintegration in the endosperm during the germination of the embryo. It is suggested that the uptake and distribution of water in germination prepares for and perhaps accomplishes the distribution of enzyms which are active in the solution of reserves.

The laticiferous system of Hevea brasiliensis and its protective function, A. SHARPLES (*Ann. Bot.* [*London*], *32* (*1918*), *No. 126, pp. 247–251*).—In order to settle the question of whether scraping the bark of Hevea with the view of stimulating increased flow of latex renders the trees more susceptible to insect and fungus attack, the author experimented with 30 well-grown trees five years old.

The results are said to show that the removal of the outer corky layers increases susceptibility to insect and fungus attack, particularly if the green cork cambium is removed or broken. This may be connected with the continued soaking of the tissues and the slowing up of the normal activities during a period of wet weather and the consequent lowering of resistance. It is stated that scraping away the scaly bark on old trees to insure a clean yield of latex can be done without injury if care is employed. The question as to whether latex is a secondary and waste, or primary and necessary, product is regarded as not yet settled.

Effect of bog and swamp waters on swelling in plants and in biocolloids, D. T. MacDougal (*Plant World, 21* (*1918*), *No. 4, pp. 88–99, fig. 1*).—This work was undertaken primarily to determine the principal factors in plant growth, but extended to a general consideration of swelling in protoplasm as affected by its own composition and by various solutions. It was based upon the assumption (and its experimental justification) that the materials which make up the protoplasm of a plant, if combined in the form of an elastic gel, would show for the resulting mass water relations similar to those of the plant. A mixture of 80 to 90 parts of agar and 20 to 10 parts of albumin, gelatin, or albuminous derivatives, impregnated with the nutrient salts in proportions decreasing to the vanishing point, stimulates the swelling action of the protoplasm of stems and roots of the various plants tested. Various factors may influence the amount and nature of the swelling, which may therefore offer suggestions as to the character of the solutions in which it occurs.

The general method of preparing the biocolloids has been described in previous papers (E. S. R., 37, p. 821; 38, p. 729). Bog and swamp waters of typical constitution were employed in tests with disks of *Opuntia discata*, which was also tested in nutrient and in simple solutions. It is stated that living matter swells in solutions in the same manner as do biocolloids consisting of salted mixtures of varying proportions of agar and protein or albuminous derivatives. The swelling of biocolloids and that of living and dried sections of plants in distilled water, bog water, and a calcium solution of the same concentration as the bog water, are said to be practically equal. Swamp water was found to affect absorption and swelling as does an equivalent solution of calcium sulphate. Swelling and absorption are retarded by swamp water in salted biocolloids and in sections of plants having a large proportion of pentosans and a low protein content. Biocolloids having a high protein and salt content, on the other hand, show an enhanced absorption in swamp water. The inference is that plants of similar constitution would carry on absorption readily and thrive in swamp waters.

A new three-salt nutrient solution for plant culture, B. E. Livingston and W. E. Tottingham (*Amer. Jour. Bot., 5* (*1918*), *No. 7, pp. 337–346*).—The authors have taken up the problem which has been made the subject of a preliminary and a fuller report by Shive (E. S. R., 34, p. 333; 36, p. 328), employing a second of the six logically possible combinations of salts containing the essential ions Ca, K, Mg, NO_3, SO_4, and PO_4, in the form of potassium nitrate, magnesium sulphate, and monocalcium phosphate. This preliminary investigation involved, however, only 12 sets of salt proportions as opposed to the 36 sets employed by Shive, the total concentration being also in this work about 1.75 atmospheres. Wheat of the same variety and technique of the same sort as employed by Shive were used in this work, the culture period extending from May 15 to June 2.

The data obtained, as presented and discussed, are considered as showing the optimum solutions here employed to be as good as, or better than, the solution found by Shive to be optimal, though both are said to give some evidences of magnesium poisoning in case of wheat plants. It is thought that some evidences of poisoning may be expected whenever maximum dry-weight values are obtained with young wheat plants, if the transpiration rate is not too low.

The progress of knowledge of the relations between nutrient solutions and plant growth is thought to suggest strongly that, after all, the physiological properties of a solution are not determined simply by atomic, ionic, or molecular proportions.

Organic plant poisons.—II, Phenols, W. E. Brenchley (*Ann. Bot.* [*London*], *32* (*1918*), *No. 126, pp. 259–278, figs. 18*).—The author has carried forward the work previously noted (E. S. R., 39, p. 224), testing in the present series the comparative direct action of phenols on plants.

Considerable similarity was noted in the effects of various phenols upon barley and pea plants in water cultures. Phenol at M/100 was quickly fatal to roots, although peas in orcinol or resorcinol continued growth for a few days, apparently at the expense of the stored material in the seeds. Marked differences were noted in the action of different phenols at $M/100\times\frac{1}{2}$ and $M/100\times\frac{1}{16}$, but at lower concentrations no injurious effects were observed for any of the poisons employed. The occurrence of root recovery sometimes followed by comparatively good growth in strong solutions suggests a temporary suspension of the plant's activities, or else a lowering (by oxidation) of the concentration of the solution. None of the few apparent indications of stimulation by the poisons employed was confirmed by determinations of the dry weights.

In case of plants killed by high concentrations of the phenols, molds soon appeared, usually on dead roots and on the solutions. Phenol in strong concentration prevented mold formation nearly to the end of the experiments, cresols preventing mold formations altogether. No molds grew in the absence of root injury.

Studies on the embryo sac and fertilization in Œnothera, M. Ishikawa (*Ann. Bot.* [*London*], *32* (*1918*), *No. 126*, *pp. 279–317*, *pls. 3*, *figs. 12*).—The author, reporting a study of gametophytic behavior and fertilization phenomena in *Œ. nutans* and *Œ. pycnocarpa* and in their hybrids, states that the embryo sac arises either from the micropylar or from the chalazal member of the tetrad, both sometimes simultaneously developing into complete embryo sacs. The embryo sac is tetranucleate, this being regarded as a diagnostic character (produced possibly by mutation) of the Onagraceæ. Self-sterility in some hybrids is regarded as due to deficient growth of the pollen tube.

Abortiveness as related to position in the legume, B. D. Halsted (*Proc. Soc. Prom. Agr. Sci.*, *38* (*1917*), *pp. 68–72*).—From studies designed to locate definitely in the seed pod the best seed for crop production, the author reports details in regard to five legumes. He states that aborts are associated primarily with basal position in all the subjects studied except the Canada field pea, in which the failures were most numerous in the seeds from the tip and next in those from the basal portion.

Studies in the classification and nomenclature of the bacteria.—VII, The subgroups and genera of the Chlamydobacteriales, R. E. Buchanan (*Jour. Bact.*, *3* (*1918*), *No. 3*, *pp. 301–306*).—The present contribution (E. S. R., 39. p. 828) deals with the new order Chlamydobacteriales and the family Chlamydobacteriaceæ thereunder, including five genera.

A promising chemical photometer for plant physiological research, C. S. Ridgway (*Plant World*, *21* (*1918*), *No. 9*, *pp. 234–240*).—This has already been noted from another source (E. S. R., 39, p. 524).

FIELD CROPS.

Forage crops, T. A. Kiesselbach (*Nebraska Sta. Bul. 169* (*1918*), *pp. 36*, *figs. 8*).—Forage crops adapted to Nebraska conditions are briefly described and the cultural practices deemed best for their production outlined. The crops dealt with include grasses and legumes for permanent pastures and meadows, annual pasture and hay crops, soiling crops, silage crops, and root crops for stock feed.

A brief preliminary report is presented on a series of tests with forage crops begun in 1914, including data on the comparative yields of perennial, biennial, and annual forage crops, a comparison of three methods of planting annual forage crops, rate of seeding tests with Black Amber sorghum and Sudan grass for forage, variety tests with millet for forage, and observations on the effect of the number of cuttings on the yield of alfalfa hay. With the biennial and perennial grasses and legumes the yields ranged from 2.5 tons per acre for sweet clover to 5.6 tons for common alfalfa, while with the annual crops the yields varied from 2.8 tons for Broom Corn millet to 5.8 tons for Black Amber sorghum, all yields being reduced to a moisture content of 12 per cent. Black Amber sorghum, Sudan grass, Kafir corn, and dent corn all produced maximum yields when drilled in at the highest seeding rate. Common millet with an average of 4 tons per acre outyielded all other sorts. Alfalfa cut 2, 3, and 5 times produced average yields of 3.47, 5.57, and 3.7 tons of hay per acre, respectively, for the three years 1915–17, inclusive. It is stated that there was a marked weakening of the plants and thinning of the stand where the crop was cut too frequently.

[Report of field crops work in Antigua, 1916–17], F. WATTS (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Antigua, 1916–17, pp. 5–11, 13–15, 39–47*).—This reports a continuation of work previously noted (E. S. R., 38, p. 335). Variety tests with sweet potatoes, cassava, eddoes, tannias, and yams; trials of corn and cotton selections; and field plat tests of rutabagas and mangel wurzels are briefly described. Similar work is reported for the experiment station at Barbuda.

[Culture experiments on moor soils], C. J. CHRISTENSEN (*Tidsskr. Planteavl, 25 (1918), No. 2, pp. 341–356*).—The experiments here reported were conducted under State auspices at Herning, Denmark, from 1912 to 1917. The layer of peat on the soil used had an average thickness of less than 1 ft. As based on the analyses of a series of samples the dry matter in the upper 2 ft. of soil contained from 1.5 to 2.4 per cent calcium oxid, 2.19 to 2.91 per cent nitrogen, and 0.143 to 0.202 per cent phosphoric acid, while the upper foot showed a potash content of 0.027 per cent in the dry matter. The soil was well mixed with sand, fairly well drained to about one meter in depth, and practically neutral in reaction. The general rotation followed included, in the order given, oats and vetch or 6-rowed barley, rye, root crops, spring rye, carrots, oats, clover, and grass two years. The annual fertilizer application per hectare given grain and grass consisted of 40 kg. (35.6 lbs. per acre) of phosphoric acid in Thomas slag or superphosphate, 80 kg. of potash in 37 per cent potash salt, and 30 kg. of nitrogen in nitrate of soda. The root crops received annually in the same substances from 60 to 80 kg. of phosphoric acid, 160 kg. of potash, and in the greater number of seasons, also 30 kg. of nitrogen.

Sowing rye about September 1 gave much better results than sowing at a later date. Rye sown October 15 to November 1 failed, as a rule, to survive the winter. Frost during blossoming time greatly reduced the yield in 1913 and 1916, while in 1915 it prevented absolutely the formation of grain, although the yield of straw remained about normal. Winter rye gave a normal yield only one year out of four. Spring rye sown about April 3 proved to be a much safer crop, being, on account of its later blooming period, less subject to late spring frost and producing even in 1915 about one-third of a normal yield of grain. The variety of spring rye grown was Petkus.

Among six varieties of oats, Gray ranked first in average yield for five years with 3,001 kg. of grain and 5,003 kg. of straw per hectare (83.7 bu. and 2.23 tons per acre, respectively). Golden Rain oats, ranking next, produced 2,644 kg. of grain per hectare, but as the hull content of the two varieties was 34.9 per cent and 26.9 per cent, respectively, the yields of grain without the hulls were about the same.

Two varieties of barley, Hannchen, a 2-rowed, and Abed July, a 6-rowed sort, were grown in comparison with oats. The grain yields of these varieties, when the high hull content of Gray oats is considered, were in all instances greater than the grain yields of oats varieties.

The largest 5-year average yield of roots, 23.96 tons per acre, was secured from kohl-rabi as compared with fodder beets, turnips, carrots, and potatoes. The varieties grown were Olsgaard Bangholm and Pajbjerg 3.

[Report of field crops work in Assam], A. A. MEGGITT and J. W. MCKAY (*Ann. Rpt. Agr. Expts. Assam, 1917, pp. 6–24, 27–38, 71–80, 83–91; Rpt. Agr. Dept. Assam, 1918, pp. 6, 7*).—In a continuation of work previously noted (E. S. R., 38, pp. 230, 336), the results of variety and selection trials with sugar cane, rice, and potatoes are reported, together with observations on cultural and soil fertility experiments with rice and sugar cane and field tests with miscellaneous crops as conducted at several experimental centers in the Assam Valley for the years ended June 30, 1917 and 1918, respectively.

[Report of field crops work in Bihar and Orissa, India, 1917] (*Rpt. Agr. Activ. Govt. Bihar and Orissa, 1917, pp. 21–28, 46–52, 56–60, 62–72, 76–80*).—This reports the results of variety, fertilizer, and cultural tests with rice, wheat, barley, corn, sugar cane, and miscellaneous forage crops at several experimental farms in the region.

[Report of field crops work in Burma], T. COUPER (*Rpt. Dept. Agr. Burma, 1917, pp. 2–4*).—This briefly describes the progress of work, along the same general lines as previously noted (E. S. R., 38, p. 336), for the year ended June 30, 1917.

[Report of field crops work in the Central Provinces and Berar, India, 1916 and 1917], J. H. RITCHIE, D. CLOUSTON, G. EVANS, and R. G. ALLAN (*Dept. Agr. [India], Cent. Prov. and Berar, Rpt. Agr. Stas., West. Circle, 1916, pp. 6–22; 1917, pp. 1–17; South. Circle, 1916, pp. 3–20, 25–33, 39–49; 1917, pp. 2–12, 17–34, 37–49, 57–61; North. Circle, 1916, pp. 3–12, 17–38; 1917, pp. 3–25, 35–42; Rpt. Expt. Farm, Agr. Col., Nagpur, 1916, pp. 2–12; 1917, pp. 2–12*).—These reports note the results obtained in variety, cultural, and fertilizer tests with sugar cane, rice, wheat, cotton, gram, and miscellaneous field crops conducted on numerous experimental farms in Central India. Considerable tabulated data are presented in connection with experimental work, together with statistics on crop yields, crop values, cost of production, etc.

[Report of field crops work at the Alibag Agricultural Station, Kolaba District, India, 1915–16], V. G. GOKHALE (*Dept. Agr. Bombay, Ann. Rpt. Expt. Work Alibag Agr. Sta. 1915–16, pp. 3–22, 24–29*).—This reports the results of fertilizer, cultural, and seed selection tests with rice and rotation and field tests with miscellaneous crops.

Administration report of the Government economic botanist for 1916–17, F. R. PARNELL (*Rpt. Dept. Agr. Madras, 1916–17, pp. 59, 60*).—Notes are given on the breeding of rice, a survey of available rice varieties, and work in the breeding of cotton resistant to drought.

Agricultural research [with field crops] in Australia (*Advisory Council Sci. and Indus., Aust., Bul. 7 (1918), pp. 10–95, 108–161, pl. 1, figs. 3*).—The following papers were read and discussed before a conference of scientific workers in agriculture held at Melbourne in November, 1917: Wheat Breeding in its Incidence to Production, by H. Pye; Oat and Barley Breeding, by J. T. Pridham; Maize Breeding, by H. Wenholz; The Application of Statistical Methods to the Selection of Wheat for Prolificacy, by W. H. Green; Production of Cereals for Arid Districts, by A. E. V. Richardson; Immunity and Inheritance in Plants, by D. McAlpine; The Acclimatization of Plants, by G. L. Sutton; The Tobacco Industry in Australia, by T. A. J. Smith; Native Grasses and Fodder Plants of Australia, by E. Breakwell; The Possibility of Cultivating Fiber Plants in Australia, by T. Hogg; The Australian Sugar Industry, by H. T. Easterby; and Crops for the Production of Power-alcohol, by W. R. Grimwade.

[Report of field crops work in New South Wales], H. Ross, J. T. Pridham, and E. Breakwell (*Rpt. Dept. Agr. N. S. Wales, 1917, pp. 23–27, 33–36*).—In a continuation of work previously noted (E. S. R., 38, p. 735), this reports the results of variety and fertilizer tests with wheat, corn, and potatoes; plant breeding work with wheat, oats, barley, and rye; and field tests with miscellaneous forage plants at various experimental centers for the year ended June 30, 1917.

[Report of field crops work in South Australia], W. J. Spafford (*Rpt. Min. Agr. So. Aust., 1917, pp. 26–37*).—This notes the progress of variety, cultural, and fertilizer tests with miscellaneous cereal and forage crops, in continuation of similar work previously noted (E. S. R., 38, p. 433).

[Field crops work in the Union of South Africa], W. H. Scherffius, H. S. Du Toit, and M. Van Niekerk (*Union So. Africa Dept. Agr. Rpts., 1915–16, pp. 63–67, 121–129, 137–140; 1916–17, pp. 71–75, 131–141, 149–153*).—Field crops work for the years ended March 31, 1916 and 1917, for the divisions of tobacco, cotton, and dry-land farming is outlined, and considerable tabulated data are presented on acreage and crop yields. The annual reports of the chief grain inspector are also given.

The exploitation of plants (*London and Toronto: J. M. Dent & Sons, Ltd., 1917, pp. VII+170*).—This work, edited by F. W. Oliver, comprises a series of public lectures delivered at University College, London, in an effort to bring before botanists and other interested persons information relating to the prevailing methods of plant exploitation and to the field awaiting development in this respect. In addition to an introduction by the editor, the subjects dealt with include the following: Plant Food and Soil Problems, by W. B. Bottomley; Waste Lands, by F. W. Oliver; Timber Production in Britain, by E. J. Salisbury; Tropical Exploitation, with Special Reference to Rubber, by J. C. Willis; The Cotton Plant, Its Dependent Industries, and Natural Science, by W. L. Balls; Vegetable Dyes, by S. M. Baker; Tea Making, by S. E. Chandler; The Plant as Healer, by E. N. Thomas; and Pants as a Source of National Power—Coal, by M. C. Stopes.

Observations on some hybridization and plant selection experiments, H. M. Gmelin (*Cultura, 30 (1918), No. 353, pp. 1–19, pls. 4*).—The author reports the progress of plant breeding work, noting the observations made during 1916 on the spontaneous crossing of wheat and spelt (E. S. R., 38, p. 636) and of beans, and on plant selection work with rye.

Mendelian inheritance in wheat and barley crosses, with probable error studies on class frequencies, A. Kezer and B. Boyack (*Colorado Sta. Bul. 249 (1918), pp. 5–139, pls. 9, figs. 10*).—The authors describe work begun in 1911 in which crosses were made between different varieties of wheat, wheat and emmer, and between varieties of barley in a study of Mendelian inheritance of characters. The behavior of the F_1 progeny and the segregations in the F_2 generation are described, and observations made upon certain progenies continued into the F_3 generation recorded. Considerable data are presented which have been subjected to a theoretical analysis showing the probable error of Mendelian class frequencies and the conformity of the material thereto.

Stating that if the characters of an organism are the developmental results of certain factors inherited according to the Mendelian law, their occurrence in numerous samples should be such as to conform to the binomial frequency distribution, the authors attempt to apply such a test to their results. For convenience the probable error of the binomial distribution has been calculated and tables of its value for certain classes and for populations up to 500 have been prepared. "It is recognized that if pure chance controls the recombinations of factors in the combining gametes, then, in a large number of cases, the differences between observed and theoretical results should be divided about equally between values less than and greater than the probable error of the binomial frequency distribution of those differences."

Altogether the test has been applied to the occurrences in 1,865 different cases, of which 896 were found to be within the probable error limits and 969 without. The results obtained with the different crops and with the different Mendelian ratios are regarded as quite satisfactory, and although they are not deemed conclusive it is thought that "they do show that for practical purposes, the Mendelian law of inheritance is an exceedingly useful tool in practical plant breeding." The final settlement of the main problem is believed to await the discovery by biochemists of the real mechanism of inheritance and development.

The text is supplemented by several colored plates and photographs showing the parental stock and hybrid progeny.

On a case of permanent variation in the glume lengths of extracted parental types and the inheritance of purple color in the cross Triticum polonicum×T. eloboni, A. St. C. Caporn (*Jour. Genetics, 7 (1918), No. 4, pp. 259–280, pls. 2, figs. 4*).—This paper discusses investigations initiated by Biffen in 1913 and carried forward by the author, beginning with the analysis of the F_2 figures. The parent strains are fully described and an accurate method for measuring and tabulating glume lengths explained. In the F_3 generation a marked change in the average glume length of homozygous "longs," as compared with the average of the parent, *T. polonicum*, was observed which, under equal conditions, is said to persist through into the F_6 generation.

A study has also been made of the purple pericarp color, including observations on the manner and extent of its distribution in the tissues, its development and detection in minute quantities, and its inheritance with regard to the latter point. A distinguishing feature is that segregations analogous to the F_2 segregation have not been observed in the F_3 generation. Streaking, a character which appeared suddenly in the F_3 generation, is said to bear some resemblance to particoloring in maize, and is discussed. Cultures have been stabilized with respect to color and glume length.

Grain production and the bread situation in Switzerland, J. Wirz (*Die Getreideproduktion und Brotversorgung der Schweiz. Zurich: Art. Inst. Orell Füssli, 1917, 2. ed., enl., pp. 163, pls. 43*).—This is a revised edition of a work dealing in a detailed manner with the grain production and the bread situation of Switzerland from the Middle Ages to the present time, also with measures deemed essential to the maintenance and increase of domestic grain production and with the regulation of the bread supplies through associations and societies.

British grasses and their employment in agriculture, S. F. Armstrong (*Cambridge [Eng.]: Univ. Press, 1917, pp. VIII+199, figs. 177; rev. in Sci. Prog. [London], 12 (1918), No. 48, p. 697, 698; Physiol. Abs., 3 (1918), No. 2, p. 155*).—This volume, designed primarily for the use of agricultural students, deals with the identification and utilization of the species of grasses found in the British Isles, with special reference to those species which are most abundant or of greatest economic importance.

The work embraces two parts, a botanical section and an agricultural section. The first section includes chapters on the morphology and biology of grasses and the distribution of British grasses; artificial keys based respectively on foliage characteristics, inflorescences and floral characters, and upon "seeds"; and a botanical description of species. The agricultural section gives chapters on the agricultural value and characteristics of 21 species of grasses sown on the farm, the valuation and purchase of grass seeds, the specification and compounding of grass-seed mixtures, and the general treatment of grassland and the effects of various fertilizers upon the different species. A list of 31 species of local, rare, or introduced foreign grasses not otherwise described and a bibliography of 35 titles are appended.

Alfalfa, L. F. Graber (*Madison, Wis.: Author, 1918, pp. 76, figs. 60*).—A handbook on alfalfa growing designed primarily for the farmer and student. It is based largely upon information obtained by the author from over 3,000 reports of successes and failures with alfalfa from members of the Alfalfa Order of the Wisconsin Agricultural Experiment Association, and upon the results obtained from more than 600 experimental plats of various strains and varieties of alfalfa grown under widely varying conditions and methods at the Wisconsin Experiment Station.

[Castor beans in Rhodesia], J. A. T. Walters (*Rhodesia Munitions and Resources Com. Rpt. 1918, pp. 70–73*).—The castor bean is regarded as indigenous to Southern Rhodesia, and isolated specimens growing without cultivation have given high yields and have proved to be resistant to insect attack. When grown under cultivation, however, the yield of seed has been considerably lowered and susceptibility to insect attack materially increased.

[Red clover experiments in Holland, 1915 to 1917], H. M. Gmelin (*Cultura, 30 (1918), No. 354, pp. 61–79*).—This is a detailed report of experiments made with selected strains of red clover on several experiment farms. Tabulated data are presented showing the yields of the different sorts, giving their green and dry weights.

Maize culture, H. Wenholz, G. P. Darnell-Smith, and W. B. Gurney (*Dept. Agr. N. S. Wales, Farmers' Bul. 116 (1918), pp. 42, figs. 23*).—A detailed description of the field practices and cultural methods employed in growing the crop in New South Wales, together with notes on the diseases and insect enemies of corn found in the region.

Selection of disease-free seed corn, G. N. Hoffer and J. R. Holbert (*Indiana Sta. Bul. 224 (1918), pp. 16, figs. 21*).—As a result of work done in cooperation with the Office of Cereal Investigaions of the U. S. Department of Agriculture, it is stated that the same organism which causes scab in wheat also appears to produce rot of the stalks, ears, and ear-shanks of corn. The use of infected seed was found to result in missing hills, slow-growing stalks, barren stalks, downstalks, nubbins, and early blighting of plants in the field. The use of the ear-to-row method for studying the quality and value of seed ears is recommended, and the selection of seed ears from disease-free stalks is explained. Careful observation of germinating seedlings is said to reveal the presence of infected seed ears, and a type of germinator deemed best for this method of testing is described and illustrated.

Cotton, O. C. Stine, O. E. Baker et al. (*U. S. Dept. Agr., Atlas Amer. Agr., pt. 5, Sect. A, 1918, pp. 28, figs. 104*).—This number of the atlas comprises a discussion of the principal commercial types of cotton; the geography, economics, methods, and history of cotton production; and marketing and distribution, supplemented by numerous maps and charts. A selected list of publications relating to the various phases of the subject is included.

The quest of the long staple cotton, W. I. Bullard (*Cambridge, Mass.: Univ. Press, 1917, pp. 31, pl. 1*).—This presents a brief historical and descriptive account of long staple types of cotton, including Egyptian, Sea Island, and

Arizona-Egyptian, together with notes on the production of long staple cotton in California, Brazil, and Peru.

Brief in behalf of the Louisiana Farmers' Association, G. E. GILMER (*Shreveport, La.: La. Farmers' Assoc., 1918, pp. 13*).—The total cost of production of cotton in Louisiana in 1918 for a 40-acre unit, including land rent, mule rent, feed, man labor, fertilizer, seed, etc., is estimated at $2,067 and the net cost of production at 32 cts. per pound.

A study of hybrids in Egyptian cotton, T. H. KEARNEY and W. G. WELLS (*Amer. Nat., 52 (1918), No. 622-623, pp. 491-506, figs. 3*).—Investigations begun in 1914 at Sacaton, Ariz., dealing with the conditions under which mutants occur in Egyptian cotton, are described. Simple and back-crossed hybrids have been made between Pima and Gila (E. S. R., 31, p. 525), and three generations of the hybrid progenies, and of progenies from selfed seed of the parent stocks, have been grown.

No evidence of the appearance of new characters has been observed in any of the progenies, but since mutants in Egyptian cotton are comparatively rare, it is deemed desirable to examine much larger populations before drawing definite conclusions. It is stated that the principal interest attaching to the data thus far obtained has to do with the behavior of hybrids between varieties belonging to the same general type as compared with that of hybrids between different species of Gossypium, which have hitherto been the chief subject of genetic studies with cotton.

"The varieties used in this investigation are distinguished chiefly by size and shape characters, although a few of the characters in which they differ significantly have been found to behave as allelomorphs in hybrids between less nearly related forms of Gossypium. The Pima×Gila hybrids, however, showed no evidence of segregation in definite ratios in respect to any of the characters measured. There was little or no evidence of dominance in the F_1, and the F_2 distributions were practically without exception unimodal. The means of the simple hybrid were in most cases intermediate between those of the parents. The result of twice back-crossing the simple hybrid upon either parent was to obliterate the expression of the characters of the other parent.

"It could not be demonstrated that genetic correlation or coherence of characters occurs in these hybrids. Apparently all characters which are not correlated physically or physiologically are transmitted independently. The second and third generations of the hybrids, as compared with the parents after two and three generations of selfing, were not more variable than Gila, and were only a little more variable than Pima. This fact is of practical importance in cotton breeding, since it points to the possibility of obtaining relatively stable and uniform recombinations of the desirable characters of varieties belonging to the same general type, although breeders have found this to be well nigh impossible in wider crosses such as those of Egyptian (or Sea Island) with upland cotton."

Notes on fiber produced from some of the most useful indigenous and exotic plants in the Cape Province, J. LEIGHTON (*So. African Jour. Sci., 14 (1918), No. 10, pp. 443, 444*).—The author presents brief notes on the relative values of the fibers produced by the more important indigenous and exotic plants in the region.

Investigations on hops (Humulus lupulus).—XI, Can different clones be characterized by the number of marginal teeth in the leaves? J. SCHMIDT (*Compt. Rend. Lab. Carlsberg, 14 (1918), No. 2, pp. 23, figs. 8*).—This is a further contribution to the author's investigations with hops (E. S. R., 39, p. 234), and comprises a study of differences observed in the number of marginal teeth found on the middle lobe of the leaf to determine whether variations were due to genotypic differences or were merely of a phænotypic nature. The material studied included plants derived from the same clone and observed through three successive years, plants from the same clone grown the same years but under different environmental conditions, plants from different clones, and plants obtained through hybridization. Statistical methods were applied to an interpretation of the results, and the data presented in tabular form and fully discussed. The conclusion is reached that although the number of teeth in the margin of the leaves of the hop plant was largely affected by environmental conditions, there were nevertheless marked clonal differences which are believed to be entirely independent of external influences.

Studies of selections of two cultivated oats, L. DANIEL and E. MIÈGE (*Ann. Sci. Nat. Bot., 9. ser., 20 (1917), No. 1–6, pp. 289–308, figs. 6; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 7, pp. 806–808*).—The authors describe work, conducted over a period of four years with a white and a black variety of oats, in which they made observations of the inheritance of certain grain characteristics. Four types of grain were recognized with respect to their location in the spikelet and were designated as single, external, internal, and intermediate. The yield of grain and straw from the different types, the proportion per 1,000 grains of the different types obtained in the two varieties and in the progeny of selected seed, the weight of the different types, and the proportion by weight of grain and of glumes comprised the points studied. It was concluded that, at least in the case of these two varieties, the morphological differences in the grains are not transmitted to their offspring.

An account of an experiment to determine the heredity of early and late ripening in an oat cross, A. ST. C. CAPORN (*Jour. Genetics, 7 (1918), No. 4, pp. 247–257, fig. 1*).—Statistical data are presented on the exact maturation values of an entire F_2 generation as established by the F_3 progeny of a cross between early and late ripening oats. Conclusions are reached similar to those arrived at by Hoshino in his work with rice (E. S. R., 35, p. 329).

Mesdag, a weak-strawed, large-grained type, was used as the early parent and Hopetown, a small-grained, profusely tillering type, as the late parent. A total of 106 F_2 heads were rubbed out and planted the same day, a row of each of the parents also being sown in proximity to the rest of the crop. Each row contained 24 grains. The Mesdag row began ripening August 10 and finished August 24, while the Hopetown row began ripening September 4.

No row was as late as the late parent nor as early as the early parent, although two rows extended only two and three days, respectively, beyond the Mesdag period. Starting early, 22 other rows ripened over the period between the parental times and finished the first day of the Hopetown harvest. It is concluded that early and late ripening are Mendelian characters, but that they are dependent upon more than one factor, possibly three. F_2 plants, apparently homozygous for one of these, were definitely early in the sense that their F_3 progeny all attained complete ripeness before any individuals of the late parent had matured. Homozygosis in all three factors was apparently required to produce the two perfectly early rows. The diversity in the time of ripening of the other 22 early ripeners is thought to support the inference that although one factor is here constant and homozygous, thus imparting a common measure of earliness, the other two, in various heterozygous and homozygous combinations, are responsible for the different incidences of the greatest intensity of this earliness.

"There can be little doubt, too, that the extent of the tillering has much to do with the rate of ripening. The tillering power of late forms is always good; that of early, very poor. Owing to the concentration of growth among early plants into one or two panicles only, these are generally bigger and bear better grain than those of late plants; but this advantage does not compensate for the diminished yield due to the small number of heads. There is thus an inevitable sacrifice of crop when it is attempted to render a late kind early. The only hope, apparently, lies in increasing the output, per individual panicle, of an already early variety. This can best be done by extracting it again from a fair-sized F_2 generation of a cross with a type which, quite apart from any ability to tiller profusely, has above all larger panicles and larger grain of better quality."

The olona, Hawaii's unexcelled fiber plant, V. MACCAUGHEY (*Science, n. ser., 48 (1918), No. 1236, pp. 236–238*).—Olona (*Touchardia latifolia*), said to be the strongest and most durable fiber known, is described, and its distribution and utilization in Hawaii are discussed.

[Proceedings of the Potato Association of America] (*Proc. Potato Assoc. Amer., 4 (1917), pp. 113, figs. 6*).—This reports the proceedings of the fourth annual meeting of the association, already noted (E. S. R., 37, p. 800).

Approved methods of transplanting rice [in Italy] (*Gior. Risicolt, 8 (1918), No. 5, pp. 65–79, figs. 10*).—This gives a rather detailed description of the methods employed in transplanting rice under irrigation, including the preparation and care of the nursery seed bed.

Notes on the production of dry land rice, G. E. COOMBS (*Agr. Bul. Fed. Malay States, 6 (1918), No. 7–8, pp. 321–327*).—Field practices and cultural methods employed in growing dry-land rice in the Federated Malay States are described, approximately 15,000 acres being under this system of cultivation. Two forms of the system are said to obtain—"ladang" or hill cultivation and "tenggala" or plow cultivation. The former method involves the utilization of virgin forest land cleared of trees, while in the latter method the broad alluvial tracts occurring along the river banks are utilized.

Culture experiments with rye, E. W. LJUNG (*Sveriges Utsädesför. Tidskr., 28 (1918), No. 3, pp. 97–116, figs. 5*).—This paper reviews the results of culture experiments with a number of varieties of rye, conducted at different places in Sweden and at various times from 1905 to 1917, inclusive.

The results of five experiments carried on from 1905 to 1911 showed that the best average yields of grain and straw were secured from seedings made August 16, as compared with one earlier and three later dates, ranging from August 6 to September 26. The average yield of grain for the years 1907 to 1917 at Svalöf was in favor of Svalöf Stjärn rye, which produced 4,331 kg. per hectare (69 bu. per acre). A strain of Stjärn rye, No. 0302, yielded 4,298 kg.; a strain of Schlanstedt rye, No. 0451, 4,146 kg.; a strain of Prof. Heinrich, No. 0280, 4,053 kg.; and Petkus, taken as the standard variety, 4,050 kg. per hectare. Svalöf Stjärn rye also led in yield in similar experiments conducted at five other points. Svalöf Stjärn rye strain, No. 0302, which also entered the tests at three of these places ranked second in every instance. Svalöf Improved Wasa rye, compared with several varieties from 1910 to 1917 in six localities, gave an average yield higher than that of Petkus, but lower than the average yield of Svalöf Stjärn rye.

Studies on the contamination of the pollen of rye with the help of "indicator plants" in Sweden, N. HERIBERT-NILSSON (*Ztschr. Pflanzenzücht., 5 (1917), No. 2, pp. 89–114, figs. 10; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 2, pp. 170–172, fig. 1*).—In work with rye at the Seed Selection Station of Weibullsholm, near Landskrona, Sweden, the author isolated descendants of selected plants in fields of wheat or fodder grasses. This practice led to a study of the manner and of the extent to which pollen from one plant or from a group of plants when carried by the wind may reach the flowers of other plants, even at a considerable distance. These observations were made by means of (1) the determination of the percentage of fertilized flowers in almost completely self-sterile plants, (2) by the direct collection of pollen on glass slides covered with liquid paraffin and placed at various distances from the rye plat with the paraffined surface turned in the direction of the prevailing wind, and (3) by the use of so-called indicator plants.

The number of fertilized flowers in normal rye was found to average 5 per cent, while higher averages, exceeding 10 per cent, are regarded as due to cross-pollination. Single plants separated by a distance of 30 meters (about 32.8 yds.) were regarded as practically isolated, while groups of plants covering areas of about 0.5 square meter (approximately 5.4 sq. ft.) and separated by a distance of 30 meters were found to be exposed to a contamination of 10 per cent.

In 1913 the author isolated a strain of Brattingsborg rye, distinguished by the persistence of chlorophyll in the stem, leaves, and glumes, even when fairly ripe. This nonripening character was found to be recessive, the F_2 individuals being distributed according to the ratio 3:1. Since this green type was quite rare (less than one per million) and recessive, it was deemed to be particularly well suited for use as an indicator of cross-pollination. On applying this method it was found that 10 per cent of the isolated rye plants were subject to contamination when grown at a distance of 50 meters from rye plats measuring from 1 to 2 square meters.

That the danger of contamination increased with an increase in the size of plat was demonstrated by observations made on isolated plants located 50, 250, 350, and 400 meters from a plat measuring 3,500 square meters, the amount of contamination being 54.4, 46.3, 29.7, and 19 per cent, respectively. Contamination by this plat in a group of 20 indicators 60 meters distant was 37.3 per cent, indicating a marked protective action of the pollen of the 20 plants. Differences in the amount of contamination observed in individual plants of this group ranged from 9.6 to 68 per cent and were thought to be due to the fact that the plants did not all flower at the same time, the late-flowering plants being exposed to a greater volume of pollen. By the use of indicators it was also observed that muslin bags were ineffective as a protection against cross-pollination, an average contamination of 83.3 per cent being obtained in the four indicator plants isolated by this means.

See also a previous note (E. S. R., 38, p. 336).

Svalöf Improved Wasa rye, E. W. LJUNG (*Sveriges Utsädesför. Tidskr.*, *28* (*1918*), *No. 2*, *pp. 71–81*).—A detailed description of this new variety is given, and the results of several comparative tests in progress during a varying number of seasons in different localities are reported in tables.

It is pointed out that in southern and middle Sweden, where the conditions for rye culture are of the best, Improved Wasa rye is not so productive as Svalöfs Stjärn or even Petkus, but that in Värmland and other sections where these conditions are not so favorable and where hardiness is of greater importance this new variety proved to be the best of all sorts tested. In experiments with nine varieties conducted at Svalöf from 1911 to 1917 it ranked first in weight per hectoliter, with 74 kg. (57.4 lbs. per bushel), but in weight per 1,000 kernels it ranked fifth. In strength of straw the variety stood above the average, the degree of strength being designated as 6.1 on a scale of 10.

Spartina and coast erosion, I. M. ROPER (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, *No. 1* (*1918*), *pp. 26–31*, *fig. 1*).—The author describes experimental work with *S. townsendi* in North Somerset (England) in an effort to establish the grass on the extensive mud flats of the River Severn as a means of protection against erosion from the high spring tides and winter storms. The plant is said to give considerable promise for the future.

Climatic control of the morphology and physiology of beets, H. B. Shaw (*Sugar [Chicago], 19 (1917), Nos. 10, pp. 387–391, figs. 10; 11, pp. 431–434, figs. 10; 12, pp. 479–486, figs. 27; 20 (1918), Nos. 1, pp. 23–27, figs. 3; 2, pp. 68–70, figs. 8; 3, pp. 109–112, figs. 2; 4, pp. 150–154, figs. 4*).—Observations by the author during several years' work in breeding sugar beets are said to have revealed numerous apparent vagaries in their morphological development, many of which proved detrimental to the production of seed.

A strong correlation between climatic conditions and morphological development was noted and was seemingly substantiated by available data. Extensive experimental work was planned to test the effect of environmental factors upon the morphology and physiology of beets, with special reference to climate, especially temperature and moisture. Field experiments were begun at Ogden, Utah, in 1912, in which 4 series of plats were planted at successive intervals of about 3 weeks, so that the earlier stages in the development of the crown bud rudiments might be exposed to progressively higher temperature conditions with all their accompanying meterological factors.

Different methods of planting were also adopted in order to modify the effects of these factors and their relations to the bud development. In the first row of each series the crowns of the mother beets were covered with soil to protect them from late frosts and to protect the young buds from the intense heat and actinism of the midday sun in semiarid regions. In the second row the developed buds were removed to insure the activity of the hitherto dormant bud rudiments. The crowns of the beets in the third and fourth rows were exposed to afford comparisons with those in the first and second rows, respectively. The effect of shade was ascertained by placing a canopy over certain portions of the beets. An additional series was made up of selected beets from which all visible buds and leaves were removed after robust rosettes of leaves had formed on their crowns, thus leaving only bud rudiments that otherwise would have remained dormant, but which, due to the stimulus of relatively high mean temperatures of both air and soil and of a well-developed root system, were aroused into active growth. The meteorological apparatus employed is fully described.

During 1913 experiments were conducted at Jerome, Idaho, with beets placed in cold storage to induce a rest period, siloed beets at Ogden being used as controls. Additional tests with siloed beets were made at Brooklyn, N. Y., in 1916 and 1917.

The methods of procedure of all the experimental work are enumerated in detail, the meteorological and other data are recorded in tabular form, and the results are discussed at some length.

"The experiments described have shown a close correlation between climatic conditions and the morphological development of beets, whether wild or in cultivation. It would appear that climatic factors operating on the growing point of the bud rudiments of beets, according as they cause a prolonged restraint of the physiological operations of those growing points or a stimulation, determine the bud rudiments either reproductively or vegetatively. Any intermediate stage between normal reproductivity and complete vegetativeness may be induced, according to the degree and duration of the restraint. It would also appear that other factors inducing a similar restraint of the activities of the growing point will produce identical results. Among such factors are drought, lack of nutriment, and inhibitory pathological or physiological conditions.

"Based upon these data, the following hypothesis is advanced: A relatively prolonged period of restrained growth in the growing points of bud rudiments of beets is necessary to determine the development reproductively. The absence of such a period of restrained metabolism results in a vegetative determination. To reduce the intensity or duration of restrained physiological activity will result, according to degree, in a determination intermediate between normal reproductivity and complete vegetativeness. When determination has been effected a relative stimulation like that induced by the rise in temperature accompanying the march of the season must follow to complete the full development of the determined morphological phase. With this hypothesis it is found possible to account for the occurrence of every phase in the morphology of both the wild and the cultivated beet.

"In the case of the cultivated beet it is essential in many localities that some portion of the period of restrained growth should take place during the winter storage, in order to duplicate to some extent the exposure of the wild beet seedling to the winter temperatures of its natural habitat. . . .

"The physiological changes induced in the growing point to determine one or another form of development are not known. It is known that grape sugar is present in and about the growing point of the crown buds of beets and starch is absent when conditions are favorable for reproductive determination, and that the reverse is true when conditions favor vegetative determination. Oxidase activities are much greater in the aerial parts of beets whose growth has been restrained by pathological or other conditions than in those whose growth has been relatively stimulated. It is probable that the biochemical processes of the cells of the punctum vegetationis are more numerous and more complex where reproductivity is being determined than where vegetative growth is to ensue."

The botany of the sugar cane, J. M. Geerts (*Plantkunde van het Suikerriet. [Pasoeroean], Java: Proefstat. Javasuikerindus. [1916], pp. XIV+151, pls. 4, figs. 104*).—This book is designed primarily for the use of sugar cane planters and deals in a rather popular but comprehensive manner with the external and internal structure of sugar cane, the life processes of the plant, the propagation of cane, variability, heredity, hybridization, etc.

New varieties of sugar cane, R. C. McConnie (*Rev. Agr. Puerto Rico, 1 (1918), No. 1–2, pp. 12–17*).—Tabulated data are presented, showing the yields of 25 varieties of sugar cane grown in Porto Rico during 1915, 1916, and 1917.

Thick v. thin canes for planting, A. H. Rosenfeld (*Internat. Sugar Jour., 20 (1918), No. 235, pp. 303–306*).—This reports the results of experiments undertaken at the Tucumán Experiment Station in 1911 to determine whether thin canes transmitted a tendency to that type of growth or whether the character was simply the result of some unfavorable condition of growth during the year. The average yields of cane from two plantings of thick and thin canes and two stubble crops amounted to 28,619 and 28,267 kg. per hectare (about 12.78 and 12.57 tons per acre), respectively. It is concluded that, provided the stalks planted are healthy, the thickness of the cane is of little importance.

Fertilizer experiments with sugar cane, J. Mirasol y Jison (*Philippine Jour. Sci., Sect. A, 13 (1918), No. 3, pp. 135–143, figs. 2*).—This describes some rather limited fertilizer experiments with sugar cane begun in 1916 and made on a clay loam soil near Los Baños, P. I.

The highest yields were obtained from applications of sulphate of ammonia in combination with sulphate of potash or with double superphosphate, amounting to 95.77 and 95.28 tons of cane per hectare (38.8 and 38.6 tons per acre), respectively. A complete fertilizer containing sulphate of potash, nitrate of soda, and double superphosphate showed the highest purity of juice, 90.16 per cent, with sulphate of potash next in order with 89.52 per cent purity.

The use of sulphate of ammonia as a fertilizer for sugar cane, J. T. CRAWLEY (*Sugar [New York], 20 (1918), Nos. 5, pp. 177–180, figs. 3; 6, pp. 222–225, figs. 2; 7, pp. 267, 268; 8, pp. 312–314*).—The author presents a rather general review of fertilizer practices, with particular reference to the use of sulphate of ammonia, in the principal sugar-cane producing countries, including Porto Rico, British West Indies, British Guiana, Cuba, Louisiana and other southern States, Java, and Hawaii.

It is concluded that nitrogen is the most important element in the fertilization of sugar cane, and that wherever mixed fertilizers are used sulphate of ammonia is the usual source of nitrogen, except where nitrogen from other sources is more plentiful or cheaper. It was also observed that where nitrogenous dressings were used sulphate of ammonia was preferred in practically all sugar-growing sections.

The sugar situation, C. L. SPENCER (*Jacksonville, Fla.: The Drew Press, 1918, pp. 89+VI, figs. 58*).—This is a comprehensive discussion of the factors contributing to the shortage of sugar, with suggestions as to remedial measures and with particular reference to the encouragement of cane sugar and sirup production in southeastern United States.

A study of Swedish sunflower seed in 1917, S. RHODIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 170 (1918), pp. 14; K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), No. 4, pp. 317–328*).—This article discusses the temperature and moisture requirements of sunflower culture and their relation to the climatic conditions of various localities in Sweden, where sunflowers were grown experimentally to test their value as a source of oil. Samples of seed from 16 localities were studied as to their maturity, germination, weight, fat content, and moisture content, and the results are reported in tabular form.

It was found that a high moisture content of the seed tends to give low germination. These samples proved to be of a higher moisture content than that reported for seed produced in Hungary. The fat content of the 16 samples, on the basis of 10 per cent of moisture, ranged from 12.67 to 26.09 per cent. Attention is called to the fact that in Hungary a fat content of 20.68 per cent with 10 per cent of moisture is considered the minimum for profitable oil extraction, and that on the average in that country the seed with 10 per cent of moisture contains about 27.82 per cent of oil. Of the samples grown in these experiments five were well above the Hungarian minimum.

Stocks of leaf tobacco (*Bur. of the Census [U. S.] Bul. 136 (1918), pp. 44, fig. 1*).—Statistical data are presented and discussed showing the stocks of leaf tobacco held semiannually from October 1, 1912, to October 1, 1916, and quarterly since then, also statistics assembled for the different phases of the industry "regarding the production, consumption, imports, and exports of tobacco, the prices obtained for the staple by the growers, the quantities of the several products manufactured therefrom, and the revenue on tobacco collected by the Government of the United States."

Wheat growing in Saskatchewan, J. BRACKEN (*Univ. Saskatchewan, Col. Agr. Field Husb. Bul. 1 [1917], pp. 106, pl. 1, figs. 65*).—This publication presents a comprehensive summary of experimental work with wheat conducted at the University of Saskatchewan, including variety tests and observations on cultural, rotation, and fertility practices. Considerable statistical and other information concerning the production, botany, milling, grading, and marketing of wheat is also given.

[Cultural and fertilizer tests with wheat in Argentina], A. C. TONNELIER (*Min. Agr. Nac. [Buenos Aires], Dir. Gen. Enseñanza e Invest. Agr. [Pub.] No. 78 (1918), pp. 43, figs. 4*).—The author reports rather extensive cultural and fertilizer tests with wheat conducted during the period 1911 to 1916, inclusive, the results being presented in tabular form, illustrated graphically, and fully discussed. The experiments embraced a comparison of bare-fallow cultivation with the growing of leguminous crops for forage and for green manure and with various applications of commercial fertilizers both with and without the legumes. In every case the different treatments gave increased yields over bare fallow.

Tests of foreign varieties of winter wheat, 1914–1916, E. Lindhard (*Tidsskr. Planteavl, 25 (1918), No. 2, pp. 240–255*).—A comparison was made at Tystofte and Abed from 1914 to 1916 of the varieties Small Tystofte 2, Queen Wilhelmina 2, Victor, Cropwell, Red King, Early Red, and Iduna. In addition two varieties, Little Joss and Burgoyne Fife, were tested at Tystofte only. The experiment included the growth of two crops. The yields of grain and straw of the different varieties, together with the protein content of the grain, are given in tables, and a brief description of each variety is presented.

In average yield of grain at Tystofte and Abed, Small Tystofte ranked first with 4,420 kg. per hectare (65.56 bu. per acre) being followed by Queen Wilhelmina 2, Victor, and Cropwell with 4,320, 4,230, and 4,110 kg. of grain per hectare, respectively. Of the two varieties grown only at Tystofte, Little Joss yielded 4,520 kg. of grain per hectare, while Burgoyne Fife, considered as a hardy spring variety rather than a winter wheat, yielded 3,550 kg., this yield being the lowest of all the varieties under test.

There was little injury from rust during the experiments, Red King being the only variety suffering perceptibly. The highest average yield of straw, 7,760 kg. per hectare (6,906 lbs. per acre), was secured from Cropwell with Small Tystofte ranking next. Little Joss, Red King, and Iduna also gave perceptibly higher yields of straw. Burgoyne Fife stood last in straw yield and was found to be the only variety in these experiments showing clearly a tendency to lodge.

The highest yields of nitrogen, 84.7 and 83.9 kg. per hectare, were produced by Little Joss and Small Tystofte 2.

Svalöfs Pansar wheat, Å. Åkerman (*Sveriges Utsädesför. Tidskr., 28 (1918), No. 3, pp. 117–120*).—This new variety is briefly described and the results of comparative tests are presented in tables.

At Svalöf Pansar wheat gave for the years 1907 to 1916 an average yield of 4,970 kg. per hectare (73.7 bu. per acre) as compared with 3,440 kg. produced by the common unimproved wheat of the region. In tests conducted in three other localities Pansar wheat outyielded four other improved varieties. In a series of local tests in five different regions Pansar and Fylgia wheat ranked first in average yield among six improved sorts.

Svalöfs Sol wheat, 1 and 2, Å. Åkerman (*Sveriges Utsädesför. Tidskr., 28 (1918), No. 3, pp. 121–124*).—In experiments conducted for four years in Östergötland Sol wheat 2 gave an average yield of 4,235 kg. of grain per hectare (63 bu. per acre), this being 7.2 per cent more than Sol wheat 1 and 0.8 per cent more than Thule wheat 2. The average results of cooperative experiments carried on in two localities from 1912 to 1917 showed that Sol wheat 1, as compared with Bore, Iduna, Squarehead, and Thule wheat 1 in most instances led in yield. Results secured at Svalöf indicated that Sol wheat 1 although giving good yields was not equal in production to Pansar wheat 1, Fylgia, and Sol wheat 2, Pansar wheat 1 outyielding all. Nineteen cooperative experiments made in 1916 and 1917 with Sol wheat 1 and 2 in Göteland resulted in an average yield of 2,475 and 2,500 kg. per hectare, respectively. From these experiments as a whole the general conclusion is drawn that Sol wheat 2 is at least as hardy as Sol wheat 1, ripens more uniformly, and has a stronger straw.

Russian wheats, K. A. Fliaksberger (*Mat. Izuch. Estest. Proizvod. Sil Rossii, 17 (1917), pp. 62*).--Tabulated statistics derived largely from Russian sources are presented and discussed, showing the nitrogen content of Russian wheats, the yields, the variety distribution in the different Provinces, and the flour, bread, and other wheat products produced by Provinces. Similar data for other countries are also presented.

A bibliography dealing with the subject and comprising 212 titles is appended.

Treatment of seed wheat with formalin, H. Garman and C. L. Hathaway (*Kentucky Sta. Circ. 22 (1918), pp. 21-27, figs. 2*).—Both germination and field tests with wheat treated in different ways with formalin for the prevention of stinking smut are briefly described.

The average germination of all untreated seed was 95 per cent and of all treated lots 88.6 per cent. The number of heads harvested was generally less in treated than in untreated lots, the average yield of sound heads from treated seed amounting to 257 as compared with 274 from the untreated seed. The percentage of infected heads, however, ranged from 0 to 3.1 per cent for treated seed, and from 11 to 35 per cent for untreated seed. Sprinkled seeds gave somewhat better results than dipped seeds, the average yield of heads being 335 and 223, respectively. Sprinkled seed also averaged 0.75 infected head per lot as compared with one infected head per lot for the dipped seed.

On the basis of the results obtained, it is recommended that for the prevention of stinking smut seed wheat be sprinkled with a solution of 0.5 pt. of formalin in 30 gal. of water, left in a heap for 2 hours, then spread out to dry before planting.

Agricultural seed inspected in 1917, C. P. Smith (*Maryland Sta. Bul. 220 (1918), pp. 13-63*).—This reports the results of purity and germination tests of more than 1,375 official samples of seeds collected during 1917.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 2 (1919), Nos. 8, pp. 8, figs. 5; 9, pp. 8, figs. 5*).—The principal feature of the first of these two numbers is the final red clover, alsike clover, sweet clover, alfalfa, and timothy seed shippers' report, together with maps of the United States showing the counties reported as normally producing either a surplus, a sufficient, or an insufficient quantity of these seeds as compared with their planting requirements.

Tabulated statistics are also presented dealing with the retail catalogue prices of vegetable seeds for 1917, 1918, and 1919; a partial report of field seed stocks and receipts for the United States for January 1, 1919; wholesale field seed selling prices about January 27, 1919; stocks, shipments, prices, etc., of soy beans and cowpeas; a preliminary report of the shippers' stocks, shipments, prices, etc., of millet and sorghum seed; estimated red clover seed consumption in the United States, and the seed stocks and receipts January 1, 1919; and a brief note on the seed-potato situation.

The second number contains tabulated statistics on vegetables and field seed stocks and receipts for the United States as of January 1, 1919, together with tentative seed production and consumption maps intended to show in a graphic form the most important areas of production and consumption in a normal year of Golden (formerly German) and common millet seed, and Amber and Orange sorgo seed. A final tabulated report is also given from shippers' reports as to soy beans, cowpeas, velvet beans, millet, and sorghums as of January 15, 1919.

Information relative to wholesale and retail field seed selling prices, February 20, 1919; a preliminary report on the acreage of commercial vegetable seed; and summarized data as to seed stocks, etc., in Canada and Great Britain are also noted.

The usual statistics relative to the imports of forage plant seeds permitted entry into the United States are included in each of the two numbers.

Alfalfa dodder in Colorado, W. W. Robbins and G. E. Egginton (*Colorado Sta. Bul. 248 (1918), pp. 15, figs. 8*).—This pest, said to have originated largely from three widely separated localities in the State, is described and its distribution, spread, and methods of eradication indicated. All the alfalfa-growing sections of Colorado were found to be more or less contaminated. *Cuscuta planiflora*, *C. arvensis*, and *C. indecora* have been identified as attacking alfalfa. Dodder is said to be disseminated through impure seed, irrigation water, hay, and manure.

The exclusive use of cleaned and dodder-free alfalfa seed is urged, *C. planiflora* and *C. arvensis* being removable by the use of power-driven mills, hand mills, or sieves. For small infested areas, cutting and burning the plants, followed by hoeing to a depth of from 2 to 3 in. every few days for several weeks, is recommended. Where extentive areas are involved, however, it is suggested that the crop be cut for hay before the dodder seeds, or if seed has already matured, that it be cut and burned, the area then being plowed and kept in cultivated crops for several seasons.

Weed-control experiments in 1917, L. M. Kvadsheim (*Tidsskr. Norske Landbr., 25 (1918), No. 6, pp. 231–242*).—The experimental results of different methods of weed control are given in tables and briefly discussed.

The use of the weeder on oats before the plants were above ground gave a profitable increase in yield of grain and straw. In other tests sulphuric acid, iron sulphate, and cyanamid were used for the control of weeds in fields of oats, wheat, barley, potatoes, turnips, and kohl-rabi. The sulphuric acid was applied in 3.5 to 4 per cent solutions and the cyanamid was used as a dust spray. In all instances the use of these substances controlled weed growth to such an extent that the resulting increases in yields proved profitable. It is pointed out that especially with oats the cyanamid also had a perceptible fertilizing effect.

The weeds of western Pennsylvania, T. E. Kirch (*Trillia, No. 4 (1914–15), pp. 11–24*).—The author presents a check list of weeds occurring in 31 counties in western Pennsylvania, but limited to those specimens actually on record for Allegheny County in the herbarium of the Carnegie Museum (Pittsburgh).

HORTICULTURE.

Food gardening for beginners and experts, H. V. Davis (*London: G. Bell & Sons, Ltd., 1918, 2. ed., rev. and enl., pp. VIII+133, figs. 12*).—A small treatise on vegetable growing in which the subject matter is presented under the following headings: An intensive cropping rotation to produce food essentials, an additional rotation to produce some additional food, various gardening matters, and how to use the food grown in the garden.

The food-producing garden, H. A. Day (*London: Methuen & Co., Ltd., 1918, pp. IX+98*).—A popular treatise on vegetable and ornamental gardening in the open and under glass, including also chapters on keeping poultry, rabbits, bees, pigs, etc.

The market gardener: Economic production of vegetables for the market (*Maraicher: Production Economique des Legumes pour la Vente. Paris: Libr. Larousse [1918], pp. 48, figs. 26*).—A small treatise on market garden practices, with special reference to French conditions.

The inheritance of seed coat color in garden beans, J. K. Shaw and J. B. Norton (*Massachusetts Sta. Bul. 185 (1918), pp. 59–104*).—The work here recorded was continued over a period of eight years. Twenty-one varieties of garden beans were used in making over 120 different crosses, involving more than 40,000 plants. The data secured are presented in tabular form and certain hypotheses are advanced to account for the facts observed. A bibliography of cited literature is appended.

This work shows, as in other investigations, that the inheritance of seed coat color in beans is very complicated and difficult to explain fully and satisfactorily. In a general way the crosses of pigmented and white beans show a 3:1 ratio but there are certain wide departures. Certain correlations occur between seed and flower. All white or eyed beans are accompanied by white flowers; all black or black mottled beans, by dark pink flowers. Mottled beans other than black mottled beans and those of various yellow and brown colors are usually accompanied by light pink flowers.

The inheritance of mottling, it is suggested, may be explained by the double factor hypothesis of Emerson,[1] which theory supposes that mottling is brought about by two factors, *Y* and *Z*, which are coupled in the case of true-breeding mottled varieties, but may be separately borne by distinct varieties, and in such cases are inherited independently. Individuals from such crosses bearing both *Y* and *Z* are mottled and always heterozygous, while those bearing either one are not mottled. Crosses of two mottled varieties gave only mottled progeny. Crosses of mottled and self-colored varieties yielded mottled beans in F_1 and the parent types in a 3:1 ratio in F_2. Crosses of mottled and white varieties gave mottled beans in F_1 and usually mottled, self-colored, and white in a 9:3:4 proportion in F_2.

"In most cases crosses of two self-colored varieties have given only self-colored progeny. The principal exceptional variety is Blue Pod Butter, which, when crossed with most self-colored varieties, yields mottled progeny none of which breed true to the mottled character. White varieties may carry the character for mottling, which can show itself only after crossing with a pigmented sort. Creaseback is peculiar in that it seems to carry factors for mottling and an additional factor causing a blackening which nearly or quite obscures the mottled pattern.

"There are two types of mottling—the dark, seen in Red Valentine and Refugee and many others, and the light, seen in varieties of the Horticultural class. The former behaves toward the latter as a simple dominant. Apparently the factor for the dark mottling is associated with one of the mottling factors. White beans may yield light mottled beans, but none have yielded dark mottled beans.

"There is evidently needed to produce a totally pigmented bean a factor for total pigmentation. If it is absent when the factor for pigmentation is present we have an eyed bean. Eye size is evidently governed by one or more factors, but these investigations do not afford definite data regarding their relations.

"Pigment patterns and pigment colors are controlled by distinct factors. According to the hypothesis presented in this paper, any color shown in a bean seed is, in most cases, dependent on three or more factors. The basic factor for pigmentation may be modified into either one of two series, one including the various yellows, browns, and black; and the other, different shades of red. The third factor, called a determiner, finally determines what the color is to be. In some cases the determiners bring about the color through causing an alkaline or acid condition. Possibly in some cases the color is determined by the degree of acidity or alkalinity.

"The two modifiers discovered are apparently associated with one of the mottling factors, but the determiners are free and independent, though standing often in an epistatic or hypostatic relation to one another."

[1] Amer. Breeders' Assoc. [Proc.], 5 (1909), pp. 368–376.

Washington asparagus: Information and suggestions for growers of new pedigreed rust-resistant strains, J. B. NORTON (*U. S. Dept. Agr., Bur. Plant Indus., 1919, pp. 8*).—This circular gives the history of and descriptive notes on raising rust-resistant strains of asparagus, developed by the Bureau of Plant Industry in cooperation with the Massachusetts Experiment Station and other cooperators throughout the country during the last 13 years (E. S. R., 28, pp. 538, 539), together with suggestions for the treatment and handling of the new strains from various cultural and market standpoints and advice to seed growers and others who expect to continue developing these strains.

Asparagus, F. J. SUTTON (*Univ. Ky., Col. Agr., Ext. Div. Circ. 68 (1919), pp. 14, figs. 4*).—A popular treatise on the culture and harvesting and preparation of asparagus for market.

Hybridization of eggplants, A. M. BAYLA (*Philippine Agr., 7 (1918), No. 3, pp. 66–71*).—Data are given on the F_1 progeny of crosses between the purplish native elongated eggplant of the Philippines and the New York Improved variety as the female parent. The F_1 plants were very much more vigorous, strong, and healthy than either parent. The hybrid fruits leaned more toward the female parent in weight, diameter, and shape, while the color of the fruits and of the portion beneath the calyx resembled more the male parent.

Acreage totals and values of California fruits for 1918 (*Bien. Rpt. Cal. State Com. Hort., 8 (1917–18), p. 5*).—Tabular data are given of orchard fruits and nuts, showing the acreage in bearing and nonbearing trees and the value for 1917 and 1918. The acreage and value of different classes of grapes are also given.

The testing of a new tree crop for hardiness, D. FAIRCHILD (*Jour. Heredity, 9 (1918), No. 8, pp. 368–371, figs. 4*).—The experience of the U. S. Department of Agriculture in testing introduced trees for hardiness has shown that much is to be gained by giving the young trees adequate protection during their babyhood, when they are naturally less hardy than at a more advanced age.

Experiment on the culture of grapes in cordon, C. GODET (*Ann. Agr. Suisse, 19 (1918), No. 2, pp. 205–207*).—The results are given of experimental trials of Chasselas grapes grafted on different American stock plants and grown in cordon.

New direct bearers, I–II, M. DE ARANA Y FRANCO (*Prog. Agr. y Pecuario, 24 (1918), Nos. 1078, pp. 412, 413; 1079, pp. 425, 426*).—This paper gives the results of tests conducted at the Zamora Agricultural Station at Zamora, Spain, of the more important European-American grape hybrids now being grown in Europe on their own roots.

Crossing investigations with grapes, H. RASMUSON (*Ztschr. Induktive Abstam. u. Vererbungslehre, 17 (1916), No. 1–2, pp. 1–52, figs. 29*).—A full report of the author's work, the principal results of which have been previously noted (E. S. R., 36, p. 537). It is pointed out that although the work was not continued long enough to warrant definite conclusions, the evidence obtained indicates that phylloxera-resistant vines may be obtained through judicious crossing.

Fertilizer experiments in vineyards, C. DUSSERRE (*Ann. Agr. Suisse, 19 (1918), No. 2, pp. 192–195*).—The results are given of fertilizer experiments conducted for a number of years under the direction of the Agricultural Chemistry Station at Lausanne, Switzerland.

As compared with the former practice of trenching and burying organic manure in the soil, tillage with the use of commercial fertilizers gave somewhat larger yields, required less hand labor, and was cheaper as to the cost of application of fertilizer. As applied on the surface of the soil, nitrate of soda gave much better results as a carrier of nitrogen than lime nitrogen. In one set of experiments the best results were secured by alternating a dressing of organic manure one year with a dressing of a complete commercial fertilizer the following year. Better results were secured when a complete fertilizer was used than when one of the elements was omitted.

A study of the effects of freezes on citrus in California, H. J. Webber et al. (*California Sta. Bul. 304* (*1919*), *pp. 243–321, figs. 23*).—A bulletin of information for citrus growers summarizing the results of general field studies and observations, as well as special studies conducted following the great freeze of January 5–7, 1913. The subject matter is presented in three papers, as follows:

A study of the freeze of 1913 in California, by C. S. Milliken, A. R. Tylor, W. W. Bonns, and H. J. Webber (pp. 249–298).—This paper is essentially a record of the freeze of 1913, based on a survey made in a number of different districts by many different observers. Information is given relative to the effects of the freeze upon citrus trees, foliage, wood and bark, on the external appearance of fruit, on the internal condition, and on the quality and uses of the fruit; method of determining the extent of fruit injury; relative hardiness of trees and fruit of different species and varieties of citrus; natural factors influencing the temperature, such as elevation, protective hills, canyons, bodies of water, and location of fruit on the tree; artificial methods of protecting groves, such as windbreaks, irrigation, spraying, wrapping the trees, lath houses, burlap or cloth coverings; and protection by artificial heating. Considerations are also given factors influencing resistance of trees to cold injury, treatment of frozen trees, and aftereffects of the freeze on the trees and fruit. Methods employed in separating good fruit from frozen fruit are described.

Changes that take place in frozen oranges and lemons, by E. E. Thomas, H. D. Young, and C. O. Smith (pp. 299–314).—The work here reported was carried out at the citrus substation following the freeze of 1913, with the view of determining the nature and rate of change that takes place in frozen fruit. Special consideration was given to a comparison of the specific gravity, average weight, and percentage and total amount of sugar and acid in frozen and sound fruit. See also previous notes (E. S. R., 34, p. 365; 36, p. 416). The results are here presented in tabular form and discussed.

Generally speaking, the specific gravity of frozen citrus fruits was found to be lower than that of unfrozen fruits. Although there is a certain overlapping of the two classes, the division is sufficiently complete to make it commercially practical to separate frozen fruit by the specific gravity test. In lemons the changes in specific gravity are more rapid than in oranges. The specific gravity of sound fruit increases under storage and the specific gravity of frozen fruit decreases. A month is generally long enough to make a recognizable difference, but better separations can be obtained after six weeks or two months.

The excessive loss of moisture in citrus fruits caused by freezing is due to a change in the walls of the cells from semipermeable membranes to a porous substance that freely allows the liquid to evaporate from the interior without decreasing its volume. Frosted citrus fruits that remain on the tree continue to increase in size, this development being a thickening of the rind.

The total amount of sugars decreases in frozen fruit, although no change was found in the relative amounts of the different sugars present. The percentage of acid in the juice of frozen citrus fruits decreases slightly as compared with the unfrozen. The weight of acid per fruit in unfrozen fruit remains nearly constant, while in that which is frozen it continues to decrease until practically none remains.

A test of the efficiency of orchard heating, by A. D. Shamel, L. B. Scott, and C. S. Pomeroy (pp. 315–321).—The test here reported was conducted cooperatively by the U. S. Department of Agriculture with the substation. Following the freeze of 1913, performance records were kept of comparable plats of trees in heated and unheated lemon groves, beginning with the first pick after the frost and continuing for one year. In two of the plats observations were continued for two years.

The data here presented indicate that under the conditions of the Corona district, where an unusual number of groves were protected by heaters, orchard heating was highly profitable. The estimated average returns per acre from three series of plats was $1,787.02 for the heated plats and $284.45 for the unheated plats. The average cost of heating per acre of heated plats in the experiments was $101.30. In the second year's data the heated and the unheated plat also showed considerable difference in production.

Propagation and culture of the date palm, B. Drummond (*U. S. Dept. Agr., Farmers' Bul. 1016 (1919), pp. 22, figs. 10*).—This discusses the propagation of the date palm, nursery bed practices, transplanting offshoots to permanent positions, winter protection for young date palms, irrigating the date garden, fertilizing the date garden, soils suitable for date gardens, choice of location of date gardens, pruning date palms, fruit production in relation to offshoot production, and pollination of date palms.

Investigations with pecans, C. D. Matthews (*Bien. Rpt. Comr. Agr. N. C., 1917–18, p. 87*).—A brief progress report on investigations with pecans being conducted at the Truck, Coastal Plain, and Piedmont Stations of the North Carolina Department of Agriculture.

The work of variety testing has shown the marked adaptability of certain varieties to North Carolina conditions, while others are proving undesirable. Performance records of individual trees kept at the several stations have shown that trees of the same variety under identical conditions are uniformly heavy yielders, while others are very poor producers. Some trees produce uniformly large nuts and others uniformly small nuts. These results have been used as the basis for bud selection work.

Correct cultural practices, such as tillage and the use of cover crops, have given good results in the increased size of trees as well as in the increased size and number of nuts produced when compared to trees grown in sod.

Investigations dealing with the methods of budding and grafting employed in top-working pecan trees have led to the opinion that top-working should be confined, as a general rule, to trees not over 8 to 10 years old to be entirely successful. A combination of both grafting and budding has given the most satisfactory results.

On hybridization of some species of Salix, S. Ikeno (*Jour. Genetics, 8 (1918), No. 1, pp. 33–58, pls. 2, fig. 1*).—A fuller report of an investigation previously noted (E. S. R., 37, p. 432).

A number of allelomorphic characters were segregated, but in every case the proportion of individuals bearing each antagonistic character failed to follow the usual Mendelian ratios. It is suggested that a great number of factors are concerned in the development of each character, hence a complex segregation takes place in F_2.

Chrysanthemums for greenhouse and garden, D. B. Crane (*London: W. H. & L. Collingridge, 1918, 3. ed., pp. 128, pls. 15, figs. 61*).—The introductory chapters of this work deal with the history and classification of greenhouse and border varieties of chrysanthemums. The succeeding chapters discuss various types of chrysanthemums and their special cultural requirements, manures and fertilizers, the exhibition of blooms and plants, and pests and diseases. The work concludes with several selections of varieties for various purposes.

Studies of inheritance in the Japanese Convolvulus, B. MIYAZAWA (*Jour. Genetics, 8 (1918), No. 1, pp. 59–82, pl. 1, fig. 1*).—Reciprocal crosses were made between yellow-leaved white-flowered plants and green-leaved dark-red-flowered plants of the Japanese morning-glory. Data are given for four generations on the transmission of leaf and flower colors.

The green color of leaves was dominant to yellow with a ratio of 3:1 in F_2. A factor producing "hukurin" (marginal white) was present in the white-flowered parent. It was dominant to full color, segregating 3:1 in F_2.

With the factor for green leaf-color denoted by *G* and that for dark-red flowers by *D*, and with one parent denoted by *GGDD* and the other by *ggdd*, there is an interrelation between the factors *G* and *D*. In the presence of *D* the production of the dark-red color takes place when *G* is present in homozygous condition, and that of red (magenta or scarlet) color when *G* is present in heterozygous condition or altogether absent. The F_1 crosses (*GgDd*) will always bear flowers of magenta red.

Dahlias and their culture, M. A. HOWE (*Jour. Hort. Soc. N. Y., 2 (1919), No. 20, pp. 285–301, pl. 1, figs. 3*).—In this paper the author briefly discusses the origin, relationships, and classes of dahlias, gives specific cultural directions, and presents a list of some sixty varieties recommended for garden decoration and general effective results.

New species of Rhododendron, B. BALFOUR (*Notes Roy. Bot. Gard. Edinb., 10 (1917), No. 47–48, pp. 79–166*).—Forty new species of Rhododendron are here described.

Note on the origin of a mutation in the sweet pea, R. C. PUNNETT (*Jour. Genetics, 8 (1918), No. 1, pp. 27–31, fig. 1*).—The mutation here discussed is a "cretin" or monstrous form, of which the chief characteristic is the straight stigma protruding through the cleft keel. The standard and wings are generally smaller than in the normal flower and fail to expand fully. The author presents the data secured in connection with the appearance of this form of sweet pea in some pedigree cultures, and arrives at the conclusion that the cretin always behaves as a simple recessive, and that the original plant arose, not through the union of two germ cells which had lost the normal factor, but through some radical alteration in the zygote after union between two normal gametes had already taken place.

FORESTRY.

Regional spread of moisture in the wood of trees.—I, Deciduous-leaved trees during the period late autumn to early spring, W. G. CRAIB (*Notes Roy. Bot. Gard. Edinb., 11 (1918), No. 51, pp. 18, pls. 10*).—The study here reported was conducted with *Acer pseudoplatanus* trees grown under similar conditions in the Royal Botanic Garden. Determinations were made of the moisture content of different parts of the trunk of felled trees in October, December, January, and March. The results are presented in a series of graphs and colored illustrations and further discussed.

Summing up the evidence secured, it appears that with the cessation of foliar activity for the season the tree immediately commences its preparations for the next season. As a result of the water moving inward from the outer zones, beginning at the base of the trunk there is created an area of maximum moisture content in a transverse plane at the center of the trunk. This inward current and the consequent plane of maximum moisture content at the center gradually extends, as the leafless season progresses, upwards in the trunk to the topmost region. However, before this is reached and the center of the trunk at the top of the bole has become a storage region of maximum moisture content a radial movement has begun at the bottom of the trunk which likewise progresses upward, and through it the region of maximum moisture content passes almost to the outside of the trunk, leaving the center as the driest region during the latter part of the leafless season. The movements upwards and radial, both inwards and outwards, are going on synchronously at different levels in the trunk.

Partial tests with some other trees indicate that with but slight modifications the observation on *A. pseudoplatanus* may be regarded as applicable to most, if not all, broad-leaved deciduous trees in the same region.

Notes on North American trees.—IV, C. S. SARGENT (*Bot. Gaz., 67 (1919), No. 3, pp. 208–242*).—In continuation of previous papers (E. S. R., 40, p. 248), notes are given on the distribution and characteristics of several species of North American trees.

Botanical identifications of British Guiana trees and plants, L. S. HOHENKERK (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), Nos. 3, pp. 98–106; 4, pp. 178–185*).—This comprises a descriptive list of trees and plants of British Guiana which have been botanically identified at Kew from specimens collected by C. W. Anderson.

Synopsis of the genus Ochroma, with descriptions of new species, W. W. ROWLEE (*Jour. Wash. Acad. Sci., 9 (1919), No. 6, pp. 157–167*).—In view of the increasing importance of balsa wood for making life rafts, life boats, and insulating material, a survey was made in Central America in 1918 to determine the amount of timber available and to investigate as to the quality of the wood and the kinds that grow in different regions. This paper comprises a brief report of the taxonomic results of the survey.

Investigation of the oil palm and its products, W. H. JOHNSON (*Ann. Rpt. Agr. Dept. South Provs., Nigeria, 1917, pp. 8–10, 11–13*).—A variety test of oil palms conducted at the agricultural stations is briefly noted, and data are given on oil extraction and wine tapping tests.

Forests and forest planting (*Bois et Boisement. Paris: Libr. Larousse [1918], pp. 32, figs. 13*).—A forest planting pamphlet, dealing especially with conditions in France and with afforestation of slopes, waste lands, and bottoms.

Recreation uses on the National Forests, F. A. WAUGH (*U. S. Dept. Agr., Forest Serv., 1918, pp. 43, figs. 14*).—A descriptive account of the National Forests, with special reference to their facilities for providing various forms of recreation for the public.

Fifth biennial report of the State forester, J. C. VAN HOOK (*Bien. Rpt. State Forester, Mont., 5 (1917–18), pp. 102, figs. 6*).—This report includes a general report on fire protection and other work conducted during the two years 1917–18; a reproduction of Farmers' Bulletin 742 of the U. S. Department of Agriculture on The White Pine Blister Rust, by P. Spaulding (E. S. R., 35, p. 551); a report by E. E. Hubert on A Type of Winter-killing, Known as the Red Belt Injury of Forest Trees, Occurring in the Vicinity of Helena, Mont., and a special paper on the Economic Use of the Forests of Montana, by J. F. Preston (pp. 44–99). The subject matter of this paper is presented under the following general headings: Forest wealth of the State, production of forest products, principal lumber trees of the State, consumption of forest products, economic importance of the lumber industry, what the State should do for the forest industry of Montana, and recommendations of legislative measures for improving the industry.

Biennial report of the Forestry Commission for the two fiscal years ended August 31, 1918 (*Bien. Rpt. Forestry Com. N. H., 1917–18, pp. 3–127, pls. 12, fig. 1*).—A detailed report of the activities of the commission, including fire protective and white pine blister rust work, classification and description of public forests, reforestation and improvement operations on waste and cut-over land and on the State forests, organization of sawmill units for overseas service, and miscellaneous operations. Recommendations are given for further development of forestry in the State, and the present forest laws are appended to the report.

Pulpwood consumption and wood-pulp production in 1917, F. H. Smith (*U. S. Dept. Agr. Bul. 758 (1919), pp. 19, fig. 1*).—A statistical report on pulpwood consumption and wood-pulp production in the United States in 1917, including comparative data for certain previous years. The data given show the consumption of wood by species, States, and by processes of manufacture. Imports and exports of pulpwood, wood-pulp, and paper are included.

A total consumption in 1917 of 5,480,075 cords of pulpwood was reported by 241 establishments, an increase of 251,517 cords, or 5 per cent, over the estimated total consumption in 1916. The production of wood pulp totaled 3,509,-939 tons—an increase of 74,988 tons, or 2 per cent, over 1916.

DISEASES OF PLANTS.

Handbook of plant disease and pest control, R. E. Smith, E. O. Essig, and G. P. Gray (*California Sta. Circ. 204 (1918), pp. 36*).—Lists are given of the more common diseases and animal pests to which economic plants are subject, with suggestions for their control. Sections are included on formulas for the preparation of insecticides and fungicides.

Histological studies on potato leaf roll, E. F. Artschwager (*Jour. Agr. Research [U. S.], 15 (1918), No. 10, pp. 559–570, pls. 12*).—The results are given of cooperative investigations carried on by the Bureau of Plant Industry, U. S. Department of Agriculture, and the experiment station at Cornell University on the histology of potato leaf roll as a means for the identification of the disease.

Anatomical studies of both European and American leaf roll failed to show a distinct correlation with the external symptoms exhibited by the plant. Typical leaf roll plants which early show external symptoms often fail to exhibit extensive necrotic conditions, while plants affected with troubles apparently other than leaf roll often show pathological changes in phloem and cortex. There is believed to be reason to suspect that the development of necrotic tissues is not confined to plants affected with leaf roll but that it is common to the so-called degeneration troubles and perhaps to others also.

The pathological changes observed in connection with leaf roll are described at considerable length. The rolling of the leaves and the characteristic xerophytic appearance of the plant is said to be the resultant of many interrelated changes and processes. Such changes could not be produced by simple anatomical disturbances, nor can the results be explained on a merely mechanical basis.

Wart of potatoes: A disease new to the United States, L. O. Kunkel (*U. S. Dept. Agr., Bur. Plant Indus., 1919, pp. 14, figs. 4*).—A description is given of the wart disease of potatoes, due to *Chrysophlyctis endobiotica*, which was first reported in this country in September, 1918, by J. G. Sanders, of the Pennsylvania Department of Agriculture. The material upon which the report was based was received from Highland, Luzerne County, Pa. A survey of the region showed the disease in 27 cities and villages of Luzerne, Schuylkill, and Carbon Counties, Pa. With the exception of three points of infection, all the localities lie within a rather restricted area. The disease is supposed to have been brought from Europe in cargoes of potatoes received before 1912. The nature and seriousness of the disease are described and the proposed measures for its control are indicated.

Further data on the susceptibility of rutaceous plants to citrus canker, H. A. Lee (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 12*, *pp. 661–666*, *pls. 4*).—An account is given from the Bureau of Plant Industry, U. S. Department of Agriculture, of inoculation tests with *Pseudomonas citri* on 24 species representing 20 genera of the family Rutaceæ, which show that 19 of the species are susceptible to a greater or less degree. From this it appears that citrus canker is not limited to the genus Citrus, but has a wide range of hosts among the Rutaceæ. The investigations upon which this report is based were carried on mainly at the Lamao Experiment Station of the Philippine Bureau of Agriculture.

Pecan rosette in relation to soil deficiencies, S. M. McMurran (*U. S. Dept. Agr. Bul. 756* (*1919*), *pp. 11*, *figs. 4*).—Previous investigations (E. S. R., 32, p. 241) have shown that the pecan rosette is not associated with any definite parasite but is rather the result of physical, chemical, or biological causes. With this in mind, the author made a survey of a large number of pecan orchards on various types of soil and under varying conditions of cultivation and fertilization.

While somewhat contradictory results were noted, at least 90 per cent of the disease was observed under conditions which indicated a deficiency of humus, plant food material, and moisture. Some experiments were undertaken with mineral fertilizers, but where these were applied to young orchards located on poor soils the rosetted trees generally became worse under the treatment. In the fall of 1915, experiments were begun on three tracts of about 13 acres of pecans located in southern Georgia. One plat in each tract received stable manure alone at the rate of 20 tons per acre, a second plat stable manure at the same rate with 1 ton of cottonseed meal, and a third plat cottonseed meal alone at the rate of 1 ton per acre.

The results of the applications are given in tabular form for the seasons of 1915 and 1917, from which it appears that the application of organic fertilizers has greatly improved the condition of the trees so far as the rosette is concerned. Lime applied to a lot of trees was without effect in reducing rosette. Experimental and other evidence is considered to indicate that pecan rosette is a result of a deficiency of humus, fertility, and moisture supply.

Brown canker of roses caused by Diaporthe umbrina, A. E. Jenkins (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 11*, *pp. 593–600*, *pls. 3*, *figs. 3*).—The author, of the Bureau of Plant Industry, U. S. Department of Agriculture, gives a description of a canker of roses due to *D. umbrina* n. sp., which is said to be widely distributed, being known to occur in the District of Columbia, Virginia, West Virginia, Georgia, and Connecticut.

The causal organism produces cankers on the rose stems, the diseased areas being raw umber in color, sometimes surrounded by a purple border. Both the pycnidial and perithecial stages of the fungus have been produced in cultures, and the disease has been produced on roses with both the pycnosporic and ascosporic stages.

For the control of the disease, the author suggests the use of only healthy stock for planting, the removal and burning of diseased canes from affected gardens, and the application of a fungicide in the fall, again in the spring before the first symptoms appear, and during the growing season when the fungus is active.

Seedling diseases of conifers, C. HARTLEY, T. C. MERRILL, and A. S. RHOADS (*Jour. Agr. Research* [U. S.], *15* (1918), *No. 10, pp. 521–558, pl. 1*).—According to the authors, damping-off of coniferous seedlings is an important factor in the propagation of these trees, and the fact that a number of damping-off parasites are able to cause practically identical symptoms has led to a study both of damping-off and of other diseases which may attack seedlings of the same age. The present paper, a contribution from the Bureau of Plant Industry, U. S. Department of Agriculture, gives an account of the diseases which the authors found attacking seedlings up to the age of approximately two months.

Corticium vagum, *Pythium debaryanum*, and other oomycetes; *Fusarium moniliforme*, *F. ventricosum*, *F. solani*, and other species of Fusarium; *Trichoderma* spp.; and *Botrytis cinerea* have been isolated from damped-off conifers and are believed to cause the disease. Artificial inoculation on pines in autoclaved soils showed that the first three species were specially virulent parasites, and all except *Trichoderma* spp. gave more or less indication of parasitic ability in inoculation experiments.

For *C. vagum*, 12 coniferous hosts are listed. One strain of the organism was maintained in artificial cultures for eight years without perceptible loss of virulence. Marked differences in virulence between different strains were observed, but this is considered to bear little relation to the host from which the strain was isolated. There was no indication observed that passage through seedlings and reisolation resulted in any increase in virulence. *C. vagum* was found especially virulent in inoculations on sandy soils treated with sulphuric acid followed by lime. With the possible exception of *P. debaryanum*, *C. vagum* is considered the most important single damping-off parasite on conifers. Certain species of Fusarium are also believed to be important, while the remainder of the organisms mentioned above are rather unimportant.

Lists are given of other species of fungi which are observed in connection with damping-off of seedlings, but most of them were either weakly parasitic or present as saprophytes.

A large amount of the damage done by *C. vagum* and *P. debaryanum* is caused by the killing of the seed or seedlings before they appear above ground, such losses being often attributed to poor seed. Strains of Fusarium are less inclined to attack seedlings in this manner. Excessive heat, drought, or bending over may cause damage closely resembling damping-off, but this type of injury may usually be distinguished from the parasitic attack.

Parasitism, morphology, and cytology of Cronartium ribicola, R. H. COLLEY (*Jour. Agr. Research* [U. S.], *15* (1918), *No. 12, pp. 619–660, pls. 12, fig. 1*).—Results are given of studies on the parasitism, morphology, and cytology of *C. ribicola*, the investigations having been carried on in the Bureau of Plant Industry, U. S. Department of Agriculture. Considerable unpublished data are reported on the morphology and cytology of *C. ribicola*, and the interrelations of the parasite and its hosts, *Pinus strobus* and *Ribes* spp., are described.

The mycelium of the fungus is said to be more abundant in *P. strobus* than in species of Ribes, and in the former host the hypæ force the cortex and phloëm cells apart, thus causing a swelling of the infected bark. The destructive effect on the pine host resulting from the attack of *C. ribicola* is said to vary. In young trees death may result quickly, while in older ones the attack is in the nature of a primary injury which may prepare the way for the drying out of the infected bark and the entrance of secondary fungi and insects which complete the destruction initiated by the fungus attack. The effect on Ribes varies with the species attacked, and may result in early defoliation and a consequent poor crop, but in general it is not serious on this host.

New researches on the variability of plantation Para rubber, B. J. Eaton (*Jour. Soc. Chem. Indus., 36 (1917), No. 23, pp. 1217–1226*).—In connection with a large body of observations and deductions on other phases of rubber-curing technique, the author states that the formation of pigment, which is known as spot disease of rubber, requires the presence of moisture and air or oxygen for the development of the spores. The development of the organisms on a slow-curing crêpe rubber has little or no effect on its vulcanizing capacity in respect to its rate of curing, since thin crêpe contains none of the vulcanization accelerator present in slab crêpe. Such development of microorganisms in slab crêpe causes a marked retardation in the rate of cure, due supposedly to the utilization or alteration of the accelerator by the organisms. During the development of spot disease, a loss in gaseous form occurs of some constituent at present unknown. The antiseptic effect of smoke (that from coconut husks, for example, containing creosote products) retards, while high temperature accelerates, the rate of curing.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The rodents of Iowa, D. Stoner (*Iowa Geol. Survey Bul. 5 (1918), pp. 172, figs. 36*).—An account of 31 species of rodents occurring in Iowa, of which the pocket gopher (*Geomys bursarius bursarius*) is the most destructive, being responsible for an annual loss estimated at a half million dollars. Keys for the separation of the genera and species, a list of 40 references to the literature, and a subject index are included.

The rat.—Reference tables and data for the albino rat (Mus norvegicus albinus) and the Norway rat (M. norvegicus), H. H. Donaldson (*Mem. Wistar Inst. Anat. and Biol., No. 6 (1915) pp. V+278, figs. 32*).—The introductory part of this work treats of the rat as a laboratory animal, indicates the methods of gathering the data here presented, and also gives examples of the use of the tables. An outline of the classification and early records and migrations of the common rats are also included. Part 1 (pp. 19–186) deals with the biology, heredity, anatomy, physiology, and growth of the domesticated albino rat; and part 2 (pp. 189–213), with the life history, distinguishing characters, and growth of the wild Norway rat.

A 53-page list of references to the literature and a subject index are included.

The rat and infantile paralysis.—A theory, M. W. Richardson (*Amer. Jour. Pub. Health, 8 (1918), No. 8, pp. 564–579, figs. 12*).—The data presented in this second contribution (E. S. R., 36, p. 354), which are based particularly upon observations made during the epidemic in New York City in 1916, have led to the following conclusions:

"Although the virus of infantile paralysis has been demonstrated in the secretions and excretions of persons sick with the disease and healthy third persons who have or have not been in contact with patients, and although such secretions and excretions may in animal experiment remain active for many months, the epidemiological facts are strongly against the theory that infantile paralysis is spread from person to person by direct or indirect contact. On the other hand, the epidemiology of infantile paralysis corresponds so remarkably with that of bubonic plague, a disease known to be due to the rat and flea, that it can be stated with great probability that human infantile paralysis is due to a precedent and underlying infection of rodents.

"As with bubonic plague, final proof as to the rôle of the rat and flea in infantile paralysis must rest in elaborate laboratory investigation."

Description of a new seaside sparrow from Florida, A. H. Howell (*Auk, 36 (1919), No. 1, pp. 86, 87*).

[Contributions on economic insects] (*Ztschr. Angew. Ent., 4 (1917), No. 1, pp. 188, figs. 17*).—The papers here presented include the following: The Fight against the May Beetle and White Grub, with Particular Consideration of Their Bird Enemies, by K. Loos (pp. 1–15); The Wheat Bulb Fly (*Hylemyia coarctata*), Present Year Observations in Pommern, by R. Kleine (pp. 16–24); The Temperature of the Bee Hive during Winter, by E. Zander (pp. 25–30); Effect of Heat upon the Body Louse, by E. Martini (pp. 34–70); The Relation of Ants to Man and Their Agricultural Importance, by H. Stitz (pp. 71–128), which includes a bibliography of eight pages; The Use of Hydrocyanic Acid Gas against the Mediterranean Flour Moth, by H. W. Frickhinger (pp. 129–140); The Winter Moth Problem (*Cheimatobia brumata*), by K. Escherich (pp. 141–145); The Woolly Apple Aphis Problem (pp. 145, 146); Combating Bark Beetles (*Anisandrus dispar*) in Fruit Orchards with Carbon Bisulphid pp. 147, 148); etc.

On the insect visitors to the blossoms of wild blackberry and wild spirea.—A study in seasonal distribution, M. W. Blackman (*Syracuse Univ. [Pubs.], 18 (1918), No. 4, pp. 119–144, fig. 1*).—This report is based upon collections made in large part during July and August in 1913, 1914, 1915, and 1917, in the Catskills and the western Adirondacks.

A revised check list of the British terrestrial Isopoda (wood lice), with notes, W. E. Collinge (*Jour. Zool. Research, 3 (1918), No. 1, pp. 31–43*).—In this revision of an earlier check list[1] the author recognizes 35 species and 59 varieties.

The pear thrips (Tæniothrips inconsequens) and its control in British Columbia, A. E. Cameron and R. C. Treherne (*Canada Dept. Agr., Ent. Branch Bul. 15 (1918), pp. 51, figs. 22*).—This is a report of extended studies of this pest, formerly known as *Euthrips pyri*, in British Columbia, a brief account of which by the authors has been previously noted (E. S. R., 38, p. 259). Studies of this species in California by Moulton (E. S. R., 21, p. 755) and by Foster and Jones (E. S. R., 24, p. 455) have also been previously noted.

"The emergence from the soil continues up to the middle of April, the maximum number appearing from April 1 to 14. This practically coincides with the time of the bursting of the buds of the various fruit trees on Vancouver Island. The buds have barely opened when the adults enter and feed on the young, delicate tissue of the developing parts within. Almost as soon as the leaves and blossom pedicels appear the adults begin to lay their eggs. The first eggs are generally laid about the middle of April and the last about the middle of May. The period of maximum oviposition usually extends from April 24 to May 7. Eggs are laid in largest numbers on the petioles and midribs of the leaves, on the outer surface of the calyxes of the young fruit, as well as on the fruit stems. They require about 5 to 17 days to hatch, and it is probable that the great majority hatch in about 14 days under the conditions prevailing on Vancouver Island.

"Prunes, plums, and cherries, which are more tardy in their development than apples and pears by almost a week, are attacked later by migrating individuals. The damage, which is effected on the buds of these first, is proportionally greater than what obtains on apples and pears. It is well to bear in mind that the most serious damage to the trees is associated with the buds just after bursting and before blossoming.

[1] Scot. Nat., 1917, pp. 111–116.

"The larvæ make their first appearance at the beginning of May and are to be found on the trees until the middle of June. In great abundance they occur inside the calyx cup of the blossoms, lacerating its tender tissue and feeding on the nectar. They are also to be found on the back of the leaves, shaded from the sun, busily sucking the leaf juices. When at rest, they are generally to be found ranged along each side of the midrib and chief veins. When the larvæ attack the young fruit in numbers they cause a 'russetting' of the skin which is known as 'thrips scab.' They appear in maximum numbers from May 20 to June 5. The individuals remain on the trees for about three weeks before they are fully fed."

Control work in 1916 and 1917 shows that it can be readily controlled through spraying twice before blossoming and once after. "Usually the first application is made on a bright, warm day in spring after the buds have just begun to burst. The second may be made in the week preceding the period of maximum bloom. The third spray is directed against the larvæ in the calyx cups and on the leaves just after the fall of the petals. It has been demonstrated that for the first application the best results attend the use of miscible oil No. 2 in combination with nicotin sulphate. Whale-oil soap, also combined with nicotin sulphate, is the most suitable and economical for the second and third sprays. Lime-sulphur has been shown to possess very poor penetrative and spreading qualities, hence its potency as a controlling agent for thrips is merely confined to those insects with which it comes into direct contact. Therefore it should only be used to replace the second and third application of whale-oil soap in cases of light infestation and where it has been found necessary to undertake control measures for 'scab.'

"On no account must it be inferred that the first application of miscible oil can be dispensed with. Miscible oil, by reason of its greater powers of penetrating the young buds, has been found to be the best remedial agent in the first spraying. The use of whale-oil soap at this time, whilst often satisfactory, is less effective than the oil."

Control of the onion thrips, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 1007 (1919), pp. 16, figs. 11*).—A summary of information on the onion thrips, including its distribution, life history and habits, and methods of control.

Kerosene-soap emulsion and fish-oil soaps applied as sprays afford some relief, but nicotin sulphate (40 per cent) used at the rate of ¾ pint to 50 gal. of water, plus 4 lbs. of soap, is considered the best direct remedy. The author recommends that spraying be begun as soon as the adult thrips can be seen in any numbers or the characteristic whitening of the leaves is in evidence, and that the sprays be applied under a pressure of at least 100 lbs. Early cabbage and cauliflower should not be planted next to onion fields, for they serve as host plants for the thrips. Fields should be cleaned up after onion, cabbage, and related crops are harvested, as the thrips continue to breed on any living portion of these plants and on almost any kind of weeds that remains in the field. After harvest the fields should be plowed as deeply as possible and harrowed and again in the spring if onions are to be grown anywhere in the vicinity. The seed should be planted as early as possible and quick-acting fertilizers applied.

The possible spread of influenza through the bedbug, G. A. Friedman (*Med. Rec. [N. Y.], 95 (1919), No. 1, pp. 14–18*).—The similarity of influenza to sporadic typhus, an insect-transmitted affection which has occurred for many years in New York City where it is known as Brill disease, is pointed out.

In countries where sporadic typhus is common, it is frequently confounded with influenza in adults and with measles in children because of the respiratory disturbances common in all three diseases. A comparison of the toxemia observed in the influenza epidemic with the toxemia observed in severe typhus indicates that influenza, like typhus, is essentially a blood infection and not a primary respiratory infection. The toxemia observed in the last influenza epidemic was so severe that in many cases it caused death on the second or third day after the onset. Attention is called to the fact that there are localities in certain countries where influenza is endemic, as was found to be the case in Russia in 1890 when investigated by the French Minister of Public Instruction.

It is pointed out that the bedbug is quite universally distributed, and that influenza may be transmitted by it is contended by the author.

A list of 26 references to the literature is appended.

The periodical cicada or seventeen year locust, E. N. Cory (*Md. Col. Agr. Ext. Serv. Bul. 14 (1918), pp. 11, figs. 10*).—A brief popular account of the periodical cicada which calls attention to the fact that it is due to occur in the spring of 1919.

Late dormant v. delayed dormant or green tip treatment for the control of apple aphids, W. S. Regan (*Massachusetts Sta. Bul. 184 (1918), pp. 47–57*).—The results of comparative tests by the author, here reported, have been summarized as follows:

"The delayed dormant period is usually indicative of the complete hatching of apple aphid eggs. At this time the buds have expanded from 0.25 to 0.5 in.

"Lime-sulphur solution at full dormant season strength is less than 10 per cent effective against the living aphids when applied at the delayed dormant period. Lime-sulphur applied at the late dormant period, before the buds split open and just before the hatching of the aphid eggs, appears to be highly effective, under favorable conditions, in destroying the eggs, but the elements of thoroughness of application and unfavorable meteorological conditions present such uncertainty as to results that this treatment can hardly be recommended as an effective control. If lime-sulphur is to be used as a control for San José scale and no special treatment for apple aphids is to be made later, best results against aphids, if present, are likely to be obtained by a late dormant-season application just before the eggs hatch. Treatment at this time should also be thoroughly effective against the scale.

"The application of the lime-sulphur (1:8) and nicotin sulphate (1:800) combination applied at the delayed dormant period gives practically a perfect control for apple aphids, and makes unnecessary a separate earlier application of lime-sulphur for San José scale. The percentage of efficiency will depend mainly upon thoroughness of application. The ordinary dormant-season treatment of apple orchards with miscible oil against San José scale, if applied thoroughly at the delayed dormant period, should result in practically a perfect control of apple aphids also.

"Delayed dormant applications of full dormant-season strength lime-sulphur, lime-sulphur and nicotin sulphate combined, and miscible oils, if perfect, can be made without material injury to apple foliage. Even when the foliage is considerably more advanced, little severe injury usually results. This fact, if taken into account, might make unnecessary separate applications for early and late budding varieties. As the foliage becomes more advanced, however, the success of the treatment involves greater difficulty, since the aphids are very difficult to reach when they have the spreading leaves for protection.

"The action of lime-sulphur in destroying both the aphid eggs and living insects appears to be mainly mechanical, by sticking them to the twigs. The action of nicotin sulphate in killing the living aphids is slow, requiring from about half an hour to 24 hours or more for different individuals. Death appears to be due to paralysis. Miscible oils are practically instantaneous in their killing action against the living aphids. The action is probably of a chemical nature."

A list of 11 references to the literature is included.

The present conditions of lac cultivation in the plains of India, C. S. Misra (*Agr. Jour. India, 13 (1918), No. 3, pp. 405–415, pl. 1*).—A discussion of the present status of the lac (*Coccus lacca*) industry.

Trench fever.—A report of clinical observations and research as to the etiology, pathology, prophylaxis, and treatment of trench fever among troops, W. Byam et al. (*Jour. Amer. Med. Assoc., 71 (1918), Nos. 1, pp. 21–26; 2, pp. 110–113; 3, pp. 188–193*).—This is a detailed report of investigations of trench fever at Hampstead, England, in which the clothes or body louse was shown to be the active agent in its transmission. A summary of the evidence obtained from the experimental work is as follows:

"The whole blood from febrile trench fever cases, up to the fifty-first day of disease, when injected intravenously, is capable of reproducing the disease. The incubation period in such infections varies greatly—from 5 to 20 days. The virus as contained in the circulating blood is destroyed by the addition of distilled water in large quantities.

"The bites alone of infective lice do not produce trench fever. The excreta of infective lice when applied to a broken surface of skin do readily produce trench fever. The incubation period of such infections is remarkably constant, and averages 8 days. The excreta passed by lice and fed on trench fever patients are not infective till the expiration of not less than 7 days from the commencement of the feeding on trench fever blood, thus indicating a developmental cycle in the louse or a period during which the organism multiplies.

"Once lice are infective, they remain so till at least the twenty-third day from the date of their infection. The virus of trench fever as contained in infected louse excreta is capable of withstanding drying at room temperature, exposure to sunlight, keeping for not less than 16 days, and heating to 56° C. [132.8° F.] for 20 minutes. A temperature of 80° for 10 minutes destroys the virus, which is therefore not a spore-bearing organism. The bodies of infected lice when crushed on the broken skin are capable of producing trench fever. When lice become so infective remains to be determined.

"Active trench fever blood equivalent to the content of 11 lice does not produce trench fever when rubbed into the broken skin. Infection probaly does not take place by the mouth or by inhalation. The excreta of lice are not normally capable of producing trench fever. Trench fever infected lice do not transmit the disease to their offspring. Some attacks of trench fever may be afebrile throughout.

"The percentage of individuals naturally immune to trench fever is exceedingly small. Old age is no bar to infection. Such immunity as results from an attack of trench fever is not permanent, and may persist only for so long as the individual shows evidence of the disease. Even as late as the seventy-ninth day of disease a patient's blood may remain infective and be capable of infecting lice fed on such a patient while febrile. The different varieties of trench fever result from differences in the persons infected rather than in the source of infection."

The transmission of relapsing fever by the body louse, J. Koch (*Deut. Med. Wchnschr., 43 (1917), p. 1066; abs. in Rev. Bact., 8 (1918), No. 3, p. 85*).—During the course of investigations of the transmission of the spirochete of recurrent fever by *Pediculus vestimenti* the author found spirochetes in the lice from 16 individuals, or in 26 per cent of those examined. The large number of spirochetes present and their peculiar arrangement and grouping led him to believe that multiplication takes place in the lice, and that the latter are not mere transmitters but true hosts of *Spirochæta recurrens*.

Government report on laundry machinery.—Its adaptability to various requirements of disinfection and disinsection, W. D. Pierce, R. H. Hutchison, and A. Moscowitz (*Reprint from Nat. Laundry Jour., 81 (1919), No. 1, pp. 4–14*).—This is a report of a series of experiments conducted by agents of the Bureau of Entomology of the U. S. Department of Agriculture with a view to determining whether the regular processes used in the laundry establishments of the Army are sufficient to insure control of the body louse, with consideration in each case of the question of shrinkage of woolens. The results of the experiments, here reported in detail, led to the following recommendations:

"In the washer run a current of live steam 15 minutes, revolving cylinder every 5 minutes and discharging water of condensation every 5 minutes. Remove the garments and shake until almost dry. This requires only a few shakes. Submerge in water at 165° F. for 20 minutes without motion, except a few revolutions every 5 minutes. Wash 15 minutes at 131° in heavy suds and light load. Rinse 3 times, 3 minutes each, at 131°. Extract. Run in tumbler 15 minutes, at a minimum of 140°. We advise live steam or very hot soaking only in cases where there is no heated tumbler available, or where the garments are suspected of being contaminated with very resistant spore-bearing bacteria. In other words, we recommend the usual laundry methods for the disinfection and disinsection, because of their added value of cleansing. There can be no doubt that the ordinary processes of the laundry will kill all lice and their eggs, and probably all insect life.

"We have proved that woolens can be treated with temperatures which will kill lice and bacteria without undue shrinkage—that is, 131°. Washing in heavy suds, with motion; 165° soaking, without motion; live steam, without motion, except occasionally to remove water of condensation; dry tumbling of wet garments, do not cause undue shrinkage of woolens.

"The overseas mobile laundry unit is a completely satisfactory delousing and sterilizing unit for all garments and bedding. The same is even more true of the cantonment laundries because of their very nature, which permits of added facilities for finishing the garments."

The birch case bearer (Coleophora fuscedinella) in Sweden, 1915–1917, N. A. Kemner (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 161 (1917), pp. 28, figs. 20; K. Landtbr. Akad. Handl. och Tidskr., 56 (1917), No. 7–8, pp. 637–660, figs. 20; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 5, p. 648*).—This elachistid caused considerable damage to birch trees in 1915 and 1916 by attacking the buds and foliage, and injury was also caused to pear, apple, *Sorbus aucuparia*, oaks, etc. The pest rapidly decreased in numbers in 1917, due largely to its natural enemies, a list of which is given.

A list of 15 references to the literature is included.

Olethreutes variegana, a microlepidopteran injurious to fruit trees in Italy, A. Sabra (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 12 (1918), pp. 175–187; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 5, pp. 645, 646*).—A report of morphological and biological studies of a lepidopteran which attacks common medlar, almond, mahaleb, plum, apricot, and apple trees in the districts of Santeramo Colle (Apulia) and Matera (Basilicata), Italy. It occurs in central and southern Europe, Livonia, Finland, Sweden, and Asia Minor. Studies of its parasites have shown five species to act as important checks.

nizes 349 species of Sphecoidea which occur in Nebraska. These wasps are of economic importance in that the adults provision their nests with other insects, most of which are more or less destructive.

On Braconidæ parasitic on Diatræa saccharalis in Demerara, R. E. Turner (*Bul. Ent. Research, 9 (1918), No. 1, pp. 81, 82*).—The author reports having reared three hymenopterous parasites from the sugar cane borer in Demerara, namely, *Ipobracon grenadensis* Ashm., previously recorded[1], and *I. saccharalis* and *Microdus diatrææ*, here described as new.

Key to American insect galls, E. P. Felt (*N. Y. State Mus. Bul. 200 (1917), pp. 310, pls. 16, figs. 250*).—The main part of this work (pp. 15–214) consists of a key to the families and species of plants by means of which galls can be identified. In the case of host plants infested by numerous gall insects, additional divisions are made according to the location on the plant and the structure of the galls. Drawings of the galls are given in the text, and photographs of galls are reproduced on appended plates.

In a tabulation of the hosts and galls (pp. 215–228) 1,441 species are listed, 682 being gall midges and 445 gall wasps. A tabulated synopsis of American gall makers (pp. 229–231) and an annotated bibliography (pp. 232–241) arranged chronologically follow. A complete index is included.

Dwarfing effect of attacks of mites of the genus Eriophyes upon Norway maples, H. E. Enders (*Proc. Ind. Acad. Sci., 1917, pp. 79–84, figs. 4*).—The author discusses the peculiar dwarfed and somewhat blighted condition of a portion of the branches of Norway maple trees in the vicinity of Hershey, Pa., as observed during August, 1917.

The cercaria of the Japanese blood fluke, Schistosoma japonicum, W. W. Cort (*Univ. Cal. Pubs. Zool., 18 (1919), No. 17, pp. 485–507, figs. 3*).—This is a report of studies of the larval stages of *S. japonicum* obtained from living specimens of the Katayama snail (*Blanfordia nosophora*) from Kyoto, Japan.

The developmental cycle of Trombidium akamushi according to the recent researches of the Japanese investigators, Miyashima and Okumura, G. Teodoro (*Redia, 13 (1918), No. 1–2, pp. 105–114; abs. in Rev. Appl. Ent., Ser. B, 6 (1918), No. 10, pp. 187, 188*).—This relates to the article previously noted (E. S. R., 39, p. 870).

FOODS—HUMAN NUTRITION.

The newer knowledge of nutrition, E. V. McCollum (*New York: The Macmillan Co., 1918, pp. IX+199, pls. 11, figs. 16*).—A series of lectures, most of which have been noted from other sources, delivered by the author at the Harvard Medical School, and with subjects as follows: The biological method for the analysis of a foodstuff; experimental scurvy and the dietary properties of vegetables; the vegetarian diet; the foods of animal origin; the diseases referable to faulty diet, or the so-called "deficiency diseases"; the nursing mother as a factor of safety in the nutrition of the suckling; and practical considerations which should guide in the planning of the diet.

Physiological chemistry, F. G. Hopkins (*Ann. Rpts. Prog. Chem. [London], 14 (1917), pp. 171–196*).—In this section of the Annual Reports on the Progress of Chemistry for 1917 (E. S. R., 40, p. 109) the following subjects are discussed: The alkaline reserve of the body, some aspects of nutrition, the growth process—endogenous catalysts, chemistry of bacterial growth, the pancreas and diabetes, guanidin and tetany, and formation of pigment in the skin.

A national laboratory for the study of nutrition (*Brit. Med. Jour., No. 3019 (1918), pp. 520, 521; abs. in Science, n. ser., 48 (1918), No. 1252, pp. 650,*

[1] Ann. and Mag. Nat. Hist., 8. ser., 20 (1917), No. 117, p. 244.

651).—This discusses the resolution adopted by the Inter-allied Scientific Food Commission urging the allied governments to establish national laboratories for the study of human nutrition.

The interrelations of animals and plants and their influence upon the food supply of man, R. W. HEGNER (*Sci. Mo., 6* (*1918*), *No. 5, pp. 467–473*).—This article cites many illustrations of the interrelations of animals and plants with special reference to their influence on the food supply of man. The author concludes that there should be an increasing realization of how dependent we are upon wild animals and plants for our food supplies, and how important it is that steps should be taken for their conservation.

The food value of fresh-water fish, GUENAUX (*Vie Agr. et Rurale, 7* (*1917*), *No. 35, pp. 155, 156*).—This is a brief discussion of the food value and digestibility of several kinds of fresh-water fish.

A bacteriologic study of sardines, M. M. OBST (*Jour. Infect. Diseases, 24* (*1919*), *No. 2, pp. 158–169, figs. 3*).—This article deals with the bacteriological results obtained during the studies of Weber and Wilson previously noted (E. S. R., 40, p. 411).

The swelling of processed cans of sardines is considered to be caused by an anaerobic spore-forming organism which is probably identical with *Bacillus walfischrauschbrand*. This organism was isolated from factory dirt, from gills of the herring, from feed (schizopods and copepods) found in the stomach and intestines of the fish where it had produced gas, and from the thoracic and digestive portions of the schizopods and copepods as taken from the water. Another organism, Bacillus B., also found in the feed, especially in the copepods, proved to be pathogenic in peritoneal inoculation (guinea pig) and to produce gas in protein medium containing blood. This organism is killed at 65° C. (149° F.) in 20 minutes.

It is considered that the fish, while massed together in boats during transportation from the weirs to the cannery, develop enough heat to permit rapid growth of these organisms with the production of gas. As the digestive tract of the herring was usually found sterile when no feed was present, it is thought that the danger of spoilage from these organisms would be partially reduced by holding the fish in pounds until free from feed and would be prevented by removal of heads, gills, and viscera. Both organisms appear to be killed by heating to 240° F. for 8 minutes if no fish are allowed to overlap, but *B. walfischrauschbrand* in sealed cans will survive 1½ hours in a boiling tank if a portion of the can is exposed.

Reptiles as food, A. M. REESE (*Sci. Mo., 5* (*1917*), *No. 6, pp. 545–550*).—The author calls attention to the possibilities of utilizing to a greater extent as food certain reptiles, such as different varieties of turtles, lizards, alligators, and crocodiles.

Relation between the weight of the bones and meat of beef cattle, DECHAMBRE (*Compt. Rend. Acad. Agr. France, 4* (*1918*), *No. 1, pp. 25–28*).—Tables are given showing the proportions of bone, meat, fat, and refuse in a large number of beef quarters. The average ratio of bone to meat was found to be 19.18 : 100, this figure being influenced greatly by the fattening of the animals. In fat samples the ratio of bone to meat was 16 : 100, in samples in ordinary condition 20 : 100, while in those of inferior grade the ratio was 22 : 100.

Influence of the principal constituents of sweetened condensed milk upon its nutritive and therapeutic effects, P. LASSABLIÈRE (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 14, pp. 764–767*).—This is a study of the nutritive value of unsweetened and sweetened condensed milk, sterilized milk, and milk powder as determined by feeding experiments with infants of the same age. The results indicate that sweetened condensed milk is superior to the other varieties of milk employed, both in its effect upon growth in normal infants and in its therapeutic effect in gastrointestinal troubles.

A diffuse bacterial alteration of bread, R. Perotti and J. Comanducci (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 27 (1918), I, No. 7, pp. 258–261*).—An investigation of ropy bread is reported, leading to the conclusion that the causative organism is similar to *Bacillus mesentericus vulgatus*, perhaps identical with *Bacterium mesentericus*, and somewhat different from *Bacterium panis*. As the vehicle of the infection appears to be infected yeast, the authors recommend the careful control of the preparation of the yeast and the sterilization of all the utensils employed in the bread making.

The digestibility of bread and the best utilization of wheat, G. Bertrand (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 14, pp. 438–440*).—The author, on the basis of data obtained from the investigations of Snyder and others on the digestibility and nutritive value of bread, has calculated coefficients of digestibility for protein and energy of bread made from flour of 72, 85, and 100 per cent extraction. The coefficients were obtained by multiplying the loss of material and of energy which each flour underwent during the passage through the body by the extraction figures of the flour. The following coefficients were obtained: Bread from flour milled at 72 per cent, protein 64.33, energy 66.27; from flour milled at 85 per cent, protein 69.28, energy 74.19; and from flour milled at 100 per cent, protein 76.84, energy 82.59.

The author considers this an argument in favor of highly milled flour for human consumption.

Experiments on the milling of wheat substitutes, Balland (*Compt. Rend. Acad. France, 4 (1918), No. 20, pp. 614–617*).—Tables are given of the percentage of flour, bran, grits, and waste in the milled products of beans, corn, African millet, barley, and buckwheat and of the composition of the different products.

Barley flour in the making of bread, C. V. Garola (*Vie Agr. et Rurale, 7 (1917), No. 37, pp. 195–197*).—This is a brief report of a study of the use of rye and barley in bread making. Analyses are given of wheat, rye, and barley flours and of breads made from wheat alone, from wheat and barley, and from wheat, barley, and rye.

The conclusion is drawn that barley or rye flour can be substituted for 50 per cent of the wheat flour without diminishing the nutritive value, good appearance, or taste of the bread. Owing to the insufficient supply of rye in France, the proportions recommended are 50 per cent of wheat, 8 per cent of rye, and 42 per cent of barley flour.

Potato bread, E. Maurel (*Vie Agr. et Rurale, 8 (1918), No. 8, pp. 132–134*).—The results are reported of observations upon bread made from wheat flour milled to 85 per cent and cooked potato pulp, the latter in increasing amounts of from 10 to 50 per cent.

All these breads were found to be well risen and elastic, to remain fresh for a long time, and to have a pleasing odor and taste. The author suggests that the slightly decreased nutritive value may be compensated by the introduction of a small amount of bean flour. The use of potatoes in bread making is considered to be practical in large public bakeries and also in the home bakery.

The use of potatoes in bread making, A. Arnal (*Vie Agr. et Rurale, 8 (1918), No. 21, pp. 364–366*).—In the method described raw potatoes are grated and added to the flour in the proportion of 20 kg. of potatoes to 80 kg. of flour. The bread obtained is said to be very white and not to differ from ordinary bread in taste or appearance.

Alleged poisoning by potatoes, F. W. Harris and T. Cockburn (*Amer. Jour. Pharm., 90 (1918), No. 10, pp. 722–726*).—A food poisoning outbreak in Glasgow in 1917 is reported which is considered to have been caused by potatoes. As samples of the potatoes used showed evidence of sprouting, their content of solanin was determined and found to be from five to six times the amount which is found in normal, unsprouted potatoes. This is in accord with the results obtained by Meyer (E. S. R., 7, p. 749) with sprouted potatoes. A similar epidemic in Germany in 1899 is cited which was also attributed to potatoes containing excessive amounts of solanin.

In view of these facts the authors emphasize the necessity for caution in the use of potatoes which have begun to sprout.

Production of popped rice in China, T. Sammons (*U. S. Dept. Com., Com. Rpts., No. 12 (1918), p. 182*).—A reprint from an article published in the *North China Daily News*, describing the process of popping rice. The annual production is estimated at about 50 tons. Usually the rice is colored either red or yellow and is made up into various confections. The uncolored variety is often used as a breakfast dish or porridge.

The digestibility of soy bean meal by man, J. F. Lyman and W. G. Bowers (*Ohio Jour. Sci., 18 (1918), No. 7, pp. 279–284*).—Two 3-day experiments with soy-bean meal fed as a part of an ordinary mixed diet are recorded. In the first experiment the soy-bean meal was mixed with wheat flour and made into a yeast-raised bread; in the second the soy-bean meal was prepared as a porridge by cooking for 5 hours in a double boiler.

The digestibility coefficients obtained in the two experiments were as follows: Protein, 91.3 and 90.9 per cent, and carbohydrate 96.9 and 96 per cent, respectively. The carbohydrates, in addition to having a higher digestibility than the carbohydrates of the common white bean, were found also to be less prone to intestinal fermentation.

Substitutes for native beans in the food of the French Army, Balland (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 26, pp. 740–744*).—Analyses of foreign legumes, including beans from various countries, peas, chick-peas, dolichos, and voandzeia, are reported and discussed.

The uses of the peanut on the home table, J. R. Arms (*Fla. State Col. for Women, Dept. Home Econ. Bul. 17 (1917), pp. 16*).—The food value of the peanut is compared with that of other staple foods, and recipes for its greater utilization are given.

The Hawaiian taro as food, V. MacCaughey (*Hawaii. Forester and Agr., 14 (1917), No. 9, pp. 265–268*).—The author states that taro has a much lower moisture content than either Irish or sweet potatoes, a higher fat content, a lower protein content, and more than twice as much starch as the Irish potato and nearly 50 per cent more than sweet potatoes. An analysis is reported, and the uses of taro are discussed.

A study of Dioscorea with starch determinations and cooking tests, L. S. Clemente (*Philippine Agr. and Forester, 6 (1918), No. 8, pp. 230–246*).—This paper records the results of starch determinations of varieties of yams used as food before, during, and after maturity, and includes the complete analyses of 12 representative varieties at maturity. It also discusses the comparative cooking and table qualities.

Possibilities of gulaman dagat as a substitute for gelatin in food, A. H. Wells (*Philippine Jour. Sci., Sect. A, 11 (1916), No. 6, pp. 267–271*).—This seaweed, which grows throughout the Philippine Archipelago, is used in two ways as food. Washed free from salt water it is boiled and eaten as a salad, and the sun-bleached, dried material is marketed as a cheap substitute for gelatin.

Gelatin, however, contains about 17.9 per cent of nitrogen while gulaman dagat contains less than 1 per cent. It is equally low in all other nutritive substances, and can be used as a substitute for gelatin only when the physical properties of gelatin are important. Owing to its low crushing pressure it is unsuitable for use in bacteriological work.

Egg substitutes and so-called egg savers, C. H. LaWall (*Penn. Dept. Agr. Bul. 314* (*1918*), *pp. 7–18*).—Descriptions and analyses of 42 egg substitutes and so-called egg savers are given. Their composition was found in no way to resemble that of egg, most of them being composed chiefly of cornstarch or other starches, artificially colored.

Analytical data in regard to Argentine honey, A. O. Raffaelli (*An. Soc. Quim. Argentina, 6* (*1918*), *No. 27, pp. 429–441*).—Physical and chemical analyses of 30 samples of honey are reported and discussed.

Adulteration of yerba maté, C. D. Girola (*An. Soc. Rural Argentina, 51* (*1917*), *No. 9, pp. 692–705; 52* (*1918*), *Nos. 1, pp. 29–53; 2, pp. 102–110, figs. 28*).—This article includes a summary of information in regard to the characteristics of yerba maté and other plants which can be used as substitutes or adulterants, and a review of chemical and histological investigations for the purpose of detecting adulteration.

The author concludes that at present there does not exist a complete method of easy and rapid application for determining the purity of yerba maté, that consequently the consumer should be protected by legislation controlling the substances to be used as substitutes, and that such mixtures or substitutes should be plainly labeled. A strict supervision of the preparation of yerba maté is also recommended.

Jelly making with sugar savers, L. W. Adams and E. Loflin (*Jour. Home Econ., 10* (*1918*), *No. 11, pp. 503–510*).—From the results of experiments, the authors conclude that honey, glucose, corn sirup, sorghum, or corn sugar may be used in jelly to replace part or all of the sugar. The substitution which is recommended, however, is 50 per cent. Although the sweetening powers of the various sirups vary, all of them are said to produce acceptable jellies.

Kitchen tests for pectin in jelly making, M. C. Denton (*Jour. Home Econ., 10* (*1918*), *No. 11, pp. 520, 521*).—The author discusses a pectin test in which one-half teaspoon of sugar and one-fourth teaspoon of Epsom salts are added to one teaspoon of the fruit juice and stirred until dissolved. If the juice is a good jellying juice the mixture will set into a jelly within five minutes. The test has proved more or less satisfactory with apple, crab apple, plum, quince, and cranberry juices.

The effect of heat on the spores of Bacillus botulinus.—I, Its bearing on home canning methods, G. S. Burke (*Jour. Amer. Med. Assoc., 72* (*1919*), *No. 2, pp. 88–92*).—Experiments to determine the effect of heat on the spores of *B. botulinus* are reported, from which the following conclusions are drawn:

Free spores of *B. botulinus* grown in either broth or brain cultures are highly resistant to heat, particularly those grown in brain cultures. Exposure of the spores to a temperature of 100° C. or more inhibits the development of the spores, so that the incubation time is very much increased, but resistant spores will survive in boiling liquid for three hours or more.

In applying the results to the various canning methods, the author concludes that the methods of canning by boiling the fruit or vegetables in an open kettle and sealing in clean jars, by the cold-pack (one-period) method, and by fractional sterilization on three successive days can not be relied upon to destroy the more resistant strains of *B. botulinus*, and that consequently pressure canning with a comparatively long sterilization period is the only method of sterilization that at present can be considered safe.

The use of sound fruit and clean methods of handling are considered to be the most important factors in canning to prevent spores of *B. botulinus* from entering the jars. The illness caused by spoilage from *B. botulinus* is said to be due to the toxin that the organism produces after several weeks' or months' growth in a sealed jar. As this toxin is entirely destroyed by boiling for five minutes, it is recommended that canned goods that are in the least suspicious should be boiled for five minutes before being eaten.

[Food and drug topics], E. F. LADD and A. K. JOHNSON (*North Dakota Sta. Spec. Bul., 5 (1918), No. 7, pp. 171–176*).—These pages include a review by F. W. Christensen of the article by McCollum, previously noted (E. S. R., 40, p. 463), a reprint of an article on "foodless" food substitutes, and several analyses of spirits of camphor.

[Food and drug inspection], F. A. JACKSON ET AL. (*Ann. Rpt. Bd. Food and Drug Comrs. R. I., 9 (1917), pp. 41*).—This is the usual report of the board of food and drug commissioners for the year ended December 31, 1917. The results of the inspection of dairies and the examination of samples of food and drug products are reported, as well as the standards of purity adopted for certain food products.

Electric cooking appliances, R. G. KLOEFFLER (*Kans. State Agr. Col. Bul., 1 (1917), No. 20, pp. 71, figs. 27*).—A discussion of the history and advantages of electric cooking. Various lamp socket devices and electric ranges are illustrated and their efficiency and cost considered.

The author concludes that, while with all of these satisfactory results are obtained, electricity at present is an expensive form of fuel. He states that, with the rates prevailing at the time of his investigation (electricity at 3 cts. per kilowatt hour, artificial gas at $1 per 1,000 cu. ft., and coal at $8 per ton), "cooking by electricity costs approximately 100 per cent more than by gas or by coal."

One hundred points in food economy, J. G. RAMSAY (*London: G. Bell and Sons, Ltd., 1918, 5. ed., pp. 72*).—A simple treatise on foods written at the request of the British director general of food economy (minister of foods).

Food primer for the home, L. H. GILLETT (*New York: N. Y. Assoc. for Improving the Condition of the Poor [1918], pp. 19, figs. 9*).—The purpose of this book is to reduce the food problem to simple terms. It is essentially a reprint of material which has appeared in chart form.

Bibliography of food economy for the housewife, L. M. CLATWORTHY and L. W. HUNT (*State Col. Wash., Lib. Bul. 5 (1918), pp. 59, fig. 1*).—A bibliography for the use of librarians, extension and social workers, teachers, and lecturers in collecting printed information on food conservation.

The balanced ration [food chart], H. N. LAWRIE (*Portland, Oreg.: Author, 1918, pp. 2, figs. 4*).—This consists of a series of charts computed and compiled from various sources, showing the food requirement of different individuals under different conditions, the fuel value of 100 common foods, and a graphic method of menu building. Descriptive material is also included.

Basic quantity food tables to be used in determining the daily issue of food to the kitchen (*New York: Dept. Pub. Charities, 1917, pp. 120*).—Food tables designed to serve as a quick means of determining the quantity of various foods necessary for serving various classes in institutions are presented. Among the groups are officers and other employees, hospital patients, inmates of homes for the aged, tubercular patients, feeble-minded inmates and patients, children in hospitals, lodgers at the municipal lodging house, etc.

Conservation of food by substitution with suggestive menus (*East Lansing, Mich.: Ext. Div., Mich. Agr. Col. [1918], pp. 96*).—These menus were prepared with reference to emergency food conditions, and include a family of two adults and two families with three children each.

Food requirements and the menu, P. MacDonald and M. S. Pittman (*Penn. State Col. Ext. Circ. 65 (1917), pp. 24*).—A discussion of the food requirements and suggestions for menu planning are included in this bulletin.

Moderate cost menus and recipes from Florida food materials, N. Henderson (*Fla. State Col. for Women, Dept. Home Econ. Bul. 15 (1917), pp. 25*).—Menus composed exclusively of Florida food materials are given with recipes.

The Chinese cookbook, S. W. Chan (*New York: Frederick A. Stokes Co., 1917, pp. XIII+201, pls. 2, figs. 5*).—This contains recipes for the preparation of various Chinese dishes.

Handbook of the [Young Women's Christian] Association cafeteria, B. Geary (*New York: Nat. Bd. Y. W. C. A., 1917, pp. 99, pls. 2, figs. 14*).—Details are given pertaining to the equipment and operation of a cafeteria.

[Diet in the] home for incurables, Toronto (*Amer. Med., n. ser., 13 (1918), No. 6, p. 359*).—Information pertaining to the food used in this home. A diet list is included.

[Diet in the] house of industry, Toronto (*Amer. Med., n. ser., 13 (1918), No. 6, pp. 359, 360*).—A dietary for one week with extra diet for the sick is outlined. The cost of food is said to range from 7 to 10 cts. per capita.

Infant feeding, C. G. Grulee (*Philadelphia: W. B. Saunders Co., 1917, 3. ed., pp. 326, pls. 22, figs. 13*).—Part I of this book deals with the fundamental principles of infant nutrition; Part II, the breast-fed infant; Part III, artificial feeding; while Part IV discusses infant nutrition under abnormal or pathologic conditions.

The care and feeding of children, L. E. Holt (*New York and London: D. Appleton & Co., 1918, 9. ed., rev. and enl., pp. 219, figs. 2*).—Part I of this book deals with the care of children; Part II with infant feeding; Part III with the diet of older children; and Part IV contains miscellaneous information relating to the above subjects.

Army rations: A comparative study, W. H. Newcomb (*Amer. Med., n. ser., 13 (1918), No. 6, pp. 369–374*).—A brief summary and discussion of the army rations of various countries.

Feeding of troops (*Off. Internat. Hyg. Pub. [Paris], Bul. Mens., 10 (1918), No. 5, pp. 510–571; Rev. Hyg. et Pol. Sanit., 40 (1918), No. 4, pp. 570–594*).—This report of the third session in March, 1918, of the Commission on Sanitation of the Allied Countries discusses principally the army rations of the different countries represented.

The reform in army rations and national economy, F. Rho (*Ann. Ig. [Rome], 27 (1917), No. 8, pp. 477–487*).—This is a discussion of protein requirements, with particular reference to the food habits of Italy. It is the opinion of the author that the increase of the meat ration of the Italian Army from 200 gm. per day in peace to 375 gm. in war was a mistake, and that from the point of view of national economy and of health the amount should have been decreased.

Feeding the Italian Army, S. Baglioni (*Ann. Ig. [Rome], 27 (1917), No. 8, pp. 487–502*).—The author discusses changes in the Italian Army ration as a result of the report noted above, the most important being the reduction of the meat ration from 375 to 250 gm., the increase in the amount of Italian paste from 150 to 200 gm., and the addition of 200 gm. of fresh vegetables and 40 gm. of cheese per day. Tables are given of the nutritive value of some of the foodstuffs employed, the nutritive and commercial value of the old and new rations, and the economical gain in the new ration.

The reform in the ration of the Italian Navy occasional by the war, C. M. BELLI (*Ann. Ig. [Rome], 27 (1917), No. 8, pp. 503–509; abs. in Off. Internat. Hyg. Pub. [Paris], Bul. Mens., 9 (1917), No. 5, pp. 603–608*).—This is a report of a dietary study made in 1916 of the ration of the Italian Navy and of recommended modifications.

The results of the study showed that the ration furnished more than 3,000 calories of energy, slightly more than 90 gm. of protein, from 20 to 35 gm. of fat, and from 500 to 540 gm. of carbohydrate per day. In comparison with the established ration, the freely chosen diet of a number of groups of marines receiving a money allotment for food gave an average of from 2,700 to 2,800 calories, about 90 gm. of protein of which the proportion of meat was lower than in the prescribed ration, from 25 to 28 gm. of fat, and from 500 to 600 gm. of carbohydrate. In general a largely vegetarian diet predominated in the groups making their own selection of food, which is considered by the author to be more in keeping with the food customs of Italy than was the prescribed ration.

In conclusion, the recommendation is made that to do away with the excessive uniformity of the menu a ration be adopted furnishing 2,600 calories to include the morning and noon meals and the bread of the evening meal, and that the remaining 200 calories considered necessary should be made up from various vegetables prepared in different ways.

The effects of a prolonged reduced diet on 25 college men (*Proc. Nat. Acad. Sci., 4 (1918), No. 6, pp. 149–159*).—This is a detailed report of investigations previously noted from another source (E. S. R., 40, p. 269). Three papers are presented, I, Influence on Basal Metabolism and Nitrogen Excretion, by F. G. Benedict and P. Roth (pp. 149–152); II, Bearing on Neuro-muscular Processes and Mental Condition, by W. R. Miles (pp. 152–156); and III, Influence on Efficiency During Muscular Work, by H. M. Smith (pp. 157–159).

A review of the food situation, N. AMAUDRU (*Bul. Soc. Sci. Hyg. Aliment, 6 (1918), No. 7, pp. 451–463*).—The abolition of meatless day, the milk crisis, the food situation in Russia, and the rationing at the front are discussed in this article.

Germany's food: Can it last? edited by S. R. WELLS (*London: Univ. London Press, 1915, pp. XXXI+232*).—This book, which includes an introduction by A. D. Waller, is a translation of the German treatise previously noted (E. S. R., 33, p. 462).

Scandinavian living costs, E. W. THOMPSON (*U. S. Rept. Com., Com. Rpts. No. 223 (1918), pp. 1112, 1113*).—Tables are given showing the variations in cost in 1914 and 1918 of a standard household budget in Norway, Sweden, and Denmark.

Report of the special commissioner appointed by the Government to inquire into the cost of living in the Union [of South Africa], G. OWEN-SMITH (*Cape Town, South Africa: Govt., 1916, pp. 31*).—Statistics are given which show the percentage increase in the cost of living in seven towns of the Union of South Africa, based on the cost of commodities in 1914 prior to the outbreak of the war and their cost in May to July, 1916.

Practical dietetics with reference to diet in health and disease, A. F. PATTEE (*Mount Vernon, N. Y.: Author, 1917, 11. ed., rev. and enl., pp. XXV+502, figs. 7*).—A revised edition of the work previously noted (E. S. R., 25, p. 170).

The influence of correct food quantities upon human life, T. C. STEARNS (*Jersey City, N. J.: The Stearns & Gordon Co., 1917, pp. 114, pls. 3*).—The author aims to present the essential facts concerning food, especially with reference to the effect of too little or too much food upon normal development, health, and longevity.

The influence of protein feeding on the concentration of amino acids and their nitrogenous metabolites in the tissues, H. H. Mitchell (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 501–520*).—A detailed and critical review of the experimental evidence on the question of the effect of protein feeding on the concentration of amino acids in the tissues is given, followed by a report of experiments conducted to determine whether or not an increase in the amino acid concentration of the tissues occurs during protein digestion and to obtain information as to the rate of amino acid catabolism by investigating the changes in concentration in the tissues of the nitrogenous metabolites of the amino acids—ammonia and urea.

Albino rats were used in the investigation, the plan of which was to make analyses of animals killed after a fast of 24 to 48 hours, and for comparison, of other animals killed at varying periods after the ingestion of a high protein diet. The results obtained led to the following conclusions:

"The concentration of amino acids, ammonia, and urea in the tissues of rats is comparable to that of the tissues of other mammals thus far investigated. In the young growing rats the concentration of amino acid and of ammonia in the tissues is considerable higher than in the older animal. In adult rats, protein feeding has only an inconsiderable effect upon the amino acid concentration of the tissues, while increasing distinctly the urea content. In young growing rats, on the contrary, protein feeding increases considerably the amino acid and urea content of the tissues and, less certainly, the ammonia content. The ammonia and urea content of the livers of rats, both fasting and fed, is in general higher than that of the muscles."

The author discusses the possible significance of these facts on the problem of the cell stimulants concerned in the specific dynamic effects of amino acids.

The relation of carbohydrates to protein synthesis, N. W. Janney (*N. Y. Med. Jour., 107 (1918), Nos. 18, pp. 824–828; 19, pp. 879–884*).—A collection and discussion of data supporting the view that protein may be formed from carbohydrate metabolites by their union with nitrogen compounds such as ammonia. The evidence which, according to the author, substantiates this theory is presented under the following headings: Data from carbohydrate and nitrogen metabolism, data from intermediary metabolism, data from muscle metabolism, and general considerations.

Comparative study of the influence of carbohydrates and fats on the nutritive value of food proteins, F. Maignon (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 4, pp. 172–175; abs. in Chem. Abs., 12 (1918), No. 23, p. 2602*).—Continuing the investigations previously noted (E. S. R., 40, p. 463), a study is reported of the influence of varying amounts of starch and fat on the toxicity and nutritive value of egg albumin for white rats.

The results reported indicate that nutritive equilibrium as shown by constant weight can be attained by the albumin-fat and albumin-starch mixtures, but with an unequal facility. Each of the albumin-fat mixtures (from 0.25 to 2 parts of fat to 1 of albumin) maintained a fixed weight for more than 50 days. With the albumin-starch mixtures only that containing equal amounts of albumin and starch maintained a fixed weight for more than 50 days. With both starch-albumin and fat-albumin mixtures equal amounts proved most economical from the point of view of minimum of calories, but nutritive equilibrium was obtained with 39.5 calories of the fat-albumin mixture as against 50.75 calories of the starch-albumin, showing that the albumin is better utilized with fat than with starch. The minimum albumin necessary to maintain constant weight when fed with fat was about one-half that required when fed with starch.

The author considers that these results show that fats play an important rôle in the utilization of protein, a rôle which carbohydrates are powerless to fill.

Supplementary relationships between the proteins of certain seeds, E. V. McCollum, N. Simmonds, and H. T. Parsons (*Jour. Biol. Chem., 37 (1919), No. 1, pp. 155–178, figs. 7*).—The present paper, which is a continuation of studies previously noted (E. S. R., 40, p. 69), reports the results of a study of the relative values of various mixtures of proteins from two seeds, one furnishing ⅓ and the other ⅔ of the total protein of the food mixture. The protein was fed at the plane of intake of 9 per cent of the dry food mixture. Observations were made of growth and of the variations from the normal in the usual functions of the adult animal, such as reproduction and nourishment of the young. Individual differences in vitality were compensated by the use of data from a group of four or five animals fed at the same time and with the same rations.

The results show that in general the proteins of the two seeds failed to supplement each other to any marked extent. The best growth curves resulted from a mixture of ⅓ flaxseed oil meal and ⅔ rye, and from ⅓ peas and ⅔ millet. Reproduction records were in nearly all cases better than when the protein was furnished by a single seed, but the second generation was unable to grow to maturity and reproduce.

The minimum of sugar and the hitherto unconsidered origin of carbohydrates, H. Bierry and P. Portier (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 11, pp. 574–576*).—The authors discuss the question of the isodynamic substitution of fats for carbohydrates, and offer experimental evidence to prove that there exists a sugar minimum as well as a nitrogen minimum. This minimum varies with the nature of the proteins, fats, and carbohydrates of the ration, a certain equilibrium being necessary among these three factors.

Vitamin studies.—I, Observations on the catalase activity of tissues in avian polyneuritis, R. A. Dutcher (*Jour. Biol. Chem., 36 (1918), No. 1, pp. 63–72, figs. 2*).—Data on work done by the author, with the assistance of F. A. Collatz, at the Minnesota Experiment Station are presented, which show that the catalase content of tissues was lowered to the extent of 44.4 per cent in avian polyneuritis. Polyneuritic pigeons which had been given a water-alcohol extract of wheat embryo containing water-soluble B possessed tissues approximately normal in catalase content. Body temperatures of about 41.5° C. (106.7° F.) in normal pigeons were found to be lowered appreciably in avian polyneuritis.

These results would seem to indicate that polyneuritis is accompanied by incomplete or partial oxidation, with the accumulation in the tissues of products of incomplete oxidation. It is considered probable that water-soluble vitamins function directly or indirectly in the stimulation of oxidative processes, thereby clearing the tissues of toxic materials.

It is pointed out that the order in which the tissues group themselves as to catalase content is practically the same as the order of the tissues when grouped according to their metabolic activity and also as the order of their content of water-soluble vitamin.

Vitamin studies, II, III (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 547–555*).—Two papers are presented in continuation of the work noted above.

II. *Does water-soluble vitamin function as a catalase activator?* R. A. Dutcher and F. A. Collatz (pp. 547–550).—This is a report of experiments to determine whether the stimulating action of water-soluble B on catalase production is direct or indirect. Liver extracts of polyneuritic pigeons were tested for catalase with and without the addition of three different vitamin extracts. None of the vitamin extracts showed any activity toward hydrogen peroxid, nor did the addition of the vitamin extract produce an increase in the amount of the oxygen liberated from hydrogen peroxid by the liver extract. The authors conclude that the results indicate that "water-soluble B does not act as a direct activator of catalase, but instead probably (on account of its physiological properties) stimulates the organism to greater production of catalase."

III. *Observations on the curative properties of honey, nectar, and corn pollen in avian polyneuritis*, R. A. Dutcher (pp. 551–555).—From feeding experiments with polyneuritic pigeons, it is concluded that honey contains a small but negligible amount of water-soluble B, that there is very little evidence of the presence of water-soluble B in the dilute unevaporated nectar, and that corn pollen is relatively rich in this vitamin.

The author concludes that the small amount of water-soluble B in honey may have its origin in the pollen of flowering plants.

The vitamins in green foods, T. B. Osborne, L. B. Mendel et al. (*Jour. Biol. Chem., 37 (1919), No. 1, pp. 187–200, pls. 3*).—The occurrence of fat-soluble and water-soluble vitamins in certain green plants was studied by means of feeding experiments with rats. To determine the content of each of the vitamins, the product tested was fed in combination with a diet rich in the other vitamin. The substances tested consisted of the leaves and stems of spinach, the sound inner leaves of cabbage, and the entire plant of young alfalfa, clover, and timothy air-dried at from 50 to 60° C. and finely ground.

The results obtained indicate that 10 per cent of spinach supplied somewhat less than enough of the water-soluble vitamin but an abundance of the fat-soluble vitamin for normal growth in the rat. Fifteen per cent of the cabbage is apparently equivalent to about 10 per cent of spinach in respect to water-soluble vitamin. Preliminary experiments with the remaining plants indicate that the water-soluble vitamin content of clover and timothy is comparable with cabbage, while that of alfalfa is somewhat higher. The content in fat-soluble vitamin is apparently very high.

The authors point out that from the limited data now available the green vegetables appear to supply an important addition to the diet of man, because the staples, such as cereals, meats, potatoes, fats, and surgar furnish too small an amount of either of these vitamins to meet fully the requirements of an adequate dietary.

The "vitamins" or "accessory factors" in relation to dietary problems arising from the war, A. B. Macallum (*Amer. Med., n. ser., 13 (1918), No. 6, pp. 428–432*).—This is a brief review of the literature on the occurrence, function, and stability of the vitamins.

Rations in relation to disease in Mesopotamia, W. H. Willcox (*Lancet [London], 1917, II, No. 18, p. 677*).—The scale of the ration of British and Indian troops before and after revision is considered.

Each ration scale was found to furnish a very satisfactory British ration. In the ration scale of July 4, 1916, the Indian ration showed a deficiency of protein and fat and a large excess (100 per cent) of carbohydrate. The revised ration scale showed if "atta" (an Indian flour containing the aleurone layer and the wheat germ) were supplied, an adequate amount of protein and fat was furnished, but still a large excess (70 per cent) of carbohydrate. If rice were substituted for atta there was a deficiency of protein and fat and a large excess of carbohydrate (100 per cent).

Anemia and debility occurred in both British and Indian troops during the summer when, owing to transport difficulties and great heat, the supply of fresh food was short. Scurvy was limited to Indian troops, but was prevalent from May to September when there was a scarcity of foods having antiscorbutic value.

It was found that the most valuable antiscorbutics were fresh sour limes and raw potatoes. The author states that raw potato can be made into a palatable salad by being cut up into small pieces and mixed with onion and vinegar and in this way can be used with great success in the early treatment of scurvy. Beri-beri was found in British troops during December, 1915, and January, 1916. It was believed to be due to the excessive refinement of the British flour, "Marmite," a yeast extract preparation extremely rich in anti-beri-beri vitamins was used as a protective against beri-beri. Atta, used in place of the British flour, was also found to have a high protective value.

Influence of high temperatures and dilute alkalis on the antineuritic properties of foods, A. L. DANIELS and N. L. MCCLURG (*Jour. Biol. Chem., 37 (1919), No. 1, pp. 201–213, figs. 5*).—Studies are reported of the effect upon the antineuritic properties of cabbage and of soy and navy beans of cooking in fresh boiling water, in boiling water to which a small amount of sodium bicarbonate had been added, and in an autoclave at 120° C. The extracted water-soluble material was fed to young rats in abundant proportions in a diet adequate except for the factor under question. The resulting growth curves indicate that in no case was there any appreciable destruction of the vitamin.

In explaining the difference in results obtained with dilute alkali from those of McCollum and Simmonds (E. S. R., 38, p. 612), the authors suggest the probability that the rations employed in the earlier investigation contained only a minimum amount of the antineuritic vitamin. In this case a slight destruction would be more evident than when an excess of the vitamin was employed.

The results obtained by heating the vegetable to 120° were not in accord with those reported by Chick and Hume (E. S. R., 38, p. 481). On the contrary, the authors consider it improbable that in the commercial canning of foods the vitamin is destroyed to such an extent that too little will be included in the diet when the usual amount of canned food is eaten.

The appearance of the antiscorbutic substance in the course of the germination of grains, E. WEILL, G. MOURIQUAND, and MISS PÉRONNET (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 11, pp. 607–610*).—Feeding experiments with rabbits are reported, the results of which, contrary to those of Furst (E. S. R., 27, p. 567), indicate that sprouted grains (oats or barley) possess no antiscorbutic property, although the animals survived longer on a ration of sprouted than of unsprouted grains.

On the deficiency theory of the origin of beri-beri in the light of clinical and experimental observations of the disease, with an account of a series of 40 cases, F. M. R. WALSHE (*Quart. Jour. Med. [London], 11 (1918), No. 44, pp. 320–338*).—This article is primarily a discussion of the deficiency theory of the origin of beri-beri, based upon case reports from the general hospitals of Alexandria and upon the experimtntal work of various authors.

The conclusion is drawn that both in man and poultry there are two factors in the production of the disease, (1) the absence of an accessory food factor or vitamin, which is of the nature of an enzym, and (2) the use of certain foods which are the direct and immediate cause of the disease. It is thought that carbohydrates constitute the second factor, undergoing in the absence of the vitamin an aberrant hydrolysis, with the production of toxic by- or end-products, thus producing beri-beri.

The author points out that the physical chemistry of the vitamins and metabolism in beri-beri must be investigated more completely before the pathogenesis of the disease can be fully understood.

A bibliography of 26 titles is appended.

The relation of the intestinal flora to the scurvy of guinea pigs and of infants, J. C. Torrey and A. F. Hess (*Proc. Soc. Expt. Biol. and Med., 15 (1918), No. 5, pp. 74–78*).—From results obtained in a study of the intestinal flora of normal and scorbutic guinea pigs and the fecal flora of scorbutic infants, the authors conclude that scurvy, both of guinea pigs and infants, is not associated with an overgrowth of putrefactive bacteria in the intestinal tract.

The effect of the maternal ingestion of desiccated placenta upon the rate of growth of breast-fed infants, F. S. Hammett (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 569–573, fig. 1*).—The maternal ingestion of desiccated placenta, prepared as previously noted (E. S. R., 37, p. 873), was found to produce an increase in the rate of growth and in the growth capacity of breast-fed infants above that normally occurring. This is considered to be due to the presence in the placenta of some as yet unidentified growth-promoting substance.

Action of enzyms on human placenta, V. J. Harding and E. G. Young (*Jour. Biol. Chem., 36 (1918), No. 3, pp. 575–580*).—A short study is reported of the action of the digestive enzyms in vitro upon the placenta preparation previously noted by Hammett and McNeile (E. S. R., 37, p. 873) and of the digestibility of the preparation as determined by feeding experiments with dogs. The placenta was readily attacked by pepsin, trypsin, and erepsin, and hydrolized by weak acids and alkalis. Its digestibility was found to be about the same as that of lean meat.

A metabolism study of a case of leukemia during radium treatment, A. Knudson and T. Erdos (*Boston Med. and Surg. Jour., 176 (1917), No. 14, pp. 503–507, figs. 2*).—This investigation was made in conjunction with a clinical study of a class of myelogenous leukemia treated by surface application of radium. The diet, while not carefully regulated, was practically purin-free throughout the investigation.

A study of the metabolic output of the patient showed, according to the data given, that the excretions of total nitrogen, urea, ammonia, and phosphates were enormously increased immediately after the action of radium, the phosphates increasing as high as 400 per cent at times over the excretion at the beginning of treatment. The uric acid output was only slightly increased. It would seem that surface applications of radium over the spleen accelerate the disintegration of nuclein and tissue, which results in the above increases. The uric acid, which would naturally be expected to be formed by the disintegration, is probably further broken up.

ANIMAL PRODUCTION.

Growth and form, D'A. W. Thompson (*Cambridge [Eng.]: Univ. Press, 1917, pp. XVI+793, figs. 408*).—The purpose of this volume is to point out how readily simple dynamical considerations provide adequate interpretations of the growth and conformation of animals and plants. It was written "as an easy introduction to the study of organic form, by methods which are the commonplaces of physical science, which are by no means novel in their application to natural history, but which nevertheless naturalists are little accustomed to employ. It is not the biologist with an inkling of mathematics, but the skilled and learned mathematician who must ultimately deal with such problems as are merely sketched and adumbrated here."

The topics treated include rate of growth, the form and structure of cells, the dynamics of tissue formation, the use of the logarithmic spiral to describe the shape of horns and tusks, the shape of birds' eggs, the mechanical efficiency of the skeleton and the application of the theory of the transformation of coordinates to the comparison of related forms. The last-named device consists of drawing an outline of the form selected as a type in rectangular coordinates, and then finding what deformations in the coordinates are necessary in order to produce the form that is compared. In a wide variety of cases a linear transformation is all that is necessary, a very simple matter mathematically but somewhat complicated in practice since only empirical methods are as yet available.

Effect of limited food supply on the growth of young beef animals, P. F. TROWBRIDGE, C. R. MOULTON, and L. D. HAIGH (*Missouri Sta. Research Bul. 28 (1918), pp. 3–129, figs. 26*).—The investigations described here are a part of the elaborate "use of food" project of the Missouri Experiment Station. The object as formulated in the outline prepared by H. J. Waters was "to determine (1) if an immature animal can use its stored fat to protect growth when sparsely nourished, and to what extent the body fat may be relied upon to supplement a limited ration to insure the continuation of the process of growth; (2) what changes occur in the composition of the body of immature animals when held for a considerable time on a so-called maintenance ration, and also what changes occur when such animals are kept on a ration above maintenance, but not in sufficient quantity to supply the maximum growth of which the animal is capable." The work has a bearing in the common practice among farmers of bringing young cattle through the winter with almost no gain in weight, the animals making a marked skeletal growth but becoming emaciated and unthrifty.

J. M. Evvard was responsible for the selection, management, and measurement of the animals, and the authors for the accuracy of the slaughtering data and the analytical results.

In October, 1907, a number of related steers dropped the preceding spring were assembled and fed liberally, and from these a group of seven, as uniform as possible, was selected for the actual experiment. Six were to be fed in a designated manner, 3 for 6 months and 3 for 12, then slaughtered and a complete chemical analysis of the carcass made. The seventh was to be killed at the beginning of the experiment, the chemical composition of its carcass serving as the assumed initial percentage composition of the lot. Since the experiment was to be primarily a study of the use of body fat, the thinnest steer was selected as the check animal so that an initial difference between it and one of the other animals would not be attributed to the after-treatment which the latter received. The two fattest and most thrifty steers (Nos. 593 and 599) were selected to be fed so as to gain a half pound a day. It was hoped that these two would have a natural growth rate in excess of a half pound and so would draw on their reserve fat to satisfy the persistent growth requirements of the skeleton. The next fattest pair (Nos. 597 and 595) were to be fed so as to maintain uniform body weight, and the remaining pair (Nos. 591 and 592) so as to lose a half pound a day. Since the animals were all young it was thought that those with less apparent growth capacity could better withstand the rigors of undernourishment.

The check steer was slaughtered and the feeding experiment started February 25, 1908, when the animals were from 9 to 12 months old. The feed was the same for each group, the amounts being varied. Corn chop and linseed meal (8:1) was given twice daily, while cut alfalfa hay to the extent of 40 per cent of the grain ration was fed each evening. One animal of each group (Nos. 591, 597, and 593) was slaughtered September 1. In November a digestion experiment was conducted with the remaining animals. It was found that the steers in the higher planes of nutrition made more efficient use of all the organic nutrients. The second submaintenance steer was killed January 18, 1909, and the second maintenance steer February 22, 1909. The remaining supermaintenance steer was sold at this time as he was noticeably fatter than a year before and a gain of a half pound a day had obviously been in excess of his normal growth. Some of the data derived from these animals have been discussed by the authors in another connection (E. S. R., 33, p. 569).

Measurements of 22 body dimensions were made monthly on the animals so as to get a record of changes in the skeletal framework. An accurate outline of the contour at the heart, paunch, and flank girths was secured at intervals by means of a specially devised aluminum chain of adjustable links provided with set screws.

Tables give complete data for each animal as to feed consumed every 10 days and its chemical composition, the body weights every 10 days, the body dimensions every month, and the weight and chemical composition of each of the organs and parts of the body at the time of slaughter.

Some answer to the questions raised by the statement of purpose of the experiment is given in the following selection of the author's data:

Calculated changes in chemical composition of steers under different maintenance conditions.

Steer.	Change in live weight per day.	Feeding period.	Entire animal.			Adipose tissue.		Lean flesh.		Skeleton.		
			Moisture.	Fat.	Protein.	Moisture.	Fat.	Moisture.	Fat.	Moisture.	Fat.	Ash.
	Lb.	*Days.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*
No. 502	−0.60	327	−26.4	−44.3	−10.9	−5.1	−27.9	−27.3	−8.1	+10.3	−4.9	+0.55
No. 591	− .45	188	−16.4	−25.1	− 3.9	−1.0	−19.2	−12.8	−5.6	+ 1.1	+1.6	+ .21
No. 595	− .02	362	+10.3	−20.5	+ 1.8	− .5	−17.6	+ 7.5	−3.5	+ 1.6	+1.6	+2.04
No. 597	+ .07	188	− 1.6	− 1.3	+ .1	+2.7	− 2.1	− 5.6	−2.2	+ .2	+2.9	+ .57
No. 593	+ .53	188	+13.5	+10.5	+ 3.1	+1.9	+ 6.8	+ 6.9	+ .5	+ 1.4	+2.2	+1.53

From the data of steer 593 it is concluded that his normal rate of growth was not in excess of his actual increase in weight.

"When large amounts of fat are used by the animal as a source of energy to supplement a limited food supply some of this fat is replaced by water. . . . When young beef animals in good condition are put on a ration insufficient to provide for a normal growth there is a very persistent tendency to grow in spite of the feed restrictions. Much of the surplus fat will be used for energy, and growth of both lean flesh and skeleton will continue. Later, with continued feed restrictions, the animals will draw on both the residual fat supply of the soft parts and also on the protein of the soft parts to maintain existence and to promote a normal growth of the skeleton, which even includes the storing of fat in the skeleton. As the fat supply of the soft parts becomes more seriously depleted, and when the animal has drawn heavily on the protein structure of the soft parts in order to preserve existence, the animal is able to w on the fat supply of the skeleton until that structure is almost entirely)ed of its storage of fat."

all lamb feeding, H. J. Gramlich (*Nebraska Sta. Bul. 170 (1918), pp. 28*).—results of a 67-day lamb feeding experiment begining August 21, 1916, and)lving 8 lots of 40 lambs each, are reported in this bulletin. The objects e to compare dry lot (hand feeding), cornfield, and self-feeder systems of ling, to study the desirability of clipping fall-fed lambs, and to test the pos-lity of limiting the corn in a corn and alfalfa ration. The treatment, feed sumption, gains and profits are summarized in the following table:

Results of lamb feeding experiments.

Treatment.	Daily feed consumption per head.				Average daily gain per head.	Feed cost per pound of gain.	Profit per head.
	Corn.	Linseed meal.	Alfalfa hay.	Prairie hay.			
	Lbs.	*Lbs.*	*Lbs.*	*Lb.*	*Lb.*	*Cts.*	
Dry lot	1.33	....	1.72	....	0.331	7.45	$1.65
Dry lot (clipped)	1.31	....	1.70	....	.387	6.29	1.63
Dry lot	.65	....	2.07	....	.238	7.43	1.34
Self feeder	1.22	0.85	....	0.48	.369	9.62	1.02
Self feeder (clipped)	1.31	.89	....	.60	.394	9.50	.84
Rape pasture	[1] 1.15	[1] 1.16	....	[1] .60	.288	8.60	.83
Grass pasture	[2] .65	[2] .25	....	....	.273	3.55	1.77
Cornfield	1.39	.30	1.27	....	.358	5.80	2.46

[1] Last three weeks of experiment only. Grain fed in self feeder.
[2] Last three weeks of experiment only. Hand fed.

s shown by the table, although the clipped made slightly larger and cheaper y gains, the discrimination on the market against shorn lambs resulted in profit per head than where unshorn. It is concluded that the fall clipping ambs is not justified unless the price of wool will more than offset the dis-ination which the shorn lambs encounter when marketed.

Vith respect to limiting the corn ration in fall feeding, it was found that bs receiving a full feed of corn (lot 1) made a greater profit per lamb of ts., due to increased finish, than those receiving a half feed of corn (lot 3). consumption of alfalfa did not increase in direct proportion to the reduc- in the consumption of corn.

he use of the self-feeder, either with clipped or unclipped lambs, did not re economical in comparison with the straight corn and alfalfa ration. e did not prove to be a satisfactory ration for fattening lambs.

lue grass pasture supplemented with a limited amount of corn and linseed l at the close of the test (lot 7) gave a very satisfactory gain, although the was mostly growth and the lambs at the finish did not carry flesh to permit n to sell well. The blue grass produced by far the most economical gains of ration.

ornfield feeding of lambs (lot 8) gave a large daily gain, reduced the cost of in comparison with dry-lot feeding of corn and alfalfa (lot 1) by 1.65 cts. pound, and increased the profit by 81 cts. per pound. These lambs carried most flesh of any lot in the experiment and sold at the highest value per d on the market.

he three lots (6, 7, and 8) fed green feed showed in this test relatively high y gains, and, at the same time, with the exception of the rape-fed lambs, a r cheap gain and as a result a relatively high net profit per head. The blue s and cornfield lots showed the two highest profits of any in the test.

The feed prices used in the above computations were old corn 75 cts. and ne[w] corn in the field 65 cts. per bushel, linseed meal $40, alfalfa hay $8, and prair[ie] hay $7 per ton, and grass and rape pasture each 0.5 ct. per lamb daily. A tab[le] at the end of the bulletin shows the cost of 100 lbs. of gain under varyi[ng] prices.

Profits and factors influencing profits on 150 poultry farms in New Jers[ey], F. App, A. G. Waller, and H. R. Lewis (*New Jersey Stas. Bul. 329 (1918)*, [pp.] *84, pls. 4, figs. 19*).—Results are presented of a survey for the 12 months endi[ng] October 31, 1916, of 150 New Jersey farms that derived 98 per cent of th[e] total receipts from poultry. Of the records secured, 116 were from the Vi[ne]land region in the southern part of the State, 22 from the vicinity of Lakew[ood] near the east coast, and 12 in a strip of land along the Delaware River clos[e] the New York boundary. Vineland and Lakewood have excellent transport[a]tion facilities to Philadelphia, New York, and the seaside resorts. In bo[th] places the soil is light and sandy and well drained. "The soil is probably t[he] largest single factor that allows successful intensive poultry farming here[.]" The methods, buildings, breed of chickens, and rations used were found to [be] practically the same in all three areas. None of the operators were tenan[ts.] At the beginning of the year 97.8 per cent of the laying birds were White Le[g]horns. The system of management was markedly uniform from farm to farm.

The average labor income was $730, almost $1 per hen, but was negative [on] 27 farms. The average capital per farm was $7,243, the average return on t[he] investment being 15.1 per cent. The average building investment was $1.54 p[er] bird. The average receipts per farm were $2,818. Eggs furnished $2,100, a[nd] crops, mainly fruit, $62. The other receipts were from sale of cockerels, bro[il]ers, and old fowls. The average receipts per bird were $3.82. The farms wi[th] the largest capital gave the largest profit.

The average size of flocks was 737 fowls, of which 17 were cockerels. Lab[or] income and economy of operation increased uniformly with increased size [of] flocks. The operators having the longer experience with poultry possessed t[he] larger flocks and received larger profits.

The average production per hen was 109 eggs a year. Labor income i[n]creased throughout with increased production. Flocks of hens averaging l[ess] than 80 eggs per year gave negative labor income.

Flocks in which 50 to 70 per cent of the laying stock were pullets produ[ced] noticeably higher labor incomes than flocks in which this percentage was hig[her] or lower.

Poultry ranges occupied 3.2 acres per farm, or over 27 per cent of the to[tal] farm area. The size of the area per flock did not appear to affect the egg p[ro]duction or the number of deaths.

In the authors' opinion the chief factors of success on these farms were[, in] the order of their importance, size of flock, egg production per hen, experie[nce] of operator, and the proportion of pullets to yearlings. Poultrymen having flo[cks] whose size and production were both above the average made an average lab[or] income of $2,002. Those with flocks as good or better than the average in on[ly] one of these items received $659, while those whose flocks were below avera[ge] in both made only $106. The lowest labor income in each class was +$[...] —$617, and —$1,013. respectively.

A special study of costs was made on the 100 farms where only poul[try] products were sold. Since the raising of young stock is always a part of t[he] poultry business, the cost of maintaining the farm flock was included in t[he] cost of commercial egg production. The cost of producing a dozen eggs w[as] 29.3 cts. and the profit was 4.6 cts. The man labor required for 100 birds duri[ng] the year was 1.77 months and the feed 8,297 lbs. During the pullet year a h[en] was found to depreciate in value from \$1.53 to \$1.11, or 29 per cent. In the second year it depreciated 50 per cent, its meat value when sold being 55 cts.

An accurate method for determining which hens are laying, R. H. WAITE (*Maryland Sta. Bul. 221 (1918), pp. 65-73, figs. 5*).—The method described consists of examining the hens early in the morning to see whether an unlaid egg can be felt between the pelvic bones. The method was called to the author's attention by a Maryland poultry breeder, and differs in detail from a similar method in use at the Utah Experiment Station (E. S. R., 39, p. 278), with which comparison is made. After the birds became used to the treatment it was found that an experienced man could examine 10 birds a minute when the latter were confined in a small dark compartment. At the Maryland Station, apparently, the test is expected to be used chiefly as a system of culling.

The test proved very accurate with a flock of White Leghorn hens, although in 3 of the 18 days of observation, one less egg was gathered than was expected. The test also seemed practical with Barred Plymouth Rocks and White Wyandottes.

Inspection of commercial feedstuffs, P. H. SMITH (*Massachusetts Sta. Control Ser. Bul. 10 (1918), pp. 3-21, 24*).—Report is made of feeding-stuff inspection in Massachusetts for the year ended August 31, 1918. Complete proximate analyses are given, except in the case of animal by-products. The products analyzed include cottonseed meal, cottonseed feed, linseed meal, corn germ meal, coconut oil meal, peanut oil cake feed, gluten meal and feed, distillers' grains, brewers' grains, yeast and vinegar grains, wheat middlings, red dog flour, shorts, wheat bran, durum wheat middlings and bran, velvet bean feed, rye feed, rye middlings, corn meal, barley meal, ground oats, hominy feed, barley feed, dried beet pulp, oat feed, various stock feeds, molasses feeds, and calf meal, cut clover, alfalfa meal and proprietary mashes and meals for poultry, meat scrap, bone meal, and fish scrap.

Commercial feeding stuffs, A. J. PATTEN ET AL. (*Michigan Sta. Bul. 282 (1918), pp. 3-68*).—Proximate analyses are presented of 919 samples of feeds collected during 1918. These include cottonseed meal, cottonseed feed, linseed meal, distillers' grains (corn), brewers' grains, yeast and vinegar grains, corn gluten feed, corn gluten meal, hominy feed, corn oil cake meal, corn feed meal, alfalfa meals, wheat bran, wheat middlings, barley feed and screenings, rye feed, oat hulls, pea bran, velvet bean meal, buckwheat bran, dried beet pulp, tankage and various proprietary stock feeds, calf meals, and poultry feeds.

It is stated that 8.3 per cent of samples were below guaranty in protein, 7.5 per cent below in fat, and 12.8 per cent above in crude fiber. This is nearly 50 per cent better than the results of 1916, the year in which the inspection work was taken over by the experiment station.

Commercial feeding stuffs, 1917-18, F. D. FULLER (*Texas Sta. Bul. 234 (1918), pp. 3-416*).—A detailed report is given of analyses completed during the year by the feed control service of the station, arranged alphabetically by towns and showing the names of manufacturers or importers registered in each town. Proximate analyses are given of the following feeding stuffs: Alfalfa meal, barley chop, coconut cake, coconut meal, cold pressed cottonseed, corn bran, corn chop, corn feed meal, cracked cottonseed feed, dried beet pulp, ear corn chop, flaked velvet bean feed, ground cottonseed feed, ground oats, ground peanut hay, whole pressed peanuts, hominy feed, Kafir corn chop, milo maize chop, milo maize head chop, cottonseed cake (ordinary and prime), cottonseed meal (ordinary and prime), peanut meal, rice bran, rice polish, rye middlings, wheat bran, brown, gray, and white shorts with and without screenings, and various proprietary and mixed feeds.

The report is preceded by the text of the Texas Feed Control Law, a statement of standards and definitions of feed products adopted as legal by the station, rulings made under the law by the station authorities and rulings of the United States Food Administration affecting feeding stuffs.

DAIRY FARMING—DAIRYING.

The relation of the quality of proteins to milk production, III, IV, E. B. Hart and G. C. Humphrey (*Jour. Biol. Chem., 31 (1917), No. 2, pp. 445–466, figs. 7; 35 (1918), No. 2, pp. 367–383, figs. 5*).—In these two contributions from the Wisconsin Experiment Station the authors report experiments during 1916 and 1917 on the availability for milk production of proteins derived from combinations of legume hays and nitrogenous supplements, in continuation of their previous studies (E. S. R., 36, p. 671) on corn stover combinations.

In both years the plan was to feed each supplement for a period of four weeks and then change immediately to another one. The basal ration was kept constant in relation to its source and proportion of nutrients in the different periods of each year. The concentrate for each period was mixed with starch in such a proportion that the plane of nitrogen intake (nutritive ratio) and the net available energy from the total ration would be uniform throughout the several periods of a particular year. The nutritive ratios were wide so as to secure zero or slightly negative nitrogen balances and thereby eliminate the disturbing factor of tissue building. Cows of good milking capacity and not pregnant were selected. Beginning a week after a change of concentrate, urine and feces were collected for daily nitrogen analysis. Weekly analysis was also made of a seven-day composite sample of milk from each animal. The measure of a ration's efficiency that was adopted is the percentage of the absorbed nitrogen not eliminated in the urine, a measure that is held to correct sufficiently for slight storage of nitrogen or slight use of tissue proteins. The experiments were carried out during the winter months. Complete analytical data are given in the authors' tables for each animal separately.

In the 1916 experiment reported in Study III the experimental subjects were three Jersey cows (one a grade), giving respectively about 34, 15, and 28 lbs. of milk daily. The ration was 16 per cent red clover hay, 56 per cent corn silage, 12 per cent corn meal, and 16 per cent a mixture of supplement and starch, with a nutritive ratio of 1:8.5. Proteins constituted about 12 per cent of the dry matter consumed. Fifty lbs. of the ration furnished 2.2 lbs. of digestible protein and from 19.94 to 20.13 therms. About 40 per cent of the digestible protein was derived from the supplemental concentrates. In the 1917 experiment reported in the fourth study, two grade Guernseys and a purebred Jersey were used. The daily milk yields at the start were 22, 28, and 24 lbs., respectively, for the cows numbered 1, 2, and 3. The ration was 14 per cent alfalfa hay, 56 per cent corn silage, 12 per cent corn meal, and 18 per cent a mixture of starch and supplement. The nutritive ratio was fixed at 1:8.4. On the dry basis total protein constituted 10 per cent. Fifty lbs. of the ration furnished 2.32 lbs. digestible protein, about 37 per cent of which came from the supplements, and the available energy varied from 20.59 to 20.76 therms.

In the clover hay experiment many of the twelve weekly nitrogen balances tabled for each supplement were positive. When gluten feed was given, five balances were positive and one was zero. With linseed meal 11 were positive, with distillers' grains 10, and with cottonseed meal 9. This result is in marked contrast to the condition found in the corn stover experiment. Gluten feed in conjunction with clover hay caused no sudden increase in urinary nitrogen such as was found in the gluten-stover trials. In the alfalfa experiments the balances were all negative.

The efficiency of each ration combination for the two years is shown in the subjoined table. Cow No. 2 of each year is the same animal.

Absorbed nitrogen utilized for milk production by cows fed clover or alfalfa hay with various grain supplements.

Source of supplemental protein.	Clover hay (1916).			Alfalfa hay (1917).		
	Cow No. 1.	Cow No. 2.	Cow No. 3.	Cow No. 1.	Cow No. 2.	Cow No. 3.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Gluten feed	65	46	72	40	43	43
Linseed meal	69	50	70	40	47	39
Distillers' grains	69	55	75	51	53	50
Cottonseed meal	66	53	71	35	42	28

The earlier studies showed that gluten feed was markedly inferior for milk production to linseed meal or distillers' grains as supplements to the proteins of corn stover. The above records are held to show that gluten feed as a supplement to clover or alfalfa hay is substantially equal to the other grains. The lower efficiency of cottonseed meal when fed with alfalfa hay is noted, but no explanation is offered. The higher efficiency throughout of distillers' grain than gluten feed is thought to be due to the fact that the former contains proteins from the corn embryo. It is suggested that an equally effective protein mixture could be secured by adding 10 to 15 per cent of germ oil meal to gluten feed.

Throughout both experiments the animals maintained their body weight, but there was a slight decrease of milk flow. The percentage composition of the milk remained about constant. At the end of the clover experiments the cows were fed for three weeks on the linseed meal ration to which casein had been added, so as to make a nutritive ratio of 1:5. This high protein feeding stimulated milk yield and caused an actual increase in solids secreted. "The peculiar stimulating effect of liberal protein feeding on mammary activity was strikingly shown in these records. The maintenance of milk flow desired by every dairyman is very probably secured by his customary high protein feeding, but at what expense is not so clear."

The results of these experiments "again emphasize the limitations of any classification of natural foods in respect to the efficiency of their proteins based on the determination of such nutritive worth in a single food material or a single food mixture."

Feeding trials of velvet-bean feed, palm-kernel meal, and various grain mixtures for dairy cows, J. J. Hooper and J. W. Nutter (*Kentucky Sta. Circ. 23 (1918), pp. 31–38, pl. 1, fig. 1*).—Brief reports are given of six tests of the value for milk production of grain mixtures containing either velvet-bean meal or palm-kernel meal. The palm-kernel experiments were conducted before Great Britain restricted the export of palm kernels from Africa and when it appeared certain that large quantities would be available in this country for feeding purposes. Analysis of the palm-kernel meal used showed the following percentage composition: Protein 18.75, fat 2.4, fiber 16.53, nitrogen-free extract 48.26, ash 4.67, and water 9.39. The palm-kernel meal did not prove very palatable.

The cows used were from the station herd. In each experiment a group of cows were given a test ration and a check ration alternately every two weeks. The check rations were the common dairy rations of Kentucky—corn meal and wheat bran, with or without cottonseed meal as a supplement. The test mixtures, in which velvet-bean meal replaced part or all of the bran, were cheaper by from 50 cts. to $2.25 per ton than the check grain mixtures. The experiments were as follows:

(1) Corn meal, wheat bran, and velvet-bean feed (2:1:1) *v.* corn meal and wheat bran (1:1). The average daily milk yield per cow during the feeding of these rations were, respectively, 26.94 and 26.72 lbs. Eight cows were used for seven months, beginning May 20, 1917. They had scanty blue-grass pasture during the summer and corn silage and soy-bean hay in the winter.

(2) Corn-meal and velvet-bean feed (1:1) *v.* corn meal and bran (1:1). The respective milk yields per day were 16.04 and 16.94 lbs. Three cows were tested for eight weeks in January and February, 1918. Soy-bean hay and corn silage were the roughages fed.

(3) Corn-meal and velvet-bean feed (1:1) *v.* corn meal, wheat bran, and cottonseed meal (4:3:1). The respective milk yields per day were 22.12 and 22.48 lbs. The daily roughage was 38 lbs. corn silage and 6 lbs. barley straw wetted with molasses and water.

(4) Corn meal, wheat bran, and palm-kernel meal (2:1:1) *v.* corn meal and bran (1:1). The respective daily milk yields were 22.77 and 22.41 lbs. Seven cows were fed 24 weeks, beginning June 24, 1917. The roughage was 30 lbs. of corn silage and 8 lbs. of soy-bean hay.

(5) Corn meal, wheat bran, cottonseed meal, and palm-kernel meal (4:1:1:2) *v.* corn meal, bran, and cottonseed meal (4:3:1). The respective daily milk yields were 20.75 and 20.94 lbs. Four cows were fed 12 weeks, beginning February 10, 1918. The roughage was 30 lbs. of silage, 6 lbs. of barley straw, and 1 lb. of molasses.

(6) Rolled barley, crushed oats, and velvet-bean feed (2:1:1) *v.* corn meal and wheat bran (1:1). The respective daily milk yields were 17.49 and 16.61 lbs. Eight cows were used for 30 weeks, beginning August 5, 1917. During the winter 10 lbs. of soy-bean hay and 20 lbs. of corn silage were fed daily. The barley, oats, and velvet-bean mixture is stated to have been one of the most satisfactory rations used at the station. At the beginning of the experiment oats and barley were low priced. During the winter the price of both went up, while that of bran dropped, so that the check ration became cheaper than the test ration.

No insistence is placed on the difference between the milk yields in any of these experiments. It is held that all the test rations should prove satisfactory for milk production.

Grain rations for dairy stock, J. B. LINDSEY (*Massachusetts Sta. Control Ser. Bul. 10 (1918), pp. 22, 23*).—Eight combinations of grains suitable for dairy animals are given here, as well as a ration for pigs. They are designed particularly for use during a wheat shortage when barley and oat residues are available.

Profits from milk cows on general corn-belt farms, O. R. JOHNSON and R. M. GREEN (*Missouri Sta. Bul. 159 (1918), pp. 20, figs. 5*).—This bulletin deals with the type of dairying practiced on small general farms where only a few cows are kept and much of the product is consumed by the operator's family. It is based on 41 yearly records of some 34 farms scattered throughout the State of Missouri. The four years 1912 to 1915 are represented. On these farms the raising of corn, wheat, and hogs was the most important enterprise.

The dairy herds consisted mainly of cows giving from 3,000 to 4,000 lbs. of milk per year. The average cost of keeping one of these cows for a year was found to be $45.91, of which 55.2 per cent was cost of feed, 30.1 per cent cost of human labor, 1.1 per cent cost of horse labor, and 13.6 per cent miscellaneous costs (mainly interest on investment, breeding fees, and building charge). The average total feed cost was $25.38, the percentage in different feeds being corn 23.1, hay 19, pasture 30.3, other concentrates 11.9, and other roughage 15.7. It is pointed out that the percentage of feed cost represented by pasture and roughages other than hay is high compared to typical Missouri dairy farms, where these items constitute only 20 to 35 per cent of the feed cost. In 38 farm records the value of dairy products per cow was $47.22, of which 9 per cent represents cream sales, 23.2 per cent butter sales, and 67.8 per cent the value on a butter basis of the products consumed on the farm.

It is the practice on these farms to keep calves until they are at least yearlings before selling them. The cost of a year's keep, based on records of 128 calves, averaged $14.10, of which $12.50 was for feed. Man labor per calf averaged 11.1 hours and horse labor 1.58 hours. Sale prices or inventory values of 294 such calves on 68 Missouri farms in 1914 and 1915 averaged $28 per head. Using this average, the profit from raising a calf was $13.90. Assuming that 82 per cent of the cows produced calves, a figure based on a record of 515 cows on 117 farms, adding the milk profit, and deducting labor costs on the assumption that the labor involved no additional cash outlay, the profit attributable to a cow is computed at $28.32. This represents a profit for the average herd of $110.45, an amount which covered 25.4 per cent of the average family living expenses on 400 Missouri farms in 1914 and 1915.

A special study was made of the influence of the use of pasture on costs and profits per cow on these farms. The results are summarized in the following table:

Influence of use of pasture on costs and profits.

Percentage of feed cost in pasture.	Number of farm records.	Cows per farm.	Value of concentrates fed per cow.	Value of roughness fed per cow.	Pasture charge per cow.[1]	Man labor per cow.	Horse labor per cow.	Value of milk Products per cow.	Profit or loss per cow.
						Hours.	*Hours.*		
Less than 25	15	3.0	$14.70	$13.73	$5.62	122.8	10.1	$52.45	−$5.34
25 to 39	13	3.9	7.60	9.95	8.23	104.0	4.8	47.42	+ 2.53
40 and over	13	4.3	4.83	4.11	9.26	81.8	3.2	39.60	+ 3.50
Average	....	3.9	8.88	8.82	7.68	101.9	6.4	47.22	+ 1.31

[1] Excluding calf.

"The data show, as might be expected, that the more extensive use of pasture is attended by a decrease in production, but in spite of this decrease, the practice of using pasture extensively with this class of stock is economical because the inherent ability of this stock for milk production is not such as to make it respond readily to the stimulus of intensive feeding."

In conclusion, the authors point out that aside from the production of the marketable calf, any profit from this type of dairying will be due to the utilization of pasture land, the use of roughness that would otherwise be wasted, and the utilization without extra cost of labor already available on the farm.

The part of milk contests in improving the milk supply of Portland, Oreg., E. C. Callaway and P. S. Lucas (*Oregon Sta. Bul. 156* (*1918*), *pp. 24, figs. 7*).—This bulletin describes the difficulties in the way of proper sanitary control of the milk supply of Portland, Oreg., and outlines the history of control methods since municipal inspection was introduced in a limited way in 1909. Various schemes, including the scoring of dairies and milk plants, were tried and then discarded, but finally in 1914 a system of milk contests was inaugurated, which has resulted in noticeable improvement and has proved satisfactory to the customer and the progressive dealer.

These contests are held every three or four months, the method being explained in detail. On the opening date two bottles of milk are taken from each dealer or dairyman, analyzed, plated, and scored. At irregular intervals thereafter and without previous warning inspectors collect additional samples from milk wagons, which are treated in the same way. At the end of each contest the ratings of each dealer are published. Publicity is the chief agent used in eliminating the careless handler of milk. Public interest seems to be very high, as it was found necessary to stop publishing the exact numerical rating of a dealer and give only the class to which he belonged because customers were changing dealers as a result of 0.2 of a point difference.

Tables showing changes in ratings and bacterial counts are given. The first year's improvement was greater than that of succeeding years, but the difference, it is held, was not due to a failing interest but to local economic conditions causing increased demand for milk and decreased supply. Infant mortality in Portland has undergone great reduction since the control of milk was begun, and in 1916 the infant death rate was the lowest of any large city.

The back-lot dairies have not been reached by these milk contests. They form a difficult problem inasmuch as 10 per cent of Portland's milk supply comes from them. "Many suburban families keep from one to five cows and sell the surplus milk to neighbors. In most cases children handle and distribute the product. They use little or no equipment such as the modern dairyman finds necessary. While it seems to be recognized that the city is not the proper place for a dairy, yet these small milkmen enjoy both the patronage and protection of the suburban population. The rules and regulations enforced on the bona fide dairyman in Portland do not apply to these men."

Calculation of the nutritive value of milk from routine tests, R. S. SMITH (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 6 (1917), pp. 185–189*).—A method is proposed for determining the fuel value of milk of varying composition when the analysis is limited to the tests for butter fat and for total solids as determined in routine analysis.

Jack cheese, H. S. BAIRD (*California Sta. Circ. 206 (1919), pp. 11, figs. 3*).—Brief directions are given for the manufacture of Jack cheese, a stirred curd cheese which originated in Monterey County, Cal., about 1892. The production of Jack cheese is stated to be practicable on farms because it requires a comparatively small investment for equipment. A good grade of milk must be used, however, as there is little opportunity during the manufacturing process for a lactic starter to overcome undesirable bacteria. Since the war Jack cheese made from partially skimmed milk had proved to be a satisfactory substitute for grating cheese, previously imported from Europe.

Homogenized cream used in cheese making, A. T. CHARRON (*Dept. Agr. [Prov. Quebec], Rpt. Dir. Off. Lab., 1917, pp. 8–11*).—Experiments on a small scale (two vats) at the St. Hyacinthe Dairy School, Quebec, showed that homogenized cream diluted with skim milk can be converted into a satisfactory cheese. In one vat containing a cream and skim-milk mixture testing 1.88 per cent fat, about 5 per cent of the fat was lost. In the other vat, where the mixture tested 3.7 per cent, the fat loss was nearly 10 per cent. Fat tests made on the whey, the drippings at the block, and the drippings at the press showed that

95 per cent or more of the loss occurred in the whey. The experiments were designed to assist purveyors of homogenized cream who, owing to the fluctuating demand for ice cream, frequently have on hand a considerable quantity of their product for which there is no recognized market.

VETERINARY MEDICINE.

Physiology and biochemistry in modern medicine, J. J. R. MACLEOD ET AL. (*St. Louis, Mo.: C. V. Mosby Co., 1918, pp. XXXII+903, pls. 11, figs. 222*).—This volume is designed to be supplementary to the regular textbooks of physiology and functional pathology, particular emphasis being placed on the application of physiology to the practice of medicine. It contains sections on the physicochemical basis of physiological processes, the circulating fluids, circulation of the blood, respiration, digestion, excretion of urine, metabolism, the endocrine organs or ductless glands, and the central nervous system. The section on the excretion of urine and certain chapters in the sections on the circulating fluids and respiration are contributed by R. G. Pearce. A brief bibliography is given at the end of each section.

Applied bacteriology.—Studies and reviews of some present-day problems for the laboratory worker, the clinician, and the administrator, edited by C. H. BROWNING (*London: H. Frowde and Hodder & Stoughton, 1918, pp. XVI+291; rev. in Nature* [*London*], *102* (*1918*), *No. 2554, p. 104*).—An account of research work on bacteriological subjects.

Meat inspection problems, with special reference to the developments of recent years, W. J. HOWARTH (*London: Baillière, Tindall & Cox, 1918, pp. VIII+143, figs. 2*).—The several chapters of this work deal with the development of meat inspection, general administrative problems, the tuberculosis problem as affecting cattle, the tuberculosis problem as affecting pigs, and imported meat. The lymphatic glands, the inspection and manner of packing imported offal and boneless meat, a note on examples of special regulations, and the sale of sterilized unsound meat are discussed in appendixes.

The Bureau of Animal Industry as a war auxiliary, J. R. MOHLER (*Jour. Amer. Vet. Med. Assoc., 54* (*1918*), *No. 2, pp. 96–107*).

State veterinary service, D. F. LUCKEY (*Ann. Rpt. Missouri Bd. Agr., 50* (*1918*), *pp. 126–138*).—This report deals particularly with control work with tuberculosis and hog cholera.

Maintaining animal health on farms, J. R. MOHLER (*Breeder's Gaz., 75* (*1919*), *No. 4, pp. 163, 164*).

Vitamins and nutrition, P. A. FISH (*Jour. Amer. Vet. Med. Assoc., 54* (*1918*), *No. 1, pp. 17–22*).—The author discusses the distribution and functions of vitamins, and points out that they constitute a factor which must be considered in animal as well as in human nutrition.

A suspected case of stock poisoning by wild onion (Allium canadense), F. J. PIPAL (*Proc. Ind. Acad. Sci., 1917, pp. 139–143, fig. 1*).—Symptoms of poisoning developed in apparently healthy cows within 12 hours after they were taken from a pasture where feed was scant and turned into a woods pasture where they found and grazed heavily on wild onion.

Contributions to the biochemistry of pathogenic anaerobes.—V, The biochemistry of Vibrion septique, C. G. L. WOLF (*Jour. Path. and Bact., 22* (*1918*), *No. 2, pp. 115–128*).—In continuation of investigations previously noted (E. S. R., 39, p. 887), a study is reported of the behavior of *V. septique* on tryptic broth, milk, tryptic broth with rabbit kidney, glucose peptone, and cooked meat. The results are summarized as follows:

"*V. septique* is essentially an organism whose activities are directed to an attack on carbohydrates. It grows freely in so-called carbohydrate-free media, producing considerable quantities of gas, but the addition of a carbohydrate accelerates metabolism. The acid production is not at all so marked as with *Bacillus welchii*. As a gas former in carbohydrate-containing media, it comes within the range that was found with *B. welchii*, but the process takes much longer to reach a maximum.

"A certain amount of proteolysis takes place which is of the same order as that obtained with *B. welchii*, but it is in no way commensurate with the attack which the *V. septique* makes upon carbohydrates."

The results obtained with tryptic broth to which fresh rabbit kidney had been added confirm the work of other authors that the addition of a small amount of animal tissue to a medium which by itself does not actively promote growth undoubtedly has a decided effect in stimulating the growth of the organism.

Immunity and tissue transplantation.—IV, The influence of immune serum upon the reactions about transplanted tissues, M. S. Fleisher (*Jour. Med. Research, 39 (1918), No. 1, pp. 1–14*).—In continuation of investigations previously noted (E. S. R., 39, p. 886), experiments are reported in which the influence of immune serum upon regeneration and leucocytic and connective tissue reaction was studied.

Pieces of guinea pig kidney were transplanted into the subcutaneous tissue of the abdomen of guinea pigs and rabbits passively immunized with serum obtained from rabbits immunized against guinea pig kidney. For purposes of comparison similar pieces of guinea pig tissue were soaked in rabbit antiserum and others in normal serum and later transplanted into guinea pigs and rabbits.

It was found that in passively immunized animals the same reactions occur about homoiotransplants as in normal animals. This is also true of heterotransplants, with the possible exception of a slower clearing of the leucocytes from the peripheral portion of the tissue. In the case of tissue soaked in immune serum before transplantation there is probably a slight and brief slowing of connective tissue reaction and regeneration in homoiotransplants. In heterotransplants there is interference with regeneration and a slower invasion by the leucocytes.

It is pointed out that "the results of these experiments suggest that substances in the body fluids of immunized animals have but little influence on the regeneration of transplanted tissue, and that the slowing of leucocytic invasion is in large part due to an action of the serum. The results further suggest that the more marked leucocytic reaction seen about transplants in either immune heterologous animals or immune homologous animals is a direct and independent manifestation of the immunity to the tissue. If these conclusions be correct, it appears that, in immunity to tissue transplantation, tissue reactions and especially the reactions of leucocytes play a more important part than do the reactions called forth or produced by the body fluids."

Heterolysins, A. Sordelli and G. Fischer (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 3, pp. 229–284, fig. 1; An. Soc. Quim. Argentina, 6 (1918), Nos. 25, pp. 230–249; 27, pp. 442–450; 28, pp. 522–545*).—By injecting the kidney of guinea-pigs and dogs, heterolysins for sheep and goats were obtained in rabbits, rats, and cows, but not in pigeons and dogs. No difference was observed between the isolysins of the sheep and goats and the heterolysins obtained by the injections of the kidney of the dog upon their fixation power in contact with sheep and goat corpuscles or with the kidney of the dog or guinea pig.

By the action of alcohol and ether on the kidney of the guinea pig and the dog, and also on the corpuscles of the sheep and goat, two fractions may be separated, one soluble in alcohol-ether which retains the fixation power for the original organs and corpuscles and the other insoluble in alcohol-ether which has lost this fixation property. The former alone contains the heterolysin. Immunization with these fractions showed that the insoluble portion can produce hemolysins although it has no fixation power in vitro, and that the soluble fraction, although it has the power to fix hemolysins in vitro, is unable to produce them. A mixture of both fractions is inactive.

Dissociation experiments showed that no remarkable difference of attraction exists between the heterolysins of guinea pig kidney and of sheep and goat corpuscles toward both the heterolysins of dog's kidney and the isolysins of sheep and goats.

Castellani's absorption test, W. Broughton-Alcock (*Jour. Roy. Army Med. Corps, 31 (1918), No. 4, pp. 296–299*).—A method of conducting the Castellani absorption test, previously noted (E. S. R., 40, p. 288), is described, the technique of which includes the utilization of a practically defined amount of microorganisms and a practically defined agglutinin content of a serum. The method is described in detail, and the principles involved are illustrated by a typical example.

Rôle of enzyms in the production of natural immunity, M. Belin (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 12, pp. 622–625*).—The author considers that the normal reactions of oxidation in the body play an important rôle in the production of natural immunity by protecting the organism against the intoxication which an accumulation of toxic bases would cause. The oxidizability of these toxins presupposes a preliminary splitting of the toxo-proteins by either organic or microbial enzyms, and consequently the conclusion is drawn that the enzyms which are responsible for the normal reactions of hydrolysis and oxidation of proteins must play an important rôle in natural immunity.

Rôle of enzyms in the production of acquired immunity and of anaphylaxis, M. Belin (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 12, pp. 625–628*).—The theory is proposed and discussed that acquired immunity is a function of an increase in the activity of various enzyms and, above all, of the production of new specific enzyms which can act more rapidly and completely. Similarly, anaphylaxis is considered to be an intoxication brought about by an accumulation of toxic bases which the oxidases are unable to destroy except when augmented by an oxidizing agent, such as potassium permanganate. The "toxogenin" of Richet or the "sensibilisin" of Besredka would thus be the enzyms capable in vivo and in vitro of producing toxic bases—the "apotoxin" of Richet.

Slow intravenous injection of antiserum to prevent acute anaphylactic shock, J. H. Lewis (*Jour. Amer. Med. Assoc., 72 (1919), No. 5, pp. 329, 330*).—Experiments are reported in which acute anaphylactic shock has been prevented in sensitized animals by giving otherwise fatal doses of diluted antigen intravenously at very slow rates.

Studies on anaphylatoxins, G. Fischer and L. Kantor (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 4, pp. 471–480; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 3, p. 232*).—Anaphylaxis experiments are reported and summarized as follows:

Bacterial anaphylatoxin prepared with guinea pig or rat serum is toxic for guinea pigs but not for rats and rabbits. Bacterial anaphylatoxin prepared with serum from rabbits, horses, or dogs is not toxic for guinea pigs nor for any of the species from which the serum was obtained. This is considered to refute the theory of Friedberger respecting the generalization of the conception of anaphylatoxins.

The preliminary injection of a sublethal dose of the toxin of Bordet does not protect guinea pigs from a subsequent injection of a lethal dose of the same toxin or of the bacterial anaphylatoxin prepared from guinea-pig serum. The preliminary injection of a sublethal dose of the anaphylatoxin does not protect against a subsequent lethal dose of the anaphylatoxin or of the Bordet toxin.

The preliminary injection of the serum of rabbits, dogs, horses, or guinea pigs does not protect the guinea pig against the subsequent injection of a lethal dose of the Bordet toxin.

Prophylaxis of serum sickness with bovine serum, J. PENNA, R. KRAUS, and J. BONORINO CUENCA (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 4, pp. 405–420; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 3, p. 232*).—The literature on serum sickness is reviewed and observations reported, from which the following conclusions are drawn:

Normal bovine serum, heated twice to 56° C. for half an hour, as well as that containing diphtheritic or tetanus antitoxin, only rarely produces serum sickness. If used after normal or antitetanic horse serum, it does not diminish the allergic properties of the latter. If used before horse serum, it acts as a prophylactic agent, reducing considerably the frequency and intensity of serum sickness. A mixture of the two serums in equal amounts produces serum sickness, but with a mixture of ¾ bovine serum and ¼ horse serum the frequency of serum sickness diminishes.

Studies in regard to the production of antitoxic serum, A. SORDELLI (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 4, pp. 427–444, figs. 3; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 3, p. 232*).—Continuing the studies noted above, further work is reported on the rapid immunization with diphtheria toxin neutralized with antitoxin, in which excellent results were obtained with both young and old horses. The process was also found to increase the antitoxic value of the serum of horses immunized for a long time with pure toxin.

Active immunity to tetanus was obtained in horses by means of the same method of neutral mixtures of tetanic toxin and serum, and also by the method of Löwenstein and von Eisler, previously noted (E. S. R., 34, p. 580).

Studies in regard to the production of antitoxic sera.—I, Production of antitoxic sera by the use of toxins and antitoxins in old horses, R. KRAUS and A. SORDELLI (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 2, pp. 195–203*).—Experimental evidence is given indicating that old horses (over 10 years of age) seem to be better producers of serum than young ones. By injecting neutral mixtures of toxin-antitoxin twice a week in increasing doses, an antidiphtheritic serum of high power (300, 400, and 500 units) may be produced in 20 days.

Oxhydridase, an oxido-reducing diastase. Its antitoxic rôle, J. E. ABELOUS and J. ALOY (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 14, pp. 783–785*).—This is a summary of the results of investigations, some of which have been previously noted (E. S. R., 38, p. 802), upon an oxido-hydrogenating diastase to which the name oxhydridase has been given. This soluble ferment is said to exist in animals and vegetables and also in certain secretions, particularly milk. Its action of oxido-reduction takes place within certain temperature limits, the maximum action being at about 60° C. The enzym, contrary to true oxidases, acts preferably in the absence of air, and is consequently considered to be a defensive antitoxic agent adapted to the anaerobic life within the tissues.

The action of mixtures of salts on lactic fermentation, C. RICHET and H. CARDOT (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 14*, *pp. 751–755*).—The combined antiseptic action of mixtures of salts was studied by means of their effect upon lactic fermentation, as determined by the amount of lactic acid formed at the end of a certain time. It was found that the action of a mixture of antiseptics is that of the most active substance employed, the addition of other antiseptics having no effect. The consequent futility of the use of mixtures of antiseptics is pointed out.

Remarks on the recent communication of Belin. Pharmacodynamics of alkaline chlorates, J. E. ABELOUS (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 14*, *pp. 782, 783*).—The author disagrees with the theory of Belin (E. S. R., 38, p. 585) that the action of certain organic and inorganic oxidizing agents upon toxins or microorganisms is one of direct oxidation, and proposes the theory that the favorable action is due to an appreciable diminution of the number of leucocytes, with a modification of the leucocytic structure consisting of an increase in the polynuclear cells, followed on the third day by the appearance of large vaculated mononuclear cells.

The theory and practice of alcohol disinfection, J. CHRISTIANSEN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *102* (*1918*), *No. 5–6*, *pp. 275–305*, *figs. 6*; *abs. in Jour. Chem. Soc.* [*London*], *114* (*1918*), *No. 674*, *I*, *p. 564*).—The disinfecting action of alcohols as influenced by their surface tension, hydration, and precipitating effect upon proteins is discussed. From theoretical considerations and experimental evidence, the author recommends propyl alcohol as a satisfactory skin and wound disinfectant.

A note on the value of brilliant green as an antiseptic, C. H. S. WEBB (*Jour. Roy. Army Med. Corps*, *31* (*1918*), *No. 4*, *pp. 315–317*).—Observations on the use of brilliant green as an antiseptic for the dressing of wounds are reported.

The brilliant green is dissolved in N saline solution in the strength of 1 in 1,000 and can be used as a surface dressing for wounds, in the saline pack, or after the method of Carrel. In the experience of the author it has proved to be an active, efficient, and nonirritant antiseptic, acting as well in the presence of serum as in its absence. The fact that it stains dead tissue green is considered to be of advantage in aiding the surgeon in determining what to excise.

A multiple-pipette holder for the distribution of serum for the complement-fixation test, F. H. REYNOLDS (*Jour. Agr. Research* [*U. S.*], *15* (*1918*), *No. 11*, *pp. 615–618*, *figs. 3*).—The author, at the Bureau of Animal Industry, U. S. Department of Agriculture, has devised a multiple-pipette holder based upon the principle of the multiple pipette of Buck, previously noted (E. S. R., 35, p. 680).

The device consists of a brass tube connected by means of a tube set at right angles with 12 brass collaterals. These are lined with rubber tubing of sufficient length to project about ½ in., the free end being everted over the opening of the tube. To these tubes are fitted pipettes made of selected 4-mm. glass tubing and graduated for the proper amount of serum. The bottles containing the serum are placed in trays holding 144 bottles, 12 wide and deep. The test tube racks are constructed to hold a double row of 12 tubes each, which are numbered to correspond with the pipettes and bottles. The serums are drawn above the etched graduations, allowed to recede until the graduations are reached, and then transferred to the 12 test tubes bearing the same numbers as the bottles. The used pipettes are then replaced by fresh.

Actual tests with the apparatus showed that 1,000 specimens can be removed conveniently from the bottles and placed in test tubes in about half an hour. Other advantages claimed for the holder are that no eye strain attends the operation of the device, the pipettes are sufficiently small to enter the bottles without agitation of the contents, and only one operator and two assistants are required where previously many were necessary.

Anthrax vaccination, H. J. Rossello (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 4, pp. 449–452*).—The vaccine described consists of a uniform suspension of spores of anthrax bacilli. The necessity is emphasized of the use of spores instead of active bacilli, of the use of an emulsifying liquid of special composition, and of the standardization of every vaccine and its final adjustment to contain an equal number of spores for each cubic centimeter. The question of single or double vaccination is discussed, and the double vaccination is recommended only for horses. For effective prophylaxis of the disease, the author states that it is of the greatest importance to prohibit the sale to the public of all vaccines which in practice cause an appreciable mortality.

Studies on anthrax vaccine: Necessity of an official control, R. Kraus and P. Beltrami (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 2, pp. 133–146*).—Observations on the use of anthrax vaccine are discussed and the following suggestions made:

The double vaccination of Pasteur with vaccines I and II is preferable to the single vaccination. The vaccine should always be fresh, preferably not more than a month old. The use of old vaccines is considered questionable on account of their attenuation on standing. Each series of vaccines should be tested quantitatively, and their preparation and sale should be under government control.

Studies on anthrax vaccine.—II, Fate of anthrax bacilli in normal and immunized sheep, R. Kraus and P. Beltrami (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 3, pp. 323–332*).—This is a continuation of the investigation noted above. Experiments are cited which indicate that virulent or attenuated anthrax bacilli when injected into healthy and immune animals either perish in the organism or become so attenuated that strains cultivated from them are avirulent for rabbits, guinea pigs, and mice.

The authors consider that the existing theories, such as the antiblastic and aggressin theories, do not take into consideration the attenuation of the virus, which in their opinion is the chief cause of the active and passive immunity.

The treatment of anthrax with normal (beef) serum, C. H. Hyman and T. Leary (*Boston Med. and Surg. Jour., 178 (1918), No. 10, pp. 318–323, figs. 2*).—This is a review of the literature on the local treatment of external anthrax and on the use of immune serum and normal ox serum, together with a discussion of the method of action of the various serums.

The authors conclude that specific antianthrax serum owes its efficacy in a small measure to specific immune substances, but principally to a nonspecific protein reaction obtainable by the use of other protein substances, of which heated normal beef serum is considered to be the least objectionable. A case report is given of a successful treatment of human anthrax by normal beef serum.

The treatment of anthrax in man with normal bovine serum, J. Penna (*Rev. Inst. Bact. [Argentina], 1 (1918), No. 2, pp. 115–132; abs. in Abs. Bact., 2 (1918), No. 4, p. 256*).—The treatment of anthrax with normal bovine serum is said to have given results superior to those obtained by any other method of treatment. The serum is given subcutaneously in doses of from 30 to 50 cc., repeating the injections every 12, 24, or 36 hours if necessary, although it is seldom that more than two or three doses are required. In severe cases intravenous injection is considered preferable. It is said that the serum, if heated twice to 56° C., seldom produces serum sickness. The author is of the opinion that normal bovine serum may also be efficient in the treatment of other infectious diseases, such as the plague, cerebrospinal meningitis, etc.

Tartar emetic in the treatment of derrengadera, J. ITURBE (*Gac. Méd. Carácas, 25 (1918), No. 6, pp. 62, 63; abs. in Vet. Jour., 74 (1918), No. 517, pp. 266, 267; Trop. Vet. Bul., 6 (1918), No. 3, pp. 154, 155*).—In the treatment of the trypanosomiasis known in Venezuela as derrengadera (mal-de-caderas), 1 to 1.5 gm. of emetic dissolved in 100 cc. of chlorid solution at 4:1,000 and injected intravenously at intervals of 5 days resulted in the cure of all the animals treated.

Favus herpeticus or mouse favus.—Possibility of production of favus in man from Australian wheat, R. E. BUCHANAN (*Jour. Amer. Med. Assoc., 72 (1919), No. 2, pp. 97–100*).—This is a report of studies by the Hygienic Laboratory of the U. S. Public Health Service, made with a view to determining whether or not there is danger that men engaged in this country in the handling and milling of Australian wheat may become infected with the dermatophyte *Achorion quinckeanum*. The conclusions drawn from the studies are as follows:

"There exists in many parts of Europe and in Australia and probably in the United States and in other parts of the world a disease, mouse favus, the cause of a highly fatal infection among mice and not infrequently transmitted to man, producing a herpetiform favus of the smooth skin. The disease in man usually yields readily to treatment.

"Samples of mouse skins and of wheat from Australia failed to show evidence of favus. That the disease is prevalent among the field mice that have attacked the Australian wheat stores seems to be established through the accounts of Paul and of Lawrence. It is not improbable that cases of favus herpeticus may arise occasionally among men who handle the imported Australian wheat or in animals, particularly rodents, that feed on the grain or on certain of the mill by-products.

"It is not probable that the danger from the disease is great enough, or the disease itself serious enough, to warrant interference with the importation of the wheat from Australia."

Prompt macroscopic agglutination in the diagnosis of glanders, O. R. POVITZKY (*Jour. Immunol., 3 (1918), No. 6, pp. 463–479*).—A method is described by means of which it is stated that a prompt, clear-cut macroscopic agglutination for the diagnosis of glanders can be obtained in two hours. For success in the reaction, it is necessary to use a strain of *Bacillus mallei* which has proved to be constant and of native agglutinability, to prepare very carefully the medium in which it is grown, and to neutralize all the glassware used in connection with the cultures.

The medium which has given the most satisfactory results is potato-glycerin-veal agar that is 2.5 per cent acid to phenolphthalein. Slants of this medium are inoculated with 48-hour cultures of the organism. After 48 hours' incubation at 37° C., the growth is washed off with 0.85 per cent salt solution and killed by heating at 60° for 2 hours. A little carbolic acid is added to this stock suspension, which can be kept in the ice box for two months or more if handled with aseptic precautions.

The tests are carried out with a fresh dilution of the stock suspension made by adding 0.85 per cent saline solution. A primary dilution of the serum (1:40) is made, and used in varying quantities with 3 cc. of the bacterial suspension to make a final serum dilution of 1:500, 1:800, 1:1,000, 1:1,200, 1:1,600, and 1:2,000. Known negative and positive serums and the bacterial suspension without serum are used as controls. The tubes are placed in a water bath at from 37 to 42° for 2 hours.

It is said that with this technique a reaction up to 1,000 or more may be obtained in from 10 to 20 minutes, while a positive reaction always appears in 2 hours. If the reaction is above 1:1,000 the horse should be kept under investigation. A comparative study of the agglutination, complement-fixation, and mallein tests from data obtained from the diagnosis of 123 horses which proved on autopsy to have glanders, showed a percentage value of 85.8 in the agglutination test, 24.4 in the complement-fixation test, and 12.2 in the mallein test. Three cases were identified by the agglutination test alone, 4 by the complement-fixation test, and 15 by the mallein test.

The author points out that no one test can be depended upon alone, as each one has its peculiar value in certain stages of the disease, but that if all three tests are used very few cases of glanders can escape detection. It is urged that for the successful eradication of glanders all stables should be under the supervision of the city health department, and that records of the three tests should be kept and some mark of identification devised for every horse by which all records can be compared.

The antigen for the complement fixation test for smallpox, O. Casagrandi (*Ann. Inst. Pasteur, 32 (1918), No. 10, pp. 463–470*).—The preparation of the antigen for the complement-fixation test for smallpox is discussed.

The method proposed consisted of collecting the fresh vaccine without the use of glycerin, grinding it without kaolin or silica, and centrifuging it in the presence of physiological serum to obtain a slightly opalescent liquid. If to the filtrate containing the virus alone sterile leucocytes be added, the antigen is said to give very constant results.

Chemical changes in tuberculous tissues, G. T. Caldwell (*Jour. Infect. Diseases, 24 (1919), No. 2, pp. 81–113*).—This article contains a review of the literature on the chemical analyses of normal and pathologic, particularly tuberculous, tissues of men and of animals, and a report of analyses by the author of bovine lymph gland and liver tubercles and of fresh normal lymph glands and liver.

Bromocresol purple and litmus as indicators for the classification of tubercle bacilli, L. Frothingham (*Jour. Med. Research, 39 (1918), No. 2, pp. 153–156*).—Preliminary experiments are reported in which the Smith glycerin bouillon curves with human and bovine tubercle bacilli were studied by means of the color changes in bromocresol purple and in litmus.

It was found that in general with the use of bromocresol as an indicator both human and bovine cultures first turn the bouillon more violet or blue, the color remaining fixed with bovine cultures and turning yellow with human cultures. With litmus both types turn the bouillon more or less blue at first and the bovine cultures remain bluish, while in the human cultures the bouillon is turned yellow.

The author concludes that both indicators may prove valuable in differentiating types of tubercle bacilli.

The significance of tuberculosis in infants and children with measures for their protection, A. F. Hess (*Jour. Amer. Med. Assoc., 72 (1919), No. 2, pp. 83–88*).—Statistics are given of the absolute number of deaths from tuberculosis at different ages in New York and other cities, which show that the highest mortality is during the first year of life, following which there is a quiescent phase. The second active phase seems to be governed by the onset of puberty, appearing at the age of 12 years in girls and 16 years in boys.

The great loss in infancy is considered to be due in part to the fact that infants receive an exceptionally large amount of the infective agent. The author states that bovine infection "is a factor which must be considered in accounting for the high mortality of this period, although it should not be appraised as a preponderating influence." The second active phase is thought to be due to an "autogenous reinfection" from some latent focus rather than to a fresh infection from some tuberculous individual.

Abortion in cattle: Some of the causes and preventives, G. M. POTTER (*Ann. Rpt. Conn. Bd. Agr., 49 (1917), pp. 44–55*).—This is a general discussion.

Concerning hemoglobinemia or piroplasmosis of cattle in Sweden, A. M. BERGMAN and H. WAXBERG (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 18 (1917), p. 358; abs. in Centbl. Bakt.* [etc.], *1. Abt., Ref., 67 (1918), No. 15–16, p. 384*).—It is pointed out that this disease occurs throughout Sweden, particularly in sections of the country where brush is abundant. Transmission takes place through *Ixodes ricinus*, and the mortality averages about 20 per cent.

A preliminary note on infectious keratitis, J. A. ALLEN (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 4, pp. 307–313, fig. 1*).—"Previous investigators have been unable to reproduce infectious bovine keratitis in experimental animals by the instillation of pure cultures of the predominating organism or by the transference of the exudate. In this investigation the disease has been successfully transmitted by passing an infected swab over the conjunctiva of of healthy animals.

"A diplobacillus having several of the prominent characteristics of the bacillus of Morax-Axenfeld, which is associated with human conjunctivitis, has been isolated. The disease has not yet been artificially produced by the instillation of this organism. This may result [from] several causes, or possibly from the attenuation on artificial media. An abrasion of the eye is not an essential factor in the production of the disease. Flies may play an important rôle in the dissemination of the affection."

Notes and experiments on Sarcocystis tenella, II, J. W. SCOTT (*Jour. Parasitology, 5 (1918), No. 2, pp. 45–60*).—In this second paper (E. S. R., 34, p. 384) the author deals with seasonal infection, summarizing the data as follows:

"There is a well-defined seasonal infection of *S. tenella* in the region of the Laramie Plains, [Wyo.]. It is not known whether this is true or not of other regions. Young stages of this parasite have been found in the muscles of both sheep and lambs throughout summer and early autumn, but not during the winter and spring. Reinfection occurs in successive seasons, and old sheep are apparently as susceptible to infection as are young lambs. The theory of infection in utero is untenable. Seasonal, self-reinfection is improbable, though not entirely excluded, and the evidence indicates the original de novo of successive infections.

"If a second host is required, which seems probable, it is very likely that this host is an insect, and that the definitive (sexual) stage of the parasite will be found here. If a second host is not necessary, the sexual stage probably takes place in the intestine of the sheep, and in some unknown way the life cycle falls under the influence of seasonal control. In old ewes the larger sarcocysts are not nearly so abundant as the smaller ones. That some of the older sarcocysts do not grow to a large size is probably the most satisfactory explanation of this fact."

A list of ten references to the literature is given.

Hogs and the tent caterpillar, F. M. HAYES (*Jour. Amer. Vet. Med. Assoc., 54 (1918), No. 1, pp. 59–61, pls. 4*).—Investigations made of the loss of some 30 hogs in two weeks on two ranches in a small valley of 25 square miles in California showed it to be due to feeding on cocoons of the forest tent caterpillar, large quantities of which were found on plants along ravines and on the leaves of the oak trees. Upon post-mortem examination an indigestible mass was removed from the intestines in one continuous string. A dissection of the material showed it to be composed of fine, wool-like fiber enmeshing bits of grass, barley hulls, and small fragments of a dark-brown material. Invaginations and volvulus appear to be the immediate cause of death. Treatment consists in removal from the range until the adults have emerged.

Cultivation of the causative organism of epizootic lymphangitis in series and its development in the horse, L. NÈGRE and A. BOQUET (*Ann. Inst. Pasteur, 32 (1918), No. 5, pp. 215–241, figs. 3; abs. in Trop. Vet. Bul., 6 (1918), No. 3, pp. 175–178, figs. 3*).—A detailed report of the studies noted from another source (E. S. R., 39, p. 789).

Some notes on the treatment of equine ascariasis and oxyuriasis, M. C. HALL, R. H. WILSON, and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc., 54 (1918), No. 1, pp. 56, 57*).—The authors confirm the view that equine oxyuriasis is readily amenable to anthelmintic treatment, while equine ascariasis is not readily amenable to anthelmintic treatment by therapeutic doses of safe anthelmintics.

The anthelmintic treatment of equine intestinal strongylidosis, M. C. HALL, R. H. WILSON, and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc., 54 (1918), No. 1, pp. 47–55*).—"Contrary to what has been supposed, the removal of strongyles from the large intestine of the horse presents no great difficulties. The remedy of choice is oil of chenopodium, which displays an efficacy of 95 to 100 per cent when given to horses fasted 36 hours and given in doses of 16 to 18 mils, in one dose or in divided doses, accompanied by a quart or a liter of linseed oil or followed one or two hours later by this amount of linseed oil. The small worms, Cylicostomum, are more readily removed than the large, red palisade worms, Strongylus, probably due to the fact that Strongylus attaches to the mucosa and Cylicostomum does not.

"Turpentine appears to be the second choice of the remedies tested. In the doses used, iron sulphate and tartar emetic gave very poor results and promised little of value in the treatment of strongylidosis."

The etiology and treatment of granular dermatitis, R. VAN SACEGHEM (*Bul. Soc. Path. Exot., 11 (1918), No. 7, pp. 575–578; abs. in Trop. Vet. Bul., 6 (1918), No. 3, pp. 171–173*).—Further experiments confirm the author's view that flies are the vectors of Habronema larvæ, the cause of summer sores, as previously expressed,[1] and proved that the parasites found in the verminous nodules is an aberrant larva of *H. muscæ*. This substantiates the view of Railliet and Henry.[2]

"Horses affected with granular dermatitis often showed conjunctivitis, and this was found to be set up by the presence of small verminous nodules located especially on the membrana nictitans."

A curative treatment regarded by the author as specific consists in the careful disinfection of the sore and then the application of a powder consisting of plaster of Paris 100, alum 20, naphthalin 10, and quinin 10 parts, or a sufficient quantity of any other bitter powder. This powder effectively protects the sore

[1] Bul. Soc. Path. Exot., 10 (1917), No. 8, pp. 726–729.
[2] Bul. Soc. Path. Exot., 8 (1915), No. 9, pp. 695–704.

against flies, is very adhesive, rapidly dries up the sore, and the bitter ingredient prevents the animal from biting itself. It prevents further infestation with larvæ, and those already present become encysted and are eliminated without causing any damage. All the sores treated in this way become rapidly cicatrized. Care should be taken to renew the plaster as long as the slightest breach in continuity of the surface remains.

Notes on two species of nematodes [Gongylonema ingluvicola Ransom 1904 and Capillaria strumosa (Reibisch, 1893)] parasitic in the crop of chickens, L. D. Wharton (*Jour. Parasitology, 5 (1918), No. 1, pp. 25–28, figs. 2*).—The author has found two species of nematodes to occur in the walls of the crops of the chickens examined in the Philippines. The larger of the two, which was found in about 40 per cent of all the chickens examined, was identified as *G. ingluvicola*, while the second or more slender species, which was found in about 30 per cent of the chickens, was identified as *C. strumosa*.

Experiments in avian toxicology, B. A. Gallagher (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 4, pp. 337–356*).—This is a report of experiments undertaken with a view to determining the toxic doses for fowls of the more commonly used medicinal agents and of poisonous substances to which fowls not infrequently have access.

"In general, fowls may be considered as having approximately the same susceptibility to toxic substances as medium-sized dogs. They are more resistant to such substances as calomel, strychnin, and tartar emetic, and less resistant to carbolic acid, salicylic acid, and potassium cyanid.

"In treating outbreaks of disease in fowls it is of great advantage to employ the drinking water as a vehicle for medicinal agents. It is shown that fowls are not visibly affected by drinking solutions of bichlorid of mercury 1 : 6,000, carbolic acid 1 : 1,000, permanganate of potash 1 : 500, and crude catechu 1 : 500 for a period of 18 to 21 days.

"It is interesting to note that the crop not only serves as a reservoir for food, but that absorption through its wall is very rapid, symptoms appearing in from two to five minutes after the administration of such substances as ammonium chlorid in solution, potassium cyanid, and strychnin sulphate."

Diseases transmitted by ticks, their classification, treatment, and prophylaxis, J. Lignières (*Rev. Zootéc., 6 (1918), No. 61, pp. 72–84*).—A paper presented at the Tenth International Veterinary Congress in 1914 (E. S. R., 34, p. 575).

Babesiosis and the Babesia parasite in Netherlands, A. Vrijburg (*Tijdschr. Diergeneesk., 45 (1918), No. 19, pp. 535–549, pls. 4; 20, pp. 563–578, pls. 3*).—In the course of this discussion of *Babesia bovis* an account is given of *Ixodes ricinus*, which is the active agent in its transmission in Holland.

RURAL ENGINEERING.

Preliminary report on the improvement of marshlands in western Oregon, W. L. Powers (*Oregon Sta. Bul. 157 (1919), pp. 32, figs. 24*).—It is pointed out that there are 150,000 acres of marshland in western Oregon, including the tide, overflow, and peat lands, for which drainage and improvement is feasible and desirable from an agricultural, engineering, and economic standpoint.

Drainage district procedure under the State drainage law is outlined, and the design and construction of dikes, tide boxes, outlet ditches, and pumping plants are briefly described. The design, installation, and early operation of a tile system on the diked tideland on the substation near Astoria is also recorded.

Preliminary results from experimental sections of the tile system indicate that tile placed 4 ft. deep with lines 5 rods apart will sufficiently control the excess water and water table and provide suitable drainage for staple field crops on tidelands. Where outlets limit the depth of laterals to 3 ft. tile lines may be put 4 rods apart.

"For truck crops or valuable onion lands like the beaver-dam soils, spacing 3 rods apart is desirable, yet a depth of 4 ft. should be maintained with this closer spacing on account of shrinkage. Silt loam having some variation in topography, like the overflow and bank land, may require only a random or natural system of interior tile to take care of water in depressions.

"Experiments indicate that near the north Oregon coast tide boxes should have a capacity of 1 sq. ft. for each 12 acres. On the lower Columbia supplementary pumping plants which have a capacity to handle 0.25 to 0.2 in. an acre of rainfall in 24 hours are satisfactory. Measurements of outflow indicate that tile may need a capacity to handle 1 in. an acre in 24 hours near the north coast of Oregon; 0.75 in. an acre near the south coast; and 0.33½ to 0.5 in. an acre in the Willamette Valley. The tile drainage system described has disposed of excess water and reduced the water table, frequently running full for several days at a time in heavy weather.

"Cost of the tile system as designed will average about $25 an acre. The first crop, 5 tons field-pea hay to the acre, was double the yield on the portion not yet tiled. This crop was worth $25 a ton at local prices, so the cost of tiling was repaid in the first crop. Tiling will double the productive value of the greater part of the marshlands in western Oregon. . . .

"The reclamation of marshlands consists of three operations: (1) Protecting works; (2) field or farm drainage; and (3) subjugation of wild growth, breaking, and establishment of improved crops. These latter operations are described."

The zeolite process of water softening.—Comparative analysis of commercial zeolites, R. Hulbert (*North Dakota Sta. Spec. Bul. 5 (1918,) No. 7, pp. 161–170*).—Continuing previous work (E. S. R., 39, p. 687), this paper discusses the important features of this process and presents the results of analyses and laboratory tests as a basis for comparing the composition and exchange values of three commercial zeolites. The zeolites used for water softening are natural or artificial, hydrous, alumino, or ferro-silicates, containing the associated bases sodium or potassium. They possess the property of exchanging these associated bases for others, such as calcium, magnesium, iron, etc.

As advantages of the zeolite process it is stated that zeolite softeners can deliver a water of zero hardness, and are of simple design and hence very easy to operate. The process does away with the addition of any chemicals or reagents, and no precipitate or sludge is formed at any stage of the process.

The limitations of the zeolite process are as follows: (1) Extremely hard waters, whose total hardness exceeds 1,000 parts per million, are not economically softened by the zeolites at present available; (2) the initial cost of commercial zeolite softeners is high; (3) owing to the porous nature of the zeolite grains only a clear raw water, free from suspended matter, can be used.

Machinery for cutting firewood, H. R. Tolley (*U. S. Dept. Agr., Farmers' Bul. 1023 (1919), pp. 16, figs. 5*).—This describes different types of wood-sawing rigs, points out the advantages and disadvantages of each, gives information as to first cost and cost of operation, and offers suggestions as to how they may be operated most efficiently.

RURAL ECONOMICS.

The evolution in farming, E. G. Nourse (*Yale Rev., 8 (1918), No. 1, pp. 90–105*).—This résumé of recent agricultural developments includes discussions of scientific, capitalistic, and commercialized tendencies and of the two types of agricultural organization, corporate and cooperative. The author commends especially the latter as affording managerial, marketing, and credit, as well as social advantages to the ordinary farmer.

The future of our agriculture, H. W. Wolff (*London: P. S. King & Son, Ltd., 1918, pp. VII+503*).—In suggesting remedies for England's lack of a national agricultural policy and failure in the matter of home production of the food supply, the author studies, in detail, practices carried on abroad, especially in Germany and France, in order to make comparisons. He writes that protection has not proved practical from the agricultural standpoint, either at home or abroad. He urges Britons to abandon wheat growing as unprofitable, to increase the acreage of green crops, and to develop the dairying and poultry raising industries.

Detailed discussions of the subject matter are included in chapters on education, organization, working credit for farmers, labor, small holdings, a full reward for the tiller, and reclamation of waste lands—these being the desiderata for the agricultural revival, "a maximum agricultural output in time of peace and a fully assured supply of foodstuffs in time of war"—and the safe establishment of a national agricultural policy.

[Rôle of agriculture], F. A. Ogg (In *Economic Development of Modern Europe. New York: The Macmillan Co., 1917, pp. 3–44, 117–132, 158–211, 315–340*).—In these portions of this book the author includes introductory chapters on the land and people, and agrarian foundations; discussions of the developments in English agriculture from 1750 to 1825 and of the later English rural decline; and a historical survey of agriculture in France, Germany, and Russia.

Corn Production Act, 1917, with explanatory memorandum, C. C. Black (*London: The Land Union, 1917, pp. 80*).—The explanatory notes included in this volume, with the text of the act, are designed to aid farmers, landowners, and others concerned with carrying out its provisions.

[Prevention of waste in agriculture], H. J. Spooner (In *Wealth from Waste. London: George Routledge & Sons, Ltd., 1918, pp. 143–193*).—In these chapters on the coming agricultural revolution, utilization of waste land, reclamation of waste land, and waste due to neglect of afforestation, the author urges the preparation of young men for agricultural careers, greater use of farm machinery, cultivation of unused and poor lands, prevention of waste from erosion and overflow, and the drainage of swamps, and recommends the planting of timber trees.

Farming on factory lines, T. Wibberley (*London: C. Arthur Pearson, Ltd., 1917, pp. 264, pls. 8, figs. 10*).—The author discusses an extremely intensive method of farm management advocated by him for several years and described as a "continuous cropping system." This system aims at the elimination of costly hand labor and of idle land and labor, and it is said to incur far less risk from unfavorable weather conditions than the prevailing system of cultivation. A practical demonstration of the method made in Ireland forms the basis for the discussion and for the recommendations offered.

Briefly, the continuous cropping system involves a modification of standard crop rotations as follows: The winter cereals are sown in late summer or early autumn in 12-in. rows or in double rows 18 in. apart, with 6 in. between rows, and are grazed in the fall and spring to delay harvest. They are intercropped with winter forage for sheep. The winter forage is followed by spring cereals, which, in turn, are intercropped with tares. In the third year the tares, which are intercropped with winter forage, are grazed in the fall and in the spring, and are cut for hay or silage during the summer. The winter forage provides feed from October to March, when it is followed by spring cereals seeded with grass and sainfoin. The first crop of grass and sainfoin is used for hay, and the aftermath for silage. The following year the area is pastured, and the rotation begun again. Modifications of this scheme to provide for the growing of potatoes and root crops are outlined. A discussion of intensive methods of milk and beef production from the consumption of the crops grown is included.

Continuous cropping and tillage dairy farming for small farmers, T. Wibberley (*London: C. Arthur Pearson, Ltd., 1917, pp. 186, figs. 9*).—Stating that next to intensive market gardening milk production is most profitable for the small farmer, the author outlines a system of farm management deemed applicable to a holding of 20 acres and based upon his continuous cropping system described above.

Agriculture in Berkshire, J. Orr (*Oxford, Eng.: Clarendon Press, 1918, pp. X+208, pls. 19, figs. 11*).—This is a study of Berkshire, England, similar to that of Oxfordshire, previously noted (E. S. R., 37, p. 291).

Production of food in Scotland, E. Wason et al. (*Scot. Dept. Committee on Food Prod. Rpt., 3 (1917), pp. 8*).—The committee here reports the action taken by local organizations in regard to previous recommendations (E. S. R., 37, p. 890), and makes new ones regarding the increase of arable land, the extermination of pests, and labor and wage adjustments.

[The economic effects of the war upon agricultural production], G. Renard (In *Les Répercussions Économiques de la Guerra Actuelle sur la France, August 1, 1914–May 15, 1917. Paris: Libr. Félix Alcan, 1917, pp. 319–379*).—The author, in these pages, traces the reactions of the state of war upon crop production and live-stock raising in France. Figures are given for the period 1913–1916, showing decreases. He recounts efforts to organize farm labor bureaus, the cooperation of military authorities in meeting the farm labor need, and the availability of colonial and other imported labor. He also discusses the impulse given by war conditions to motor cultivation, use of fertilizers, conversion of idle land, and gardening, and in the last chapter noted he deals with the classes found in rural populations and the means of restoring and improving the equipment and the living conditions, particularly of the peasants.

The economic future of Macedonia, H. Hitier (*Bul. Soc. Encour. Indus. Nat.* [*Paris*], *117 (1918), II, No. 5, pp. 271–273*).—General notes on the existing agricultural status of the country and the possibility of its becoming a market for French products are here recorded.

Foodstuff production in Mauritius, H. Robert (*Dept. Agr. Mauritius, Statis. Ser., Bul. 3 (1918)* [*English Ed.*], *pp. 10, pl. 1*).—This bulletin contains statistics on the production, consumption, and importation of grain and the relation between values of rice and sugar in the colony since 1898. The data indicate also the purchasing power of sugar in terms of rice, a factor which furnishes an index to the serious economic depression of the community. This condition is represented graphically in an annexed diagram.

The rôle of our colonies after the war, E. Du Vivier de Streel (*Le Rôle de Nos Colonies dans l'Après-Guerre. Paris: Augustin Challamel, 1916, pp. 38*).—This discussion of the future of French colonial development includes that of the value of raw materials imported from the colonies and of the organization of public utilities, native labor, agriculture, transportation, and financial systems, which it is thought will insure to France realization of the possibilities of assistance from her colonial possessions.

A selected list of references on the reconstruction and reeducation of disabled soldiers and sailors (*Boston Pub. Libr. Brief Reading Lists, No. 5* (*1918*), *pp. 22*).—This list contains a few references on the subject of agricultural reeducation and the return of disabled soldiers and sailors to the land.

[Farms for returning soldiers] (*U. S. Dept. Int., Ann. Rpt. Sec., 1918, pp. 12–21*).—This presents recommendations of the Secretary of the Interior for Government improvement of arid, swamp, and cut-over timber lands, with the end in view of making them available to returning soldiers.

Farm allotments and farm laborers' allotments in the Durham State land settlement (*Berkeley, Cal.: State Land Settlement Bd., 1918, pp. 7, pl. 1, figs. 4*).—Information similar to that previously noted (E. S. R., 40, p. 389) is given for areas later thrown open to inspection.

[Meeting farm labor demands] (*U. S. Dept. Labor, Ann. Rpt. Sec., 6* (*1918*), *pp. 203–214*).—These pages contain reports of the efforts of the U. S. Department of Labor toward meeting agricultural labor requirements in the grain belt and outside and in cooperation with the Canadian Government, sending wheat harvesters into Manitoba and Saskatchewan in exchange for extra workers for the potato crop and lumbering operations in Aroostook County, Me. Reports of the work of the Boy's Working Reserve and Farm Service Division are also given.

Wages Board Gazette (*Wages Bd. Gaz., 1* (*1918*), *Nos. 1, pp. 1–16; 2, pp. 17–28; 3, pp. 29–44; 4, pp. 45–56; 6, pp. 69–84; 7, pp. 85–92*).—The first of these papers contains a summary of the first eight months' work of the Wages Board of Great Britain. The others are given to minutes of the meetings of the Agricultural Wages Board, agricultural club notes, official notices, current scale of minimum-wage rate in force, etc.

New York State Boys' Working Reserve, H. D. SAYER (*N. Y. State Food Com. Circ. 1* (*1918*), *pp. 8*).—The purpose of this circular is to show the cooperation of the county farm bureaus, the State Department of Education and the public school system, and the State Public Employment Bureau in the Boys' Working Reserve organization and to outline the method of procedure in using the latter.

Children in agriculture, R. MCINTIRE (*Nat. Child Labor Committee Pamphlet 284* (*1918*), *pp. 16, figs. 11*).—This pamphlet reports child labor investigations made by the National Child Labor Committee in the beet raising localities of Colorado in 1915, in seven rural counties of Kentucky, in "shade-grown" tobacco fields of Connecticut in August, 1917, and in Oklahoma. In these districts nonattendance at school and retardation in studies are general and largely due to demands of farm work and house work. The author points out the economic fallacy of the faulty organization of the schools, which is in many instances an explanation of the situation.

[Cooperative production], E. P. HARRIS ET AL. (In *Cooperation the Hope of the Consumer. New York: The Macmillan Co., 1918, pp. 257–263*).—The author devotes this chapter to the discussion of principles underlying growers' and shippers' organizations and the advantages of cooperation among producers in insuring to customers uniform quality and standard grading, achieving a wider distribution of products, etc.

Cooperation in the New World, L. SMITH-GORDON (*Better Business, 2* (*1917*), *No. 2, pp. 163–178; 3* (*1918*), *Nos. 3, pp. 204–221; 4, pp. 321–336; 4* (*1918*), *No. 1, pp. 1–19*).—The author continues the account previously noted (E. S. R., 38,

p. 689), taking up grain and live-stock cooperative enterprises in the North and fruit and nut growers' associations on the Pacific coast.

The largest cooperative society for farmers (*Country Life* [*London*], *44* (*1918*), *No. 1139, pp. 375, 376*).—This article gives the history, organization, and benefits of the Eastern Counties Farmers' Cooperative Association of Suffolk, England, with statistics showing the membership, acreage represented, capital, sales, and net profit during 12 years, 1905 to 1917.

The spread of cooperation in the Punjab, C. F. Strickland (*Agr. Jour. India, 13* (*1918*), *Nos. 2, pp. 260–271; 4, pp. 671–684*).—This article is devoted to the discussion of early types of organization, legislation in encouragement of agricultural cooperation, attitude of officials and public, financial control, and thus of the evolution and prevailing type of the Punjab societies.

The Australian Farmers' Federal Organization (*Land* [*Sydney*], *8* (*1918*), *No. 405, pp. 2, 3*).—In this account are published the resolutions adopted at the conference of October 8, 1918, with notes of local meetings of the organization.

Journal of proceedings of the National Grange of the Patrons of Husbandry, fifty-second annual session, Syracuse, N. Y., 1918 (*Jour. Proc. Nat. Grange, Patrons Husb., 52* (*1918*), *pp. 192*).—The reports and resolutions embodied in these proceedings indicate the policy of the Grange in regard to farm loans, the Farm Service Labor Bureau, agricultural reconstruction, taxation, and related topics.

Third annual report of the New Jersey State Department of Agriculture (*N. J. Dept. Agr. Bul. 17* (*1918*), *pp. 73–152, figs. 15*).—In this bulletin are included a report of the specialist in farm management regarding his work on State institution farms, previously noted (E. S. R., 39, p. 89); a report on projects concerned with organizing and assisting farmers' cooperative and business associations as to city distribution, transportation, etc.; a summary of market conditions by counties; a list of farmers' buying and selling agencies; and a report of the statistical service on the value and accuracy of crop estimates.

Government marketing of Australian wheat, A. M. Sakolski (*Amer. Econ. Rev., 8* (*1918*), *No. 4, pp. 853–855*).—This reports the methods of securing a minimum price to the wheat growers of Australia by the issuance of negotiable scrip certificates on which Australian banks advanced about 60 cts. per bushel to the farmers. The author states that the success of this socialistic plan would no doubt be complete were it not for transportation and shipping difficulties. He suggests that the producer will grow other crops rather than submit to the pooling arrangement in the face of an enormous surplus.

The farmers' elevator movement in Ohio, H. E. Erdman (*Ohio Sta. Bul. 331* (*1918*), *pp. 139–160, figs. 5*).—This study, made in cooperation with the department of rural economics, Ohio State University, to ascertain the nature and extent of the farmers' elevator movement in Ohio, was conducted by means of personal visits and the use of a questionnaire. The author gives, in this report of the work, first a historical sketch of the movement, illustrating the location of farmers' elevators established in Ohio in 1910 or earlier and in 1914 or earlier, and those operating in May, 1918.

The inquiry shows that the elevator companies are either corporations in which most of the stock is owned by farmers who are interested as a business venture or in marketing their own grain advantageously, or else they are cooperative companies marked by restricted ownership of capital stock, limited voting privilege, and distribution of a patronage dividend. Thirty-nine of the 62 companies replying to the investigation indicated that they limited the number of shares to from one to five. Four of the same number reported the number of shares not limited. The one-man-one-vote plan was followed in 46 of the 62 companies. Fifty-five of the 86 farmers' companies reporting on this question showed that provision had been made for distribution of patronage dividends. Tables are also given showing the authorized capitalization, number of members, bushel capacity, and number of bins reported by farmers' elevator companies.

The discussion of business practices followed includes that of methods of buying grain, outlets, accounting, buying and selling of farm products and supplies, and management. Extracts of the Ohio cooperative and corporation law of 1910 and suggested steps in organizing a farmers' company are given.

Obligations and opportunities of mutual insurance companies in the conservation of property, V. N. VALGREN (*Proc. N. Dak. Farmers' Mutual Ins. Assoc., 10 (1918), pp. 27–38*).—In this address the speaker discusses the problems of overinsurance, improvement of physical risks through inspection systems, classification of farm risks, and the recognition of fire-fighting apparatus, etc., in their relation to fire prevention and conservation of property.

A rural social survey of Orange Township, Blackhawk County, Iowa, G. H. VON TUNGLN ET AL. (*Iowa Sta. Bul. 184 (1918), pp. 397–450, pl. 1, figs. 20*).—From the data collected in this survey, a map has been prepared of this township to show the size and location of farms; relative positions of roads, railroads, houses, churches, and schools; and the name of the tenant or operator and the owner of the farms. The early history of the county and township is also briefly given.

Statistics from the 1915 census of Iowa indicate that the density of population for the township is 23.56 persons per square mile. Practically all of the owner operators, tenants, and wives were born in the United States.

Findings in regard to economic conditions, landlords, and land holdings in the township, comparative ages of land holders and tenants, length of time each class has been farming, and length of time on the farm each now occupies are tabulated, and notes are given on investigations into the extent of hired labor, period and shift of ownership, rise in land values, and change in ownership and organizations.

Tables are compiled to show the extent of education of farmers and their wives and of hired help, the number of papers and magazines in the homes, church membership and church denomination of owners and tenants and their wives, and church membership of parents and children. The one church in the township is well attended and influential. The homes and home surroundings, health, recreation, and social life in this community are deemed exceptionally good.

The author cites the answers of 128 of the 142 farmers in this township to five questions intended to bring out the farmer's opinion on the cause and remedy of the problem of keeping young people on the farm.

Rural sanitation, L. L. LUMSDEN (*Pub. Health Serv. U. S., Pub. Health Bul. 94 (1918), pp. 336, pls. 36, figs. 20*).—This is a report on investigative and educational work carried on in 1914, 1915, and 1916 in 15 counties, widely separated throughout the United States, for the purpose of ascertaining existing conditions, proving out the best methods of correction of insanitary conditions, and the extent to which average rural citizens will correct evils that are pointed out to them.

Salient facts brough out in the report are that of 51,544 farm homes surveyed only 1.22 per cent were considered to be sanitarily equipped, that in the vast majority of families visited the responsible members of the household were uninformed on questions asked as to home sanitation, and that in only

0.17 per cent of the farm homes visited did the investigators fail to meet with a reasonably cordial reception.

Charts are given to show the reduction in typhoid fever cases in the counties surveyed, also tabulations of findings in regard to water supply, number of rooms in houses in rural districts, typhoid fever prevalance, and other details of findings in the communities surveyed. In the summary are included three tables on the extent of work, findings on the original survey, and sanitary improvements resulting immediately from the survey.

The conclusions reached by the investigators are that rural sanitation is needed and feasible, and that the cost of the work necessary to secure advancement in rural sanitation is many times less than the cost of illness and physical inefficiency.

In the appendixes are reproduced certain sanitary ordinances adopted, resolutions in regard to surveys, and a story used in educational work. A bibliography of available reprints and bulletins on the subject of sanitation issued by the Public Health Service is appended.

Sources of agricultural statistics, M. G. Lacy (*Libr. Jour.*, *43* (*1918*), *No. 12*, *pp. 859–866*).—This article reviews briefly census reports on agriculture and other publications of the U. S. Bureau of the Census, monthly crop reports, several price reporting publications, statistics compiled by the Bureau of Markets of the U. S. Department of Agriculture, and the Geography of the World's Agriculture (E. S. R., 38, p. 895) as sources of agricultural statistics for the United States, also publications of the International Institute of Agriculture, Experiment Station Record, and others as sources of similar data for foreign countries.

A bibliography of the sources and compilations of agricultural statistics and prices for the United States and foreign countries is appended.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr.*, *5* (*1919*), *No. 2*, *pp. 9–24*).—Besides presenting the usual information regarding the estimated farm value of important products January 15 and February 1, average prices received by producers of the United States, and range of prices of agricultural products at important markets, this number is devoted largely to statistics of live stock in the United States and other countries.

Tables are also given showing the relative rank in value of the different crops in the United States; data relating to sugar beets and beet sugar in Nebraska, 1916–1918; wild hay crop by States, 1917 and 1918; and percentage of white, yellow, and mixed corn in the crops of 1917 and 1918, by States. There are included special articles on the Canadian crops of 1918; cereal crops of Spain, 1918; milk production in the United States; tomatoes produced in the United States for canning, soups, etc., in 1917 and 1918; and other minor subjects.

[**Agricultural statistics of the Prairie Provinces, 1916**] (*Census of Prairie Prov.* [*Canada*], *1916*, *pp. 284–356*).—In this report there are published in English and in French, data relating to land occupied, farm holdings, field crops, domestic animals, dairy products, and value of farm property in Manitoba, Saskatchewan, and Alberta, taken as of June 1, 1916.

Acreage and live stock returns of England and Wales (*Bd. Agr. and Fisheries* [*London*], *Agr. Statis.*, *53* (*1918*), *No. 1*, *pp. 31*).—This report continues data previously noted (E. S. R., 39, p. 595), giving in more detail comparisons of figures for 1916 and 1918 with those of 1914, and for the period 1914–1916 with the period 1916–1918.

The important crops of Algeria and Tunis, P. Vermeil and F. Léonardon (In *Les Principales Cultures d'Algérie et Tunisie. Paris: Délégation Française* *des Producteurs de Nitrate de Soude du Chili, 1917, 4. ed., rev., pp. 83, figs. 10*).—This pamphlet deals with methods of cultivation of cereals, legumes, vegetables, forage crops, vineyards, and orchards in Algeria and Tunis, with recommendations as to the time and method of purchase and the use of fertilizers.

Annual report on the Punjab Colonies for the year ended September 30, 1916 (*Ann. Rpt. Punjab Colonies, 1916, pp.* [12]+44).—This is an annual report on colonization operations in the Punjab, with tables compiled to show land allotment, areas sown to crops, and other details of land settlement and improvement in the three canal colonies for the year 1915–16.

AGRICULTURAL EDUCATION.

Proceedings of the twenty-second annual meeting of the American Association of Farmers' Institute Workers, 1917, edited by W. WEBB (*Proc. Amer. Assoc. Farmers' Inst. Workers, 22 (1917), pp. 139, pl. 1, figs. 7*).—This is a detailed report of the proceedings of the meeting held at Washington, D. C., November 12, 13, and 14, 1917. In addition to the reports of officials and committees of the association and remarks on institute work in the different States, it includes the following papers and addresses: Address of Welcome, by C. Vrooman; Response to Address of Welcome, by W. Webb; Farmers' Institutes in the United States in 1917, by J. M. Stedman; An Account of What New England Has Been Doing in the Food Conservation and Production Campaign, by W. Wheeler; Report on Farmers' Institute Organization and Work for the Province of British Columbia, by W. E. Scott; Report on Movable Schools of Agriculture Under War Conditions, by D. J. Crosby; Some Timely Topics of Interest to Farmers' Institute Workers, by A. C. True; Canada's Part in the War, by G. C. Creelman; The Duty of the Farmer to the Community, by A. R. Mann; What Farmers' Institutes May Do for Food Conservation, by F. L. Kelly; Saving the Children, by Mrs. Max West; Conservation of Fabrics and Household Equipment, by A. P. Norton; Federal Farm Loans, by H. Quick; and Junior Farmers' Institute Work, by O. H. Benson; and Liming, by W. Frear.

Bibliography of the college.—I. The institution (*Mass. Agr. Col., Semicent. Pub. No. 2, pt. 1, 1917, pp. 69*).—This is the second of a series of publications issued in commemoration of the completion of the first 50 years of instruction at the Massachusetts Agricultural College, 1867–1917. It is a bibliography of material relating to the history of the institution, including anniversary, baccalaureate, commencement, and miscellaneous addresses; and literature on the subjects of the various departments, divisions, etc., of the college, the experiment stations, the extension service, and the graduate school.

Statistics of vocational schools and of vocational teacher-training centers for the year ended June 30, 1918 (*Fed. Bd. Vocat. Ed., Vocat. Summary, 1 (1918), No. 7, pp. 1–4*).—This brief summary of returns made to the Federal Board for Vocational Education by the State boards contains data for 1,741 schools which conducted vocational courses during the year.

Teacher-training courses for teachers of vocational agriculture were given in 40 educational institutions, for teachers of trade or industrial subjects in 45 institutions, and for teachers of home economics in 60 institutions. Teacher-training centers were reported from all but 6 States. There were 5,257 teachers of vocational courses in the 1,741 schools reporting, of whom 895 were teachers of agricultural subjects, 3,276 were teachers of trade or industrial subjects, including 827 part-time school-teachers, and 1,086 were teachers of home economics subjects. The institutions offering teacher-training courses reported 524 teachers of such courses, including 116 for agricultural, 95 for trade or industrial, 263 for home economics teacher-training, and 50 teachers not classified according to courses given.

An aggregate enrollment of 164,186 pupils was reported, this including in agricultural schools 15,187, in all-day home economics schools 8,333, and in evening home economics schools 22,360. Of the 15,187 agricultural pupils 1,286 were girls, but only 29 of the 30,693 home economics pupils were boys. In courses for training teachers of vocational agriculture 1,584 pupils were enrolled, and in home economics 3,319.

Schools applying for aid during the year numbered 1,810, of which 1,415 were approved. Of the 89 teacher-training centers applying for aid 83 were approved.

There were 139 State directors and supervisors, paid in the aggregate $241,081.71, of which $40,842.28 was reimbursed out of Federal funds.

Statement of plans and policies of Illinois Board for Vocational Education (*Bd. Vocat. Ed. Ill. Bul. 1 (1918), pp. 69*).—In this bulletin are presented the plans for the fiscal year ended June 30, 1913, prepared by the Illinois Board for Vocational Education and approved by the Federal Board for Vocational Education, for the promotion of vocational education under the Smith-Hughes Act. The texts of the Smith-Hughes Act and that of the State of Illinois accepting its provisions are included. Curricula for full-time vocational agricultural and home economics schools and for teacher training in agriculture are also suggested.

[Information desired in application for approval of plans for instruction in vocational agriculture and home economics and teacher training in vocational agriculture and home economics] (*Bd. Vocat. Ed. Ill. Buls., 1918, Nos. 3, pp. 10; 4, pp. 11; 6, pp. 7; 7, pp. 7*).—These bulletins are intended to indicate what information should be furnished to the Illinois Board of Vocational Education as regards details of courses, daily schedules for teachers, the use of funds, equipment, qualifications of teachers, students' agreement, etc.

State-aided vocational education in Massachusetts (*Ann. Rpt. Bd. Ed. [Mass.], 81 (1916–17), pp. 107–152; 234–275; Bul. Bd. Ed. Mass., No. 4 (1918), pp. 89*).—An explanation is given of the provisions of the Smith-Hughes Act, together with statements of funds available, an outline of plans, and statistics of State-aided vocational education in Massachusetts.

The 98 vocational schools in operation during the year included 9 homemaking day schools, with a total enrollment of 583 students, 4 county agricultural schools, and 23 agricultural departments. The total expenditure of the county agricultural schools was $193,165, and of the agricultural departments $33,323. The total earnings of vocational agricultural students from farm and other work during the periods covered by their school attendance and their farm projects have increased from $11,100 in 1912, by a total of 70 pupils, to $120,309, by a total of 518 pupils.

Plans for vocational education in Minnesota under the provisions of the Federal law known as the Smith-Hughes Act, E. M. Phillips (*St. Paul, Minn.: Dept. Ed., 1917, pp. 26*).—This bulletin contains the texts of the Smith-Hughes Act and of the State legislative acts accepting its provisions. It also outlines the requirements with reference to administration and supervision, kinds of schools, plant and equipment, courses of study, methods of instruction, and qualifications of teachers for the approval of instruction and the training of teachers under this act.

Plans for vocational education in Nebraska (*[Lincoln, Nebr.]: State Bd. Vocat. Ed.* [*1918*], *pp. 25*).—This bulletin contains a statement of the plans for the administration and supervision of vocational education in Nebraska under the Smith-Hughes Act. The text of the State act accepting the provisions of the Smith-Hughes Act, an outline of a four-year course in vocational home economics, and a statement of the requiremenits for teachers in that subject are appended.

Nevada plan for vocational education under the Smith-Hughes Act, 1918–19 (*State Dept. Ed. Nev. Bul. 2* (*1918*), *pp. 55*).—This bulletin consists of four parts dealing, respectively, with the guiding standards and policies agreed on between the Federal and the Nevada State boards for vocational education, texts of the Smith-Hughes and the State vocational acts, rulings of the State board and information relating thereto, and applications for aid and approval thereof.

It is provided that all resident and itinerant teacher training under the act will be done by the University of Nevada. Suggested one-, two-, and four-year courses in vocational agriculture and home economics are outlined.

Plans for vocational education in New Mexico under the provisions of the Smith-Hughes Act, R. C. Miller (*State Dept. Ed. N. Mex., Vocat. Bul. 1* (*1917*), *pp. 22*).—The text of the State legislative act accepting the provisions of the Smith-Hughes Act for the promotion of vocational education is given, and the plans for administering this act in New Mexico are outlined. In accordance with these, the State Agricultural College is to establish a separate professional department to provide training for teachers of vocational agricultural subjects.

A suggested four-year course in vocational home economics is outlined. The rules and regulations governing the establishment and maintenance of the Federal and State aided vocational schools or departments adopted by the State board are appended.

Vocational training of girls in the State of New York, A. C. Hedges (*Univ. State N. Y. Bul. 612* (*1916*), *pp. 41, pls. 12*).—The author discusses prevocational work for girls in large cities, homemaking courses, the Manhattan Trade School for Girls, household arts in grammar schools and high schools, the training of teachers, and the teaching of home economics. She concludes that the existing privileges in school life can be supplemented for wage-earning by training in special manual dexterity, which would then be guided by young and well-informed minds in the requirements of everyday living on its material and on its human side.

Federal aid for vocational education in North Carolina under the Smith-Hughes Law (*Bul. State Bd. Vocat. Ed. N. C., No. 1* (*1917*), *pp. 16*).—This bulletin contains the plans for the promotion of vocational education in North Carolina under the Smith-Hughes Act, information as to the various purposes for which Federal funds are available, the amounts available for each purpose, and the required conditions for securing the funds for the respective purposes, and the text of the State act accepting the provisions of the Federal act.

The State act creates a State Board for Vocational Education, consisting of the State superintendent of public instruction, the president of the North Carolina College of Agriculture and Engineering, and the director of the agricultural extension service of the State. Arrangements have been made for the supervision of agricultural instruction and teacher training for the white race by the head of the department of vocational education of the College of Agriculture, assisted by the associate professor of the department.

A manual of vocational education for the use of North Dakota schools desiring to receive Federal aid under the Smith-Hughes Act (*Bismarck, N. Dak.: State Dept. Ed., 1918, pp. 24*).—This manual sets forth the provisions of the plan for vocational education in North Dakota under the Smith-Hughes Act, with tables showing the annual Federal grants under the act.

The training of teachers of vocational agriculture and home economics is to be carried on in the North Dakota Agricultural College.

Vocational educational plans of the Oklahoma State Board of Vocational Education (*Okla. State Bd. Vocat. Ed. Bul. 1 (1918), pp. 59*).—The plans for vocational education in Oklahoma for 1918-19 under the Smith-Hughes Act are outlined.

The Oklahoma Agricultural and Mechanical College at Stillwater has been approved for teacher training in agriculture and home economics for white persons and the Agricultural and Normal University at Langston for colored persons. The University of Oklahoma at Norman has also been approved for teacher training in home economics for white students. Suggested four-year and two-year courses in vocational agriculture are outlined and described; also suggested one-, two-, and four-year courses in vocational home economics and four-year teacher training courses in vocational agriculture and home economics. Lists of suggested equipment for agriculture and home economics and of agricultural and home economics books for use in high schools are included.

Federal aid for vocational home economics in Texas under the Smith-Hughes Law, W. F. DOUGHTY and N. B. CRIGLER (*Dept. Ed. Tex. Bul. 75 (1918), pp. 15*).—The authors outline briefly the conditions governing Federal aid for vocational home economics instruction in Texas under the Smith-Hughes Act, explain the method of applying for such aid, and give such extracts from the law as affect vocational home economics.

Vocational education under the Smith-Hughes Law (*Salt Lake City, Utah: State Dept. Pub. Instr., 1918, pp. 14*).—An outline is given of the plan of organization and administration in Utah, setting forth the purposes for which the Smith-Hughes funds for vocational education are to be used.

The work of teacher training in vocational agriculture and home economics is being undertaken by the school of education of the State University in conjunction with the State Agricultural College. Suggestive four-year courses for teachers of agriculture and home economics are outlined, accompanied by a description of the courses in education. An outline is also given of a suggestive four-year course in vocational home economics for high schools.

The Chicago plan of high school boys in agriculture, D. G. HAYES (*Chicago: Bd. Ed., 1917, pp. 55, pls. 6*).—This is a report on the food production campaign of the Chicago high school boys in 1917. The evolution of the plan is described, including the policy with reference to the granting of school credit for farm and gardening work, placement and aids, and follow-up work in connection with the boys going out individually all over the country, etc., and an outline of a plan and its development for military summer farm camp schools for boys and girls located in agricultural centers, and offering military training, agricultural instruction, and practical work on the farm.

It is reported that 700 boys were placed in every kind of farm work known to farm hands in 29 States and 3 Provinces in Canada. Of these boys 605 proved satisfactory workers, each working on an average of 87.5 days of an average length of 11.5 hours each, and receiving an average wage with board and washing of $25 a month. The total number of days of work reported was 51,000, and the total amount of wages earned $42,583.30.

In reviewing the season's work it was found that high school boys, when carefully selected, develop rapidly into good farm workers; their trained minds and responsive hands are turned to good advantage on farms. In contrasting the camp plan with that of the individual farm proposition wherein the boy not only gets an all-round farm training but also a substantial sum for his season's work, the Chicago education authorities are inclined to advocate the latter.

Agriculture for the common schools of the counties of northwestern Indiana, 1918–19, J. S. Bordner (*[South Bend., Ind.]: Author, pp. 21*).—This contains outlines of lessons arranged in monthly sequence, consisting of class and practical work in animal husbandry, including poultry. The outlines have been prepared for both teachers and pupils, and are to be used in connection with Benson and Betts' text on agriculture (E. S. R., 36, p. 394).

Illustrated lecture on soy beans, W. J. Morse and H. B. Hendrick (*U. S. Dept. Agr., States Relat. Serv. Syllabus 35 (1919), pp. 16*).—This syllabus, prepared by cooperation between the Bureau of Plant Industry and this Service, is designed to aid farmers' institute and other extension lecturers in presenting this subject before popular audiences. It deals with the value of soy beans for stock feed and for other purposes, requirements for successful production, varieties of soy beans, their place in the cropping system, and harvesting and storing. A comparison of soy beans and cowpeas is made. A list of 50 lantern slides to illustrate the lecture is appended.

MISCELLANEOUS.

Annual Report of California Station, 1918 (*California Sta. Rpt. 1918, pp. 139, pl. 1*).—This contains the organization list and a report of the director, the latter consisting mainly of an enumeration of the various station projects. An historical article by E. J. Wickson (pp. 35–101), entitled Beginnings of Agricultural Education and Research in California, traces the development of agricultural education at the University of California and the various lines of investigation at the station. A list of publications of the station from 1877 to 1918, with a general index thereto, both prepared by F. W. Woll, are appended.

Thirty-sixth Annual Report of New York State Station, 1917 (*New York State Sta. Rpt. 1917, pp. VIII+734, pls. 66, figs. 34*).—This contains the organization list; a financial statement for the fiscal year ended June 30, 1917; a list of the periodicals received by the station; and reprints of Bulletins 429–433, 435–439, and 442–445, Technical Bulletins 57–63, and popular editions of Bulletins 429, 432, 433, 436, 437, 439, 442, and 443, all of which have been previously noted, and of Circular 52, Orchards: Location and Care, by U. P. Hedrick; 53, Culture of Field Beans, by J. W. Wellington; 54, Milking Machines; and 55, The Rose Leaf Hopper, by F. H. Lathrop.

A day at the Utah Agricultural Experiment Station, M. C. Merrill, O. W. Israelson, and B. Alder (*Utah Sta. Circ. 39 (1918), pp. 3–57, figs. 108*).—This includes brief biographical notes of the various directors of the station, a large number of illustrations with descriptive text depicting various phases of the station's work, and a list of the bulletins and circulars issued since its establishment.

NOTES.

California University.—H. S. Dadisman has been appointed assistant professor of agricultural education in connection with work under the Smith-Hughes Act. Walter Packard, assistant professor of agricultural extension, is giving instruction as to opportunities for land settlement to students in the American Army University at Beaune, France.

Florida Station.—Philip A. Macy has been appointed assistant chemist, beginning April 21.

Georgia College.—The attendance at the college for the year has shown an increase of 67 per cent.

A one-year specialized course in dairying has been instituted to meet the needs of cities and towns for trained milk inspectors, and to provide managers of dairy plants.

The college is endeavoring to assist in the vocational rehabilitation of men disabled in military and naval service. A considerable number of these men are already being given training, and provision is being made for accommodating a large body of them during the summer vacation.

Idaho Station.—J. E. Nordby has been appointed assistant animal husbandman, and will have charge of the experimental work.

Kansas College.—The sixth annual short course for millers, bakers, and chemists was given by the department of milling industry, beginning May 5, a four-week course being offered instead of the previous two-week course. The course consisted chiefly of practice in experimental and commercial milling, laboratory baking tests, and various chemical determinations.

Minnesota University.—The legislature has appropriated more liberally for the university than ever before. Among the provisions authorized for the ensuing biennium are $1,865,000 for maintenance, $365,000 from the one-mill tax, $30,000 for the division of agricultural extension, $505,000 for the building fund for next year, and $560,000 for the year following (this last item being the first of the $5,600,000 10-year fund), and $32,000 for reimbursement on the Students' Army Training Corps buildings. The maintenance fund represents a considerable increase, and will provide for comprehensive salary increases, averaging about 15 per cent.

Nevada Station.—R. W. Wells has been detailed by the Bureau of Entomology of the U. S. Department of Agriculture to carry on the project on biting flies of cattle in cooperation with the station.

New Hampshire College.—The appropriations from the recent State legislature provided an increase of approximately $100,000, or 50 per cent, over what the college has ever received before. Among the items in the budget, which totaled for the ensuing biennium $315,000, are $10,000 for the construction of beef cattle and sheep barns, $5,000 for the purchase of live stock, and $20,268 for extension work in agriculture and home economics. It is stated that the increased legislative support came after a thorough investigation of the work and needs of the institution, first by both the college and appropriations committees, and finally by the legislature as a whole.

Tennessee Station.—Dr. William G. Shaw, veterinarian since 1915, died April 23. He was a graduate of the University of Pennsylvania, and for five years a veterinary inspector for the U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

CONTENTS OF VOL. 40, No. 7.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

[1] On leave of absence for military service.

116338°—No. 7—19——1

METEOROLOGY.

SOILS—FERTILIZERS.

FIELD CROPS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

DAIRY FARMING—DAIRYING.

VETERINARY MEDICINE.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

[1] Printed in scientific and technical publications outside the Department.

U. S. Department of Agriculture—Con.

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EXPERIMENT STATION RECORD.

VOL. 40. MAY, 1919. No. 7.

The organization of research and the functions of administration in connection with it have been fertile subjects of discussion almost from the beginning of our system of experiment stations. They are important subjects, and while with a generation's experience a number of fundamental truths have come to be generally accepted there is not unanimity of opinion as expressed in practice.

It appears that interest in the relations between administration and research in agriculture is by no means confined to workers in this country. Not long ago an illuminating contribution was made to the subject in an article printed in the *Agricultural Journal of India*. This article is by Professor H. M. Leake, government economic botanist and principal of the Agricultural College of Cawnpore. It was prepared primarily with reference to administrative conditions in India, which are evidently quite different in some respects from those found in this country, with a larger measure of control and responsibility vested in the official representatives of the Government. None the less the discussion is written from a broad academic standpoint and with a frankness, appreciation, and clear insight into the elements and essentials of research which makes it of wide application.

It appears that a reorganization of scientific effort in India is under contemplation which would centralize the research of various forms under independent departments of chemistry, botany, and the like. This would associate in one service all men engaged in work of the same branch of science, which it is thought by its advocates would give rise to an esprit de corps at present lacking among the scientific workers in India. The writer, however, argues rather for evolution from the present system, and maintains that sound evolution "requires a clear appreciation of what it is essential to provide and what to avoid." He attempts in his article to help to a true appreciation of these essentials, and so to pave the way for "a proportioned organization" giving the fullest scope for the development of research.

The subject is taken up in a philosophical way from the standpoint of human qualities and human relations. Being himself a government investigator as well as an administrative officer, Professor Leake sees the question from the investigator's point of view, but with a recognition of the administrative aspect gained under the government system, where he says the very conditions of activity lead to the negation of such freedom as is generally conceded to be desirable in research.

Starting out with the thesis that organization is merely a means to an end and not an end in itself, as too often appears to be considered the case, he frankly indicates that it may be an end for personal ambition. No man is essential, however, and no line of endeavor is the essential cog in the work of the world. Organization is an important cog, but it is not considered to be the most essential one in human progress.

In explanation of his postulates, Professor Leake takes the position that man is inherently selfish in that he lacks the capacity to place himself in other men's positions. Research is classed as perhaps the most purely constructive of any form of endeavor, but he does not admit that the one who practices it is "in any sense a man apart." As to the conditions under which research work is commonly conducted, the average individual is not free from the ordinary rules of life, and is controlled in his endeavor by this fact and by the necessity of making provision for himself and dependents. Only rarely has he the means to pursue his aims independently. Hence human endeavor to reach its practical result requires the combination of two factors, one which may be termed organization and the other "initiative," usually centered in different individuals. "It is a case of partnership which will develop the fullest results only when carried out under full mutual recognition of the fact." But it is rare, he contends, to find two persons so free from selfishness, "sufficiently selfless," as to enter into each other's point of view to the extent necessary to develop that full mutual recognition. "Each strives to emphasize the importance of his own contribution to the common stock, and it is that strife that leads to the abortive schemes and stultified careers" which are depicted as the result. This he explains is a natural consequence of ambition, a highly desirable trait. "But ambition stultifies itself if it is overweening and placed in a position to force its own demands," as it frequently is between organizer and initiator.

Professor Leake accepts the premise that in India research of any sort, and agricultural research in particular, if prosecuted at all is likely to remain for some time to come a function of the government. Hence the discussion narrows down to the special aspect in which the organization is represented by Government.

Government enterprises, he maintains, differ from business enterprises in that in the former power and organization are united in one head without the restraint on their use which prevail in business interests. Appeal in practice is to the administrator. The conditions which obtain in government service give to the administrator all the advantages but none of the restraints that regulate the relations of organizer and initiator under other conditions as in business. These conditions are highly favorable to the "development of the essentially selfish character of human nature."

Men capable of supplying the initiative enter the government service in his country, he believes, because of the prospect of steady, continuous employment and regularity of pay and pension, reasons which appeal especially to the unambitious, "to the man whose chief desire is to live in contented ease." Since the system does not place a premium on efficiency, Professor Leake holds that such a government agency can never attain the efficiency of private enterprise.

Defining the nature of research with much clarity, he points out the difference between it and the product of the engineer or the cabinet maker, which can be blocked out with accuracy in advance and is tested by the way it serves its purpose. The designer or builder in either case is judged by the results. With research it is never possible to set out to attain a definite object with the same certainty of success, and the investigator can not be judged entirely by the simple test of achievement, which is the only test of efficiency the inexpert can apply.

Research is characterized, in fact, as a lottery in which the prizes are enormous, but in which there are a number of blanks. Government is in a position to take this chance and it can take a liberal view in the demand for tangible results, i. e., it is less disposed than commercial bodies to exact them or discontinue the effort.

Under government auspices, however, there is held to be the danger that attention will be concentrated on the administrative aspects, and to assume that if the administrative side is arranged for all will be well. The essential condition for successful research is freedom, freedom to select the line of work to suit the individual temperament and freedom to develop that line of work in accordance with individual dictates. The first point of weakness inherent in government management of research is failure to appreciate that research is essentially individualistic, and that the men who undertake it are not and can not be standardized. The choice must be made between selecting a man and leaving him to develop the line of individuality which best suits him, and selecting one whose special leanings appear to render him most likely to succeed in a particular investigation. Too often appointments, it is held, are made for a particular purpose, but the man is selected without relation to special aptitude for the piece of work involved. This, of course, is likely to occur when combination purpose men are appointed, for instance. primarily to fill a place in the college but with the expectation of working for the station also.

The limits of the legitimate sphere of organization are held to be to provide a general outline of the problem to be attacked, the facilities required for the work, and the opening for the development of the results obtained. But the very conditions of government activities are against this limitation. The administrative function tends to go beyond its legitimate sphere, in the direction of defining the problems in too great detail and in drawing up complex schemes for the development of the results before they are obtained. "This phenomenon is merely administration unsuccessfully attempting to justify its own existence."

Any scheme for the employment or development of research must have regard to the essential requirements both of the research and the administrative aspects, and undue prominence must not be given to those of either. This is defined as implying on the administrative side the direction of the work into certain channels while avoiding too minute a definition of these, and provision of the means to obtain the best practical developments from the results obtained. From the research point of view it is necessary to provide for the selection of investigators with a view to the particular work required, and freedom for development of initiative along the lines of individual leaning. On the latter point there may be some difference of opinion if this is construed too narrowly.

"Any department, however small, involves a certain amount of administrative work, . . . and full organization requires that provision shall be made for this without interfering with the efficiency of the purely constructive system. This is the crux of all such administrative problems and the point where lies the chief danger of the selfish basis of human nature asserting itself. All departments must work through a head who represents that department in the dealings with government." Professor Leake holds that the selection of such a head from the departmental (professional) staff "will lead to the emphasis of the purely constructional aspect of administration." He avoids the term director, since the duties of the office are to assist the members of the professional staff by freeing them from the routine administrative duties and by acting as intermediary between them and Government; hence the position he has in mind is that of secretary rather than that of director.

The specific proposal to organize research on the basis of the commonly recognized divisions of science, with departments of botany, chemistry, etc., is analyzed in the light of these considerations.

Professor Leake holds that it is not in the interests of most effective work for agriculture or of a proper esprit de corps for the whole institution. Many of the advantages claimed would vanish in actual practice, since the botanists, for example, would have to be split up and assigned to local problems which would involve their isolation. Such a centralization of departmentalized research he considers unsuited to the needs of a large section of agricultural investigation.

Agricultural research is mainly applied, and as agricultural practice is so largely a question of handling plants in relation to soil and climate a large proportion of the problems of agricultural research deal with interrelations, and consequently require local knowledge. Again, in agricultural research probably more than in any other class "the lines of investigation cut across the commonly accepted divisions of science." Hence "in agriculture probably more than any other subject do problems arise which involve combined attack from more than one direction. Such a combined attack involves cooperation, and every effort to develop such cooperation should therefore be made. The desirability for such cooperation is, I think, recognized and much has been written and said about it.

"Cooperation is essentially a growth from within by consent of the concerned parties; it can not from its very nature be the result of an external graft." This is recognized in cooperative movements, in which great care is taken to prevent any trace of external influence creeping in; "and yet between individuals cooperation is expected to develop from mere chance association." While official provision alone will not bring about cooperation, it can help greatly in avoiding "conditions inimical to its devlopment."

Despite some obvious differences in conditions in India and this country, many of Professor Leake's propositions will be found both pertinent and timely. Here, as elsewhere, research organized on a large and broad scale is a comparatively new thing. For the most part it has been conducted in connection with educational institutions. The traditions of "academic freedom" of the individual teacher as regards the subject matter of his instruction and the administrative methods developed in the handling of bodies of more or less immature students have undoubtedly had much to do with the ideas and practices prevailing in the organization and administration of research in the modern world.

In very many lines of scientific research, including agriculture, it is now evident that there is little hope of the solution of certain classes of problems except by the cooperative effort of a number of

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investigators. The problem is to institute methods of administration suited to the complex organization required and create administrators who will use such methods successfully. The administrator as a coordinator, helper, and inspirer, rather than as a dictator and compelling force, is the desideratum. He must be a man of broad knowledge and vision, human sympathy, and great adaptability in his dealings with conditions and personnel. His great interest must be in his associates and the work which they have to do rather than in personal advancement, or the applause of even a select circle of admirers. Some of the reasons for this are well shown in Professor Leake's suggestive and stimulating discussion.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Physical and chemical data of nitrogen compounds, compiled by G. W. TODD (*London: Min. Munitions, Munitions Invent. Dept., 1918, pp. 49, pls. 47*).—This publication contains a summary of physical and chemical data of nitrogen and some of its compounds, particularly nitric acid and ammonia. Data are also given of the equilibria which form the basis of the more important methods for the technical preparation and purification of hydrogen. In the presentation of data the graphic form is used as far as possible.

Legumins in peas, O. HAMMARSTEN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 102 (1918), No. 3-4, pp. 85–104; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 673, I, pp. 509, 510*).—The author points out that the legumin prepared from peas by extraction with salt solution and subsequent removal of the salt by dialysis, as described by Osborne and Campbell (E. S. R., 10, p. 214), differs from the insoluble legumin obtained from peas by extraction with water or dilute alkali and subsequent precipitation with dilute acetic acid. To the former he applies the name *a*-legumin and to the latter *b*-legumin. Slight differences in these properties are described, which indicate that *b*-legumin is not formed from *a*-legumin by the action of acid, alkali, or water, but is a distinct protein.

Alfalfa saponin.—Alfalfa investigation, VII, C. A. JACOBSON (*Jour. Amer. Chem. Soc., 41 (1919), No. 4, pp. 640–648*).—In continuation of the previously reported (E. S. R., 34, p. 710) alfalfa investigations at the Nevada Experiment Station, the author reports the results of a study of alfalfa saponin obtained from dry alfalfa hay by extraction with alcohol.

The pure saponin, the yield of which was about 1 per cent of the original alfalfa, was similar to other saponins in its physical and chemical properties but differed somewhat in its toxicological properties, as it was not toxic when ingested by animals or fish, and did not hemolyze blood. The empirical formula was found to be C[illegible]H[illegible]NO[illegible]. On hydrolysis a sapogenin was formed having the formula C[illegible]H[illegible]NO[illegible], together with a glucose derivative. It is pointed out that alfalfa saponin and solanin are the only saponins known to contain nitrogen, and that they form the connecting links between the true saponins and the alkaloids. The water solution of the saponin had a very high surface tension, minute quantities in water producing decided foaming under agitation.

The protein extract of ragweed pollen, F. W. HEYL (*Jour. Amer. Chem. Soc., 41 (1919), No. 4, pp. 670–682*).—In continuation of the investigations on ragweed pollen previously noted (E. S. R., 37, p. 612), a study is reported of the nitrogen distribution in the pollen.

The pollen was percolated with ether and with cold 95 per cent alcohol, and then extracted with water, saline solution, and dilute alkali. From the water extracts an albumin coagulating at low temperatures (45–50° C.) and proteoses were obtained, the former to the extent of about 1.2 per cent and the latter 3 per cent. The chief protein was a glutelin extracted with dilute alkalis. Precipitation of the water extract by half saturation with ammonium sulphate gave a product consisting of 75 per cent albumin and 25 per cent proteose, which possessed anaphylactogenic properties. After saturation of the aqueous extract with ammonium sulphate and removal of the ammonium sulphate, adenin, guanosin (?), histidin, arginin, lysin, and agmantin were identified.

It is suggested that the presence of agmantin may have some bearing on the hay-fever problem because of the possibility of a similarity which it may possess with β-iminazolylethylamin, known to produce asphyxia with anaphalactic shock in guinea pigs.

The forms of nitrogen in protein-free milk, C. KENNEDY (*Jour. Amer. Chem. Soc., 41 (1919), No. 3, pp. 388–393*).—Five samples of protein-free milk prepared from milk obtained at different times from the same herd were used for determination of amino and amid nitrogen before and after acid hydrolysis, of the nitrogen distribution after acid hydrolysis, and of the amount of nitrogen removed from an aqueous solution of the nitrogen-free milk by the precipitants acid mercuric nitrate, phosphotungstic acid, and trichloracetic acid.

The results obtained show that protein-free milk, when prepared under carefully controlled conditions, is variable in composition. The amid nitrogen varied from 7.12 per cent of the total nitrogen to 20.62 per cent, the nitrogen precipitated by the phosphotungstic acid from 7.66 to 14.93 per cent, and the nitrogen in the filtrate from the bases from 52.19 to 64.88 per cent. Amino nitrogen determinations before and after acid hydrolysis and the nitrogen distribution indicate that either unprecipitated protein or peptids of considerable size are present in protein-free milk.

By precipitation with acid mercuric nitrate or phosphotungstic acid, a little less than one-half of the nitrogenous compound was removed. Only nonamino nitrogen was removed by phosphotungstic acid. An increase in the amino nitrogen after tryptic digestion gave further proof that conjugated amino groups are present in the protein-free milk.

Glycerids of butter fat, II, C. AMBERGER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 9–10, pp. 313–331*).—This is a continuation of investigations previously noted (E. S. R., 31, p. 804).

Fractional crystallization of the alcohol-soluble portion of hydrogenated butter fat, according to the method of Bömer et al. (E. S. R., 32, p. 801), showed that the original fat contained the glycerids, butyrodiolein, butyropalmitolein, and oleodipalmitin. Only a small amount (2.4 per cent) of triolein was found. In addition to the above, the author has isolated from butter fat a glycerid of melting point 67.9° C., yielding mixed acids melting at 55.5°.

A study of the chemistry of grain sorghums (*Oklahoma Sta. Rpt. 1918, pp. 28, 29*).—This is in continuation of work previously noted (E. S. R., 38, p. 410). An examination of yellow milo maize, white milo maize, feterita, and darso for tannin gave negative results, except in the case of darso in which traces of tannin were found. Glucose was found to be the only reducing sugar present in the juice of the above sorghum. Preliminary studies of the inorganic and organic phosphorus of the grain sorghum indicated that the phospholipins of the sorghums do not contain a sugar. A study of the inorganic constituents of the grain sorghums at three stages of growth showed that the ash of these substances contained a considerable amount of manganese.

Continuation of the chemical investigation of the amylases, H. C. SHERMAN (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 284–286*).—This is a general report of the results of investigations which have been previously noted in detail from another source (E. S. R., 40, p. 504).

Studies on the amylolytic activity of human saliva with a new method, V. C. Myers and A. G. Dellenbaugh (*Proc. Soc. Expt. Biol. and Med., 16 (1918), No. 2, pp. 18–20*).—The technique of the method is as follows:

A specimen of mixed saliva is filtered, and a small portion accurately diluted (1:100) with distilled water and another portion with 0.3 per cent sodium chlorid as an activating solution. After thorough mixing, 1 cc. of the diluted saliva is pipetted into a test tube and the tube heated for five minutes in a water bath at 40° C. One cc. of 1 per cent soluble starch solution is then added, the mixture incubated for 30 minutes, 3 cc. of saturated picric acid solution and 1 cc. of 20 per cent sodium carbonate added, and the tube placed in boiling water for from 15 to 20 minutes. After cooling the material is diluted with distilled water in an accurately graduated cylinder until the intensity of the color approximates that of the standard (glucose in picric acid treated with sodium carbonate and heated), and is then compared with the standard in the colorimeter. After correcting for the reducing power of the soluble starch, the activity is recorded in terms of the percentage of starch converted into reducing sugar.

With this method it has been found possible to obtain a demonstrable amylolytic activity at a dilution of 1:400 when water was used as the diluent and at a dilution of 1:2,000 with 3 per cent sodium chlorid. For purposes of comparison, a dilution of 1:100 is thought to be the most suitable with distilled water as the diluent.

For normal individuals the method has been found to give an activity between 30 and 45 when water was used as the diluent and between 46 and 50 with sodium chlorid. Figures obtained on the same individuals at the same time of day agreed very closely. A considerable decline in activity of the saliva was noted as a result of glandular fatigue produced by the continuous secretion of saliva during paraffin chewing.

The preparation of sodium p-hydroxyphenylarsonate, J. B. Conant (*Jour. Amer. Chem. Soc., 41 (1919), No. 3, pp. 431–435*).

The classification of mimetic crystals, E. T. Wherry and E. Q. Adams (*Jour. Wash. Acad. Sci., 9 (1919), No. 6, pp. 153–157*).

The permanent marking of glass vessels, J. C. Bock (*Jour. Amer. Chem. Soc., 41 (1919), No. 3, pp. 359–361*).—The method described consists essentially in fusing certain glass colors into the glass by means of an ordinary burner. The color is mixed as thick as practicable with an oil composed of 4 parts of copaiba balsam, 1 part clove oil, and 1 part lavender oil, and applied with an ordinary steel pen or fine brush. The heating is applied carefully until the markings glow. It is said that the marking thus obtained can not be removed by mechanical or the usual chemical means.

An all-glass nitrogen apparatus, E. R. Allen and B. S. Davisson (*Ann. Missouri Bot. Gard., 6 (1919), No. 1, pp. 45–48, pl. 1*).—An all-glass nitrogen apparatus devised particularly for use in nitrogen determinations in studies of plant metabolism is described and illustrated. The special features of the apparatus are the elimination of rubber stoppers and connection, efficient scrubbing of the entrained alkali from the steam, and the use of Pyrex glass which does not yield an appreciable amount of alkali to steam or boiling solutions.

Arsenious oxid as a standard substance in iodimetry, R. M. Chapin (*Jour. Amer. Chem. Soc., 41 (1919), No. 3, pp. 351–358*).—The author at the Bureau of Animal Industry of the U. S. Department of Agriculture reports an investigation to establish the reliability of properly purified arsenious oxid as a standard to replace iodin in iodimetry.

It was found that, by employing weight burets with appropriate precautions, titrations against iodin of arsenious oxid prepared by the method previously noted (E. S. R., 39, p. 507) gave results the average of which agreed with the theoretical value very closely. Arsenious oxid is thought to be the more reliable standard substance for practical use.

Precautions in the preparation and use of standard iodin solutions are emphasized.

The iodotannic reagent, D. E. TSAKALOTOS and D. DALMAS (*Bul. Soc. Chim. France, 4. ser., 23 (1918), No. 9, pp. 391–400; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 674, II, p. 454; Analyst, 44 (1919), No. 514, pp. 35, 36*).—The reagent described consists of a mixture of 1 cc. of N/10 iodin solution with 1 cc. of a 1 per cent tannin solution and is used to determine the alkalinity of very dilute alkaline solutions. The technique is as follows:

To the 2 cc. of freshly prepared reagent in a porcelain dish the alkaline solution is added with stirring until a definite red color appears. The solution is then added very gradually, and after each addition a drop of the mixture is tested on starch paper. The end-point is reached when a blue color is no longer formed on the test paper. By means of a table, the derivation of which is described in detail, the alkalinity of the solution may be calculated, knowing the volume used.

It is said that exact results may be obtained by the use of this reagent with alkaline solutions as dilute as N/10,000 to N/40,000.

Estimation of silica and sand, F. J. LLOYD (*Analyst, 44 (1919), No. 514, pp. 27, 28*).—A method of differentiating between soil sand and the natural silica of feeding stuffs is described. This consists in determining the total siliceous matter in the usual way by ashing the material and removing the other ash constituents by digestion with hydrochloric acid, incinerating, and weighing the residue or total silica. The residue is then digested wth 10 per cent sodium hydroxid, washed with hydrochloric acid, filtered, and incinerated, the final residue representing the sand as distinguished from natural silica.

The author has found 98 per cent of the total siliceous matter of soil to remain undissolved by successive acid and alkali treatment as above, while of the total siliceous matter of straw 86 per cent is dissolved, indicating that the method distinguishes fairly well between plant silica and the sand of soil.

Estimation of silica and sand, B. DYER (*Analyst, 44 (1919), No. 514, p. 28*).—The author supplements the above note by describing a similar method employed for a quantitative discrimination between sand and natural silica in Indian rice bran. A 10 per cent solution of sodium carbonate was employed instead of sodium hydroxid.

This method of treatment is said to dissolve 91 per cent of the natural silica of the rice husks and only about 5 per cent of sand. The percentage of sand is then calculated from the following formula: Percentage of sand $= \frac{B-0.09A}{0.86}$, where A equals total siliceous matter insoluble in acid and B equals the siliceous matter not redissolved by the treatment of sodium carbonate.

The gravimetric and volumetric determination of zinc precipitated as zinc mercury thiocyanate; G. S. JAMIESON (*Jour. Amer. Chem. Soc., 40 (1918), No. 7, pp. 1036–1039*).

The determination of nitrous acid and nitrites, J. S. LAIRD and T. C. SIMPSON (*Jour. Amer. Chem. Soc., 41 (1919), No. 4, pp. 524–531*).—An investigation of the volumetric methods described in the literature for the determination of nitrous acid or nitrites is reported, and a modified method is described which is said to give more satisfactory results.

The method consists essentially of oxidation in acid solution with excess permanganate, reduction of the excess permanganate with excess ferrous sulphate, sodium oxalate, or hydrogen peroxid, and titration of the excess of reducing agent with permanganate. It is said that the titration is not interfered with by moderate amounts of chlorid or small amounts of bromid.

Silver nitrite is not considered a satisfactory material for use as a standard in nitrite determinations. The authors recommend a sodium nitrite solution standardized with potassium permanganate according to the method described above, or gravimetrically by the reduction of silver bromate to silver bromid according to the method of Busvold (E. S. R., 38, p. 204).

On amino acids, H. D. Dakin (*Biochem. Jour.*, *12* (*1918*), *No. 4*, *pp. 290–317*).—The author discusses a new method of extraction of amino acids by partially miscible solvents, and describes the isolation by means of this method of a new amino acid and a new peptid.

The method consists essentially of the separation, by the use of butyl alcohol as a solvent, of the hydrolysis products of a protein into the following groups: (1) Monamino acids, both aliphatic and aromatic, insoluble in alcohol but extracted by butyl alcohol; (2) prolin, soluble in alcohol and extracted by butyl alcohol; (3) peptid anhydrids (diketopiperazins) extracted by butyl alcohol, but separated from (2) by sparing solubility in alcohol or water; (4) dicarboxylic acids, not extracted by butyl alcohol; and (5) diamino acids, not extracted by butyl alcohol, but separable from (4) by phosphotungstic acid and other means.

The method is considered to be of particular value in that the groups are composed of chemically similar individuals; each group can readily be obtained in solid form, aliquot parts of which may be used in the search for individual acids; no indications of any racemization have been observed; and materially higher yields of many amino acids may be obtained from proteins than by existing methods, thus permitting a more nearly quantitative analysis of the proteins themselves. The possibilities are pointed out of other purposes to which this method of extraction by partially miscible solvents may be applied, such as the selective extraction of sensitive substances from tissue extracts, the quantitative extraction of tryptophan from the products of tryptic digestion of caseinogen, and the study of the products of the hydrolysis of proteins by enzyms.

The technique of the method as applied to the separation of the hydrolysis products of caseinogen is described in detail, and experimental proof is given of the structure of the new compounds obtained, β-hydroxyglutamic acid, $COOH.CH(NH_2).CH(OH).CH_2.COOH$ and a new peptid, isoleucylvalin anhydrid.

The quantitative determination of hippuric acid, E. Filippi (*Arch. Farmacol. Sper. e Sci. Aff.*, *26* (*1918*), *No. 8*, *pp. 243–256*).—Various methods of determining hippuric acid in urine are reviewed and a new method is described. This consists essentially of a preliminary separation of benzoic acid and other impurities from the concentrated urine by warming at from 60 to 65° C. for two hours with a mixture of two parts of benzene and one part of alcohol-free ether, oxidation of the purified urine with manganese dioxid and sulphuric acid, distillation of the benzoic acid formed from the hippuric acid, and extraction with successive small portions of ether.

The method is said to be rapid and complete.

Estimation of acidity in barley by titration in stages, A. Reichard (*Ztschr. Gesam. Brauw.*, *41* (*1918*), *Nos. 8*, *pp. 57–60*, *fig. 1*; *9*, *pp. 65–68*; *10*, *pp. 75–77*; *11*, *pp. 83*, *84*; *12*, *pp. 89*, *90*; *abs. in Jour. Inst. Brewing*, *24* (*1918*), *No. 5*, *pp. 219–221*).—A study is reported of the acidity in barleys as determined by titration of an alcoholic extract of the ground barley with alkali, first with litmus and then with phenolphthalein as indicators, the former representing acidity due to free acids and acid salts and the latter, total acidity.

In applying the method of double titration to the study of the preexisting acidity of barley, it was observed that barleys not fully matured by storage showed a higher total than litmus acidity, while for those which had undergone afterripening the litmus acidity was practically the same as the total acidity, indicating a disappearance of amino acids during the process of afterripening. It is suggested that practical identity of the litmus and total acidity, when determined on mashes prepared by alcoholic extraction, is a mark of complete ripeness in a barley and therefore of its fitness for malting.

Experiments were also conducted with a view to finding a quantitative measure of the enzymic strength of barley in the acidity developed by enzymic processes when the ground barley is digested with water for 15 hours at from 18 to 19° C. The acidity developed during digestion was found to be chiefly due to the formation of substances which react acid toward phenolphthalein but not toward litmus. The results appear to indicate that this increase of acidity during digestion may vary from year to year. For barleys of the same year, it is in general greater for those of high than for those of low germinating power.

Detection of milk in pastry, J. GROSSFELD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 12, pp. 457–471*).—The method used depends on the conversion of lactose into mucic acid. The lactose is removed from the sample by extraction with water. The filtrate is evaporated to a thin sirup with the addition of 5 cc. of glacial acetic acid. This sirup is treated with 90 per cent alcohol, filtered, and the filtrate evaporated to dryness. If a large quantity of sucrose is present, this is removed by dissolving the dried residue in alcohol and adding an equal value of ether. After standing 24 hours the sugars are collected and again treated with alcohol and ether. The precipitated lactose is heated with nitric acid and the solution filtered. Mucic acid will crystallise out, usually within 24 hours. About 80 per cent of the lactose present will be converted into mucic acid.

The calcium content of pastry may also afford some indication as to whether milk has been used in its preparation. Pastry made without milk may contain 0.2 per cent of calcium oxid calculated on the dry substance.

The estimation of cacao shell, A. W. KNAPP and B. G. McLELLAN (*Analyst, 44 (1919), No. 514, pp. 2–22*).—This is a critical discussion of the various processes suggested for the estimation of cacao shell, with an explanation of factors influencing the different methods or the limitations of their accuracy. Tables are given of the results obtained in the determination of crude fiber, nitrogen, pentosans, and ash.

The conclusion is drawn that the chief difficulties in the way of an accurate determination of cacao shell are "the natural variation in cacao shell due to botanic variety and the distinctive treatment which the bean receives in each country and that cacao shell is not a definite chemical substance, and hence the estimation can only be of a purely empirical character." The only method employed by itself which is capable of giving results of any value is considered to be the estimation of the crude fiber.

Detection of adulterations in maple products, C. H. JONES (*Proc. Vt. Maple Sugar Makers' Assoc., 24 (1917), pp. 25–30*).—A brief description is given of the methods in use for detecting adulteration in maple sugar and sirup. A table is included of the percentage of total ash, insoluble ash, and malic acid in various sugars.

Simplified preparation of the alkaline copper solution for the detection and determination of sugars, E. Justin-Mueller (*Jour. Pharm. et Chim.*, 7. ser., *19* (*1919*), *No. 1*, *pp. 18–20*).—The author states that by adding 20 cc. of a 10 per cent copper sulphate solution slowly to 100 cc. of a 33.69 per cent solution of sodium hydroxid (density 1.37) a stable solution can be made without the use of organic salts, such as tartrates, and that the solution can be used successfully in place of the more complicated Fehling's solution.

The determination of fructose in the presence of aldoses, G. Lenart (*Ztschr. Ver. Deut. Zuckerindus.*, *1918*, *No. 752*, *II*, *pp. 335–346*).—In connection with the investigation previously noted (E. S. R., 40, p. 507), a study is reported of the influence of various catalyzers, such as metallic salts, iodin, and sulphur, on the oxidation of glucose, fructose, sucrose, and raffinose by bromin. Precipitated sulphur was found to be the most active catalyzer. For samples of fructose containing polyoses, hydrolysis before bromination is recommended. The oxidation of dextrin with bromin was found to be incomplete even after seven days.

The determination of lactose in milk heated after addition of sodium bicarbonate, C. Porcher and A. Bonis (*Ann. Falsif.*, *11* (*1918*), *No. 119–120*, *pp. 295–299*, *fig. 1*).—The authors recall the results obtained by Jensen and Plattner (E. S. R., 17, p. 289) on the action of heat upon cow's milk, and report similar experiments, including the effect of heat upon milk to which various amounts of sodium bicarbonate had been added.

Determinations of lactose were made by the polarimetric and reduction methods. Pasteurized milk underwent no change in color. Heated in the autoclave at 120° C., milk without bicarbonate turned brown in from 40 to 60 minutes. Milk with bicarbonate turned brown in proportion to the amount of bicarbonate and the time of heating. Samples containing 2 gm. of bicarbonate per liter became a rich coffee color in one hour.

The reducing power of lactose is less affected than the rotatory power. The authors are of the opinion that the diminution of rotatory power is due not so much to changes taking place in the casein as suggested by Jensen as to an alteration in the lactose, and advise caution in the use of the polarimeter for the determination of lactose in sterilized milk.

The relation between the oxygen concentration and rate of reduction of methylene blue by milk, E. N. Harvey (*Jour. Gen. Physiol.*, *1* (*1919*), *No. 4*, *pp. 415–419*, *fig. 1*).—The rate of reduction of methylene blue by milk and acetaldehyde is shown to be proportional to the concentration of oxygen in the milk, and it is suggested that this fact may be made the basis of a method for determining oxygen in gaseous mixtures. The gas to be tested may be shaken with a milk-acetaldehyde-methylene blue mixture and the end-point determined by comparison with a similar tube of milk containing no methylene blue. A control determination of the time necessary for decolorization of milk-acetaldehyde-methylene blue mixture shaken with air must be made under the same conditions.

It is stated that the rate of decolorization of methylene blue by milk can be increased by raising the temperature or increasing the concentration of the reducing enzym by evaporating the milk in vacuo to from one-third to one-fourth its volume. The addition of 2 per cent of sodium fluorid to milk will prevent the growth of bacteria without affecting its reducing powers during a period of two months.

Determination of saccharin in compressed tablets, A. Bonis (*Ann. Falsif.*, *11* (*1918*), *No. 121–122*, *pp. 369–372*).—As a supplement to the methods of determining saccharin, previously noted (E. S. R., 37, p. 804), the author outlines the methods in use in the special case of saccharin tablets. These are composed of saccharin, sodium saccharinate, or a mixture of the two, generally with the addition of sodium bicarbonate. Effervescence on dissolving in water indicates the presence of free saccharin reacting as an acid with the bicarbonate. Absence of effervescence indicates that the saccharin is in the form of a saccharinate.

The procedure in each case is described in detail.

A study of the action of 10 per cent thymol-chloroform preservative on the chlorin content of urine, J. O. HALVERSON and J. A. SCHULZ (*Jour. Amer. Chem. Soc., 41 (1919), No. 3, pp. 440–442*).—Experiments are reported from the Ohio Experiment Station indicating that thymol chloroform has no appreciable effect on the chlorin content of cow urine kept at near the freezing point for long periods of time, or on swine urine kept at laboratory temperature for shorter periods of time (4 to 21 days).

The production and conservation of fats and oils in the United States, H. S. BAILEY and B. E. REUTER (*U. S. Dept. Agr. Bul. 769 (1919), pp. 48*).—This bulletin, which is a contribution from the Oil, Fat, and Wax Laboratory of the Bureau of Chemistry, U. S. Department of Agriculture, and the Fats and Oils Division of the U. S. Food Administration, contains statistics of the domestic production of fats and oils and their importation into and exportation from the United States in the years 1912, 1914, 1916, and 1917, and the monthly production of fats and oils and their derivatives in the United States from January to June, 1918.

The increasing use of vegetable oils is shown by the data presented. While in prewar years the fat exported was over three times that imported, in 1917 the imports were larger than the exports, the annual importation increasing about 200,000,000 lbs. This increase has been largely in vegetable oils. In 1917 the importation of soy-bean oil was over ten times as great, and that of peanut oil nearly four times as great, as in 1912. In domestic production a similar increase is shown. Including butter, in 1912 the quantity of animal fats produced was approximately twice as great as that of vegetable oils, while in 1917 the production of vegetable oils was over two-thirds that of animal fat. Among the vegetable oils, cottonseed stands at the head of domestic production, with linseed oil next in importance. The quantities of coconut, corn, peanut, and soy-bean oil have increased very rapidly in the last five years.

The statistical data are followed by a brief outline of the general processes in use in this country for the production of fats and oils, and more detailed descriptions of the available supply and methods of production of the important vegetable oils, including cottonseed, olive, peanut, coconut, palm kernel, palm, corn, soy bean, linseed, and castor oil; animal fats and oils, including lard, tallow, and fish oil; and refuse fats, trade wastes, and fat and oil derivatives. The possibilities are considered of increasing the supplies of these products by developing new sources, improving present methods of manufacture, substituting the more abundant oils for those which are scarce, and conserving for the purposes to which they are practically adapted those oils which can not easily be replaced by others.

The production of oil from fruit seeds, P. SCHÜTTE (*Die Gewinnung von Speiseölen aus Obstkernen. Neustadt-an-der-Hardt: D. Meininger, 1917, pp. 40*).—This is a summary of information on the possibilities of utilizing as a source of oil fruit seeds and kernels, nuts, and seeds of coniferous trees and of cultivated plants, such as the sunflower.

The preservation of rice bran as press cake, B. MARCARELLI (*Gior. Risicolt., 7 (1917), Nos. 11–12, pp. 151–155; 13, pp. 164–174; 15–16, pp. 198–201*).—The problem of preventing spoilage in rice bran is discussed and the conclusion drawn as the result of experimental evidence that the most satisfactory method is the manufacture of press cake. Analyses are given of the rice bran before and after conversion into press cake.

Concerning carbon dioxid formation in thickened fodder-beet juice.—A contribution to the so-called frothy fermentation, H. CLAASSEN (*Ztschr. Ver. Deut. Zuckerindus., 1918, No. 746, II, pp. 105–109*).—In connection with the drying of fodder beets, the juice obtained from the press cake has been utilized in the manufacture of a table sirup. From observations of the behavior on boiling of the press juice of fodder beets which had previously suffered somewhat from frost, the author concludes that the so-called frothy fermentation of massecuites and sirups is due, in most cases, to a reaction between invert sugar (or other decomposition products formed from the sugar on heating) and amino acids. The presence of oxygen is considered necessary for the reaction, but the formation of crystals is thought to be without marked influence on the process. The extent of the fermentation is thought to depend chiefly upon the variety, properties, and amounts of the amids and amino acids present in the juice and upon the kinds and amount of decomposition products of the sugar.

Utilization of breweries for dehydration, P. M. GREMPE (*Ztschr. Gesam. Brauw., 41 (1918), Nos. 24, pp. 169–171; 25, pp. 175–177*).—The practicability is pointed out of utilizing the equipment of breweries for the drying of fruits and vegetables, and suggestions are given for the selection and preparation of the food materials to be dried and the method and time required for drying different substances.

Fruit drying, G. STALDER (*Das Obstdörren. Aarau: Emil Wirz, 1917, pp. 28, figs. 20*).—This handbook includes a brief discussion of the importance of fruit drying, instructions as to the choice of fruit and its preparation for drying, and descriptions with illustrations of various drying machines.

Araucaria araucana (A. imbricata) and its resins.—Its relations to other conifers, J. ANGLI (*Bol. Acad. Nac. Cien. Córdoba, 23 (1918), No. 1, pp. 1–84, pls. 2, figs. 19*).—This is a study of *A. araucana* from the point of view of the commercial exploitation of the gum resins obtained from it. It consists of a brief account of the geographical distribution and botanical characteristics of the tree, a classification of coniferous trees, and a description of methods of tapping the trees, followed by a discussion of the analytical methods employed and results obtained in the separation of the gum resins of *A. araucana* into its constituents.

By agitation with anilin, resins were obtained to the extent of 72.8 per cent of the original gum resins; agitation with hot water, gums 15.65 per cent; residue from the above operations, waste material, 5.95 per cent; fractional distillation at from 99.5 to 100.5°, water 5.6 per cent.

The resins are thought to be suitable for the manufacture of varnishes and the gums as a material for gluing cartons and boxes.

METEOROLOGY.

Subjects for research in meteorology (*U. S. Mo. Weather Rev., 46 (1918), No. 12, pp. 566, 567*).—Among the 50 subjects listed, 2 relate to agricultural meteorology, namely, correlation of weather and crops, including mathematical correlation of monthly mean temperature and total monthly precipitation with crop yield; and effect of temperature, rainfall, and sunshine on plant development, including intensive and direct comparison between weather factors and plant growth.

Past and present climates of our leading crop plants, H. C. Cowles (*U. S. Mo. Weather Rev.*, *46* (*1918*), *No. 11*, *p. 521*).—A paper presented at the Baltimore meeting, 1918, of the Association of American Geographers is summarized as follows:

"Most crop plants have originated in what are now tropical or subtropical regions; tropical America, Malaysia, and the Levant. The potato alone of the major crops came from a cool region. Many of the crops are now grown only outside the Tropics, while others are still raised in their original zone. It is generally agreed that mutation, or perhaps acclimatization, rather than change of climate, is responsible for the change of habitat of most of our crop plants, while the rest have not moved. An interesting phase of plant origin is that for many the place of origin is by far not the best habitat for that plant. A cold-resistant plant is as likely to originate (though not as likely to survive) in a warm as in a cold region."

Some recent contributions to the physics of the air, W. J. Humphreys (*Science*, *n. ser.*, *49* (*1919*), *Nos. 1259*, *pp. 155–163*; *1260*, *pp. 182–188*, *figs. 6*; *abs. in U. S. Mo. Weather Rev.*, *46* (*1918*), *No. 12*, *pp. 563–566*).—This consists of extracts from the vice-presidential address, physics section, of the American Association for the Advancement of Science, at the Baltimore meeting, 1918, reviewing the present status of knowledge and research with reference to the temperature of the free air, isothermal state of the upper air, storm effects on temperature gradients, the law of wind increase with elevation, barometric fluctuations, and atmospheric electrical phenomena.

Seasonal precipitation (*U. S. Dept. Agr.*, *Nat. Weather and Crop Bul.*, *No. 2* (*1919*), *p. 2*, *fig. 1*).—A chart is given which shows the percentage of the normal precipitation of the United States which occurred from September 1, 1918, to February 28, 1919.

"The total precipitation for this period was above normal throughout nearly all of the Gulf States, and also over the Great Plains region, the central Rocky Mountain districts, and the central Plateau and Pacific Coast States. Elsewhere it was mostly below normal, particularly along the Atlantic seaboard, in portions of the Ohio Valley, the far Southwest, and far Northwest. In the central Plains region and some of the central Gulf districts the totals were more than one and one-half times the normal, but in some sections of the Southwest and Northwest but little more than half the usual amount for this period was received."

The dustfall of March 9, 1918, A. N. Winchell and E. R. Miller (*Amer. Jour. Sci.*, *4. ser.*, *46* (*1918*), *No. 274*, *pp. 599–609*, *figs. 3*; *Sci. Amer. Sup.*, *87* (*1919*), *No. 2258*, *pp. 234*, *235*, *figs. 2*).—A study on this dustfall, made at Madison, Wis., is reported, from which the authors conclude that "a single storm may transport a million tons of rock material a thousand miles or more," thus emphasizing the importance of the wind as a geological agent. In their opinion "it is an open question whether the total work done by the air in transporting rock material is not of the same order of magnitude as the work of the same kind accomplished by water.

"It is clear that arid regions will constantly lose rock material by wind action and that the dust will be held by moist areas which are covered by vegetation. . . . The soil of any region is probably derived in considerable part from material transported by the wind. Diatoms and all sorts of plant and animal life of microscopic size as well as fragments of larger organisms may be transported long distances by the wind."

The dustfalls of March, 1918, A. N. Winchell and E. R. Miller (*U. S. Mo. Weather Rev.*, *46* (*1918*), *No. 11*, *pp. 502–506*, *figs. 3*).—This article supplements that noted above and deals especially with the origin of the dust; the translocating agents; regions of deposition; and quantity, appearance, and composition of the dust. Suggestions are also made as to the kind of observations on such storms that should be recorded.

Monthly Weather Review (*U. S. Mo. Weather Rev., 46* (*1918*), *Nos. 11, pp. 497–548, pls. 9, figs. 12; 12, pp. 549–608, pls. 35, figs.* 8).—In addition to weather forecasts, river and flood observations, halo phenomena, and seismological reports for November and December, 1918; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during November and December, 1918; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 11.—Some Characteristics of the Marvin Pyrheliometer, by P. D. Foote (Abs.); The Dustfalls of March, 1918 (illus.), by A. N. Winchell and E. R. Miller (see p. 616); Smoke from Minnesota Forest Fires (illus.), by H. Lyman; Effects of Hurricanes on the Upper-air Currents, by W. H. Pickering; Ocean Temperatures in Long-range Forecasting, by C. F. Brooks; Ocean Temperatures and Seasonal Weather in Southern California, by W. E. Ritter and G. F. McEwen (extracts); King Island Weather: Seasonal Abnormalities in Southern Australia, by C. Richardson (reprinted); The Marine Observer's Handbook (Abs.); Definitions of "Mean," "Average," and "Normal," by C. F. Brooks (compilation); Frost and the Growing Season, by W. G. Reed (Abs.) (E. S. R., 40, p. 209); Hourly Duration of Precipitation at Philadelphia (illus.), by G. W. Mindling; Rainy Days and Rainfall Probability in the United States, by R. DeC. Ward (Abs.); The Ancient Piedmont Route of Northern Mesopotamia, by E. C. Semple (Abs.); and Past and Present Climates of Our Leading Crop Plants, by H. C. Cowles (Abs.) (see p. 616).

No. 12.—Halo Observations at York, N. Y., by M. N. Stewart; Lunar Rainbow at Tatoosh Island, Wash., by R. C. Mize; Wind Aloft at Houston, Tex., December 18, 1918 (illus.), by I. R. Tannehill; How Meterological Instruction may be Furthered by R. DeC. Ward; Collegiate Instruction in Meteorology (illus.), by C. F. Brooks; A Signal Corps School of Meteorology, by O. L. Fassig; New Meteorological Books; Some Recent Contributions to the Physics of the Air, by W. J. Humphreys (extracts) (see p. 616); Subjects for Research in Meteorology (see p. 615); Notes on Hurricanes of 1918 (illus.), by C. A. Donnel; Tropical Cyclone of September 14–17, 1918, in the Pacific Ocean Just West of Mexico (illus.), by F. G. Tingley; The Cold Winter of 1917–18 (illus.), by P. C. Day; and Effects of Cold Weather, Winter of 1917–18, on Vegetation, by J. W. Smith.

Meteorological summary, 1917 (*Oklahoma Sta. Rpt. 1918, p. 53*).—This is a condensed tabular summary of observations at Stillwater, Okla., on temperature, precipitation, cloudiness, and wind for each month and for the year.

SOILS—FERTILIZERS.

Soil inoculation with Azotobacter, P. Emerson (*Iowa Sta. Research Bul. 45* (*1918*), *pp. 25–64, figs.* 7).—Investigations with eight forms of Azotobacter are described, embracing laboratory and greenhouse pot tests together with observations on the acid extract, amino, nonprotein, and polypeptid nitrogen content of the pot soils.

The laboratory experiments comprised a study of the effect of transfers made every other day on the nitrogen fixing power of the organisms, of the effect of transfers made once each week in sand cultures variously modified, and of the effect of growing four of the strains on both agar and sand in large flasks with and without the presence of growing plants. The organisms used included four large celled nitrogen-fixing strains of bacteria giving all of the staining reactions of the Azotobacter type and isolated from the humus plats at the Iowa Experiment Station, and pure cultures of *A. vinelandii*, *A. chroococcum*, *A. beijerinckii*, and *A. chroococcum* (*HCM*). A nitrogen-free medium was used throughout. As a result of the laboratory tests, it was concluded that transfers made on a nitrogen-free dextrose agar more often than once a week were detrimental to the nitrogen fixing power of the organisms studied; that transfers made once each week into a pure sand medium containing some carbonaceous material were beneficial to the nitrogen fixing power of Azotobacter in general, but were detrimental to *A. beijerinckii*; that the nitrogen fixing power of *A. vinelandii* was markedly stimulated when the organism was grown in large flasks for five weeks in the presence of red clover and oats on both agar and sand, and in the presence of algæ when grown on agar but not on sand; that the nitrogen fixing power of *A. chroococcum* was also markedly stimulated when the organism was grown on agar for five weeks in the presence of oats and red clover but to a less extent when grown with these plants in sand, while the greatest stimulation for this organism was produced in the presence of algæ in either sand or agar; and that the nitrogen fixing power of *A. beijerinckii* was stimulated by the presence of red clover when the organism was grown on either sand or agar, and by oats when grown in sand, while algæ in either agar or sand appeared to have a depressing effect on this organism.

In the pot experiments the eight types used in the laboratory tests were inoculated into Miami silt loam soil said to be free from Azotobacter or similar forms. Ground oat straw or ground clover hay was added to the soil at the rate of five tons per acre, and the nitrogen fixing ability of the different organisms both in fallow soils and in the presence of growing oat plants determined. The length of the growing period of the oats was determined by the appearance of the seed-bearing spike when the crop was harvested, the soil sampled, and immediately reseeded. The experiments were continued through three growing periods, with results as follows:

When three crops of oats were grown continuously on this soil the nitrogen content of the soil increased during the first period, decreased during the second, and increased slightly during the third, while the nitrogen fixing powers of the bacteria and the crop responses paralleled the total nitrogen content of the soil. The nitrogen fixing powers of *A. beijerinckii* and *A. vinelandii* were stimulated to a greater extent by decaying oat straw than by clover hay, especially during the earlier stages of decomposition, while some other types of Azotobacter appeared to be stimulated to a greater extent by the presence of decaying clover hay. The nitrogen fixing power of all the organisms eventually became greater in fallow than in cropped soils, while all the organisms were also eventually influenced in their activities in the same manner and by the same materials. It is concluded that soils may be profitably inoculated with Azotobacter and similar forms, the best results in these tests having been secured with *A. beijerinckii* or *A. vinelandii*. The conditions essential for maximum nitrogen fixation are said to be good environmental factors such as tillage, drainage, etc., the presence of rapidly decaying organic matter containing small amounts of nitrogen, and freedom from growing plants.

Those soils inoculated with pure cultures of *A. chroococcum*, *A. beijerinckii*, and *A. vinelandii* in the greenhouse tests were further examined for acid extract, amino, nonprotein, and polypeptid nitrogen in order to ascertain whether bacterial action had any effect on the accumulation or disappearance of nitrogen in these forms. The methods employed in making the various determinations are indicated. It is stated that these nitrogen compounds changed into other forms with the advance of decomposition much more rapidly than the total nitrogen decreased, and that oat straw and clover hay added as manure had little effect on this change. The amounts of nonprotein and amino acid nitrogen fixed by bacterial cultures in solution were negligible, while bacterial inoculation had apparently no effect upon the amounts of nonprotein, amino, or polypetid nitrogen in the soil. These forms of nitrogen showed no tendency to accumulate in the soil under conditions approximating those in the field.

A bibliography of 68 titles is appended.

The partial sterilization of soils, G. TRUFFAUT (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 38, pp. 1030–1038, 1049–1057; Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 12, pp. 433–436; abs. in Chem. Abs., 13 (1919), No. 2, pp. 153, 154*).—Comparative tests in pots and in the field of carbon bisulphid, pure calcium sulphid and calcium sulphid containing zinc sulphid, naphthalene, anthracene, toluene, benzene, and heavy oils, are reported.

Treatment of the soil with carbon bisulphid increased the yields of cabbage and onions and appeared to prevent disease and insect attacks. Pure calcium sulphid also increased the yields of various plants, but calcium sulphid containing 10 per cent of zinc sulphid gave smaller yields than were obtained with the pure compound. The other substances named increased the yields of cabbage, but the beneficial effect was less pronounced in case of godetias, crude anthracene in the amounts used even acting unfavorably. Mixtures of calcium sulphid and the aromatic hydrocarbons named were beneficial. The general conclusion is that partial sterilization hinders the development of animal and vegetable parasites, and also promotes the utilization of the reserve plant food of the soil.

On the absorbent power of dry and moist soils for chlorin gas, D. BERTHELOT and R. TRANNOY (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 2, pp. 121–123; abs. in Rev. Sci. [Paris], 57 (1919), No. 2, p. 63*).—It is shown that white sand has small capacity for the absorption of chlorin. Yellow ferruginous sand has a higher absorptive capacity than white sand, but is still much inferior in this respect to humus. Increasing the moisture improves somewhat the absorbent power of sand. The absorbent power of humus apparently has no relation to its lime content. The absorbent power of moist humus is from two to two and one-half times that of dry humus.

The chlorin index as a comparative measure of the richness of soils in humus, E. LAPICQUE and E. BARBÉ (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 2, pp. 118–121; abs. in Rev. Sci. [Paris], 57 (1919), No. 2, p. 63*).—The authors conclude from investigations reported that the loss of active chlorin by sodium hypochlorite in reaction with soils is a measure of the oxidizability and an indication of the humus content of the soils. The oxidizable matter as measured in this way was found to decrease progressively with the depth of the soil. Forest soils showed from three to four times the amount present in neighboring bare soil and peat ten times the amount in cultivated soil.

The authors believe that the method offers a quick means of classifying soils with reference to their probable humus content.

The composition of the soil air (*Rev. Sci. [Paris], 57 (1919), No. 3, pp. 83, 84*).—This is a brief note based upon various investigations, particularly those of Russell and Appleyard (E. S. R., 33, p. 618).

It is shown that to a depth of 0.15 meter (5.9 in.) the soil air is very similar to that of the atmosphere, except that it contains a little more carbon dioxid. There are much greater variations in composition of the air of the soil than that of atmosphere. Oxygen decreases during the period of active nitrification; that is, during the warmer season of the year. There are times at which the soil air may be entirely deprived of oxygen. Variations in atmospheric pressure, velocity of the wind, and temperature, as well as of the crop, appear to have some effect on the composition of the soil air.

Layer formation in soil suspensions, P. Ehrenberg, E. Hahn, and O. Nolte (*Zentbl. Agr. Chem., 47 (1918), No. 6, pp. 145–147*).—Observations made upon the formation of layers in suspensions of clay and heavy arable soils led to the conclusion that the size, form, weight, and electrical charge of the soil particles were the principal factors involved. Layer formation is said to have occurred only where definite groups of particles were present which differed in the velocity with which they settled out of suspension. Neither temperature nor light appeared to have any significant influence upon the phenomenon.

The Nile silt (*Rev. Sci. [Paris], 57 (1919), No. 3, p. 87*).—It is stated that the deposit of silt amounts to 15 tons per hectare (6 tons per acre) annually, containing sufficient fertilizing constituents to compensate for the removal of such constituents in the crops. The proportion of phosphoric acid is 2 parts per thousand, of potash 6 to 7 parts, and of lime 3.3 per cent. Recent studies have shown also that the silt is rich in active microorganisms, which contribute largely to the beneficial effect of the silt. The silt may therefore be considered a living fertilizer.

A study of the indigo soils of Bihar, W. A. Davis (*Agr. Research Inst. Pusa Indigo Pub., 1 (1918), pp. 75; abs. in Nature [London], 102 (1918), No. 2550, pp. 27, 28*).—From observations of soil conditions as determined by chemical analysis, the author concludes that the yield of indigo varies directly with the amount of available phosphoric acid present in the soil and subsoil, and that soil improvement through the use of superphosphate is the most important factor in the successful production of natural indigo.

The rôle of bacteria in relation to phosphates in the soil is briefly described by C. M. Hutchinson.

Nitrates, nitrification, and bacterial contents of five typical acid soils as affected by lime, fertilizer, crops, and moisture, H. A. Noyes and S. D. Conner (*Jour. Agr. Research [U. S.], 16 (1919), No. 2, pp. 27–42, pls. 9, figs. 2*).—In the investigations at the Indiana Experiment Station, here reported, controlled greenhouse experiments were conducted on five typical acid soils in order to ascertain the variations in bacterial numbers, nitrates, and nitrification under different conditions and treatment. "In part of the experiments the soils were fertilized with calcium carbonate, acid phosphate, and complete fertilizer, cropped to wheat and clover and kept at optimum moisture content, while in another series the soils were unfertilized, uncropped, and kept one-fourth, one-half, and fully saturated with water.

"The results reported include crop yields, soil-acidity determinations, nitrates in the soil when sampled and after incubation with ammonium sulphate, and also the numbers of aerobic, anaerobic, and carbon-dioxid surviving microorganisms present in the soils.

"All the untreated soils were quite acid and contained nitrates when sampled, showing that nitrification takes place in acid soils. The amounts of nitrates present and the nitrifying power of the untreated acid soils varied with the organic matter and total nitrogen rather than with the soil acidity. Calcium-carbonate additions markedly increased the nitrification of all five soils. Fertilization tended to increase nitrification, but not so much as calcium carbonate did. Regardless of treatments the presence of growing clover kept down nitrate contents of the soils. The degree of saturation of the soils affected the nitrates present. As a rule, more nitrates were found in soil kept one-half saturated with water than in soil kept one-fourth saturated. The soils that had been kept fully saturated with water for the 10 months contained no nitrates and formed no nitrates when incubated with ammonium sulphate. The relation of nitrates present in the uncropped soils before incubation to the nitrates present after incubation shows that the nitrate contents of these acid soils tend to reach an equilibrium, above which no increase is obtained without additional treatment.

"The bacterial flora of each soil was different from that of every other soil. No bacteria developed into colonies visible to the eye as long as plates were incubated in an atmosphere of flowing carbon-dioxid gas. Calcium-carbonate additions increased the bacterial contents of the soils. This increase was largely in the aerobic organisms. Small increases in bacterial content resulted from the use of fertilizer.

"The degree of saturation at which the soil was kept changed the proportions between the aerobic, anaerobic, and carbon-dioxid-surviving bacteria. Cultures from samples that had been kept one-fourth saturated with water contained the largest proportions of organisms forming mold-like colonies. Under optimum moisture conditions both without and with lime and fertilizer treatments the nitrates after incubation varied directly with the aerobic counts.

"In general, the greater aerobic bacterial content and the nitrifying power of the soil the larger the crop yields."

The results of the investigations indicate in general the value of a system of soil improvement which includes the addition of lime, phosphate, and organic matter, and suggests the importance of both chemical and biological examinations of the soil in soil fertility investigations.

A list of 26 references to literature on the subject is given.

Manure supplies under present conditions [in Rhodesia], E. V. FLACK (*Rhodesia Agr. Jour., 15 (1918), No. 6, pp. 516–528*).—Analyses and other data are given regarding the supplies of kraal manure, cave guanos, rock rabbit manure, wood ashes, corncob ashes, tobacco waste, mineral phosphates, bone manures, and limestones available in Rhodesia.

The effect of unbalanced fertilizers, especially unbalanced potash fertilizers, W. SCHNEIDEWIND (*Illus. Landw. Ztg., 37 (1917), pp. 493, 494; Zentbl. Agr. Chem., 47 (1918), No. 4–5, pp. 109–111; abs. in Chem. Abs., 13 (1919), No. 2, p. 157*).—In plat experiments on soil which had not received any phosphoric acid for 14 years, it was observed that the best results were obtained with a combination of potash, nitrogen, and phosphoric acid, and that potash and nitrogen increased the yields more than potash alone. On soil that had received no nitrogen for 14 years the yields were considerably greater with potash, phosphoric acid, and nitrogen than with potash and phosphoric acid only, although the potash and phosphoric acid combination produced noteworthy increases of yield.

The conclusion was reached that potash salts increase the availability of soil nitrogen and phosphoric acid to only a limited extent, of no practical significance. The effect of unbalanced potash fertilizers is, therefore, solely that of the potash. No great significance can be attached to the effect of lime fertilization on the formation of nitrates in the soil because most cultivated soils contain all the lime required.

The crops used in the experiments were sugar beets, potatoes, wheat, and barley.

The use of ammonium nitrate as a fertilizer, E. J. Russell (*Jour. Bd. Agr. [London], 25 (1919), No. 11, pp. 1332–1339*).—Experiments on potatoes, mangolds, and wheat, at Rothamsted and other places, to determine the fertilizing value of ammonium nitrate are reported.

The results of these experiments agree in showing that ammonium nitrate is a very useful fertilizer. It was more effective than ammonium sulphate on mangolds and equally effective on wheat. It appeared to be somewhat inferior to ammonium sulphate for potatoes. It has the general advantage of being a very concentrated material. The fertilizing value of this material is receiving particular attention in England, because with the cessation of hostilities large quantities of it are being released for agricultural purposes.

Conversion of quicklime in soil, G. Hager (*Jour. Landw., 65 (1917), pp. 245–311; abs. in Jour. Chem. Soc. [London], 114 (1918), No. 667, I, p. 247; Chem. Abs.; 13 (1919), No. 2, p. 156*).—It was observed that of quicklime added to the soil only a small proportion reappeared as calcium carbonate. The remainder is adsorbed by the soil, and the presence of free calcium hydroxid can not be detected after even a very short period of digestion.

"The power of a soil for adsorption appears to be related to its content of clay and the presence of unsaturated compounds, and under normal conditions an equilibrium between the absorptive and adsorptive power of the soil carbon dioxid and the soil compounds, respectively, is soon reached. The action of calcium carbonate is stated to be less rapid than that of calcium oxid, and some months may elapse before an equilibrium is obtained."

The influence of calcium oxid on the physical character of the soil is also discussed.

Inspection of commercial fertilizers, 1918, L. D. Haigh (*Missouri Sta. Bul. 160 (1919), pp. 3–31*).—This reports the results of the actual and guarantied analysis of 253 samples of fertilizers and fertilizing material collected in Missouri during 1918, together with observations on the relative value of 42 samples of limestone and similar material for correcting soil acidity. A list of the brands and guarantied analyses of fertilizers registered and offered for sale in the State in 1919 is also included.

FIELD CROPS.

Field crops, A. D. Wilson and C. W. Warburton (*St. Paul, Minn.: Webb Pub. Co., 1918, rev. ed., pp. 515, pl. 1, figs. 166*).—This book, an earlier edition of which has been noted (E. S. R., 28, p. 493), deals with the peculiarities of each of the various classes and varieties of farm crops, the handling of the soil, selection of seed, general crop management, the theory and practice of crop rotation, and weeds and their eradication. "A thorough revision has been made of all those parts of the text where experience has suggested improvement or changes of statistics, or conditions have made it necessary. It is now believed that it contains the latest available information and practice with reference to the subjects treated."

Practical guide to tropical agriculture.—I, General principles, A. Fauchère (*Guide Pratique d'Agriculture Tropicale.—I, Principes Généraux. Paris: Augustin Challamel, 1918, pp. 159*).—This treatise has to do primarily with the development of agriculture in the French colonial possessions. The present volume deals with factors of agricultural production, including the soil, climate, capital, personnel, and agricultural equipment; the preparation of the land for cultivation, including clearing, draining, and plowing, and the construction of roads and buildings; and the continuance of cultivation, embracing the maintenance of soil fertility, protection against floods, the rational utilization of water in arid regions, and the proper use of fertilizer materials.

Field technique in determining yields of plats of grain by the rod-row method, A. C. Arny and R. J. Garber (*Jour. Amer. Soc. Agron., 11 (1919), No. 1, pp. 33–47, figs. 2*).—This paper, a contribution from the Minnesota Experiment Station, describes observations made as to the precision secured in determining yields by the removal of 9, 5, and 4 rod rows from tenth-acre plats as compared with harvesting and threshing the entire plats, and on the comparative labor requirements of the two methods. The data were obtained from triplicated and variously treated fertilizer plats sown to wheat and oats on University Farm, to wheat on the Morris substation, and to oats on the Duluth substation.

In a comparison of yields to determine the value of fertilizer treatments, it is stated that increases over the mean of the checks of 15.7 per cent for triplicate tenth-acre plats, 9.49 per cent for 9 rod rows, 12.73 per cent for 5 rod rows, and 14.44 per cent for 4 rod rows removed from 3 similarly treated tenth-acre plats are probably significant. On the Duluth substation, however, increases over the checks of 32.4 per cent for tenth-acre plats and 12.34, 16.56, and 18.51 per cent, respectively, for 9, 5, and 4 rod rows appeared to be necessary if the differences were to be attributed to the fertilizer treatments. Variations in the results secured with the methods on the different experimental fields are noted, and the conclusion reached that the removal of 9 rod rows from tenth-acre plats gave practically as accurate an indication of the value of the different fertilizer treatments as harvesting the entire plat. The amount of man labor required by the two methods was found to be about the same.

The practical value of line selection with field crops, L. Koch (*Teysmannia, 29 (1918), Nos. 1, pp. 1–36; 2, pp. 96–127; 3, pp. 165–191*).—The author describes observations made with selections of peanuts, rice, corn, and soy beans, the results of which have been subjected to a statistical analysis in an attempt to demonstrate the value of this practice in the improvement of these crops.

The influence of crop plants on those which follow, I, B. L. Hartwell and S. C. Damon (*Rhode Island Sta. Bul. 175 (1918), pp. 30, pl. 1, fig. 1*).—This bulletin describes field work begun in 1907 and previously mentioned (E. S. R., 40, p. 135) in which observations have been made of the effect of different crops upon the following crop. The general plan of the experiment was to grow without farm manures upon contiguous 2/15th acre plats, onions, potatoes, mangels, rutabagas, cabbage, buckwheat, corn, millet, oats, timothy and redtop, redtop, timothy, squash, alsike clover, and red clover, respectively, for two successive years, and one of these crops every third year over the entire area. Fertilizer chemicals were applied to all plats alike in amounts intended to supply an average of the nutrient needs of the different crops, information regarding which was obtained from soil tests made in pots in the greenhouse and in sections of drain pipe sunk in the paths between the field plats. Onions occupied the entire area in 1910, buckwheat in 1913, and alsike clover in 1916 and again in 1917. The results obtained may be summarized as follows:

Arranging the preceding crops in the order of increasing yields of onions, from 13 to 17 bu. were produced following cabbage, mangels, rutabagas, and buckwheat; 35 and 87 bu., respectively, following potatoes and rye; from 131 to 178 bu. following corn, millet, onions, oats, and red clover; from 240 to 314 bu. following squash, timothy, and alsike clover; and 406 and 412 bu., respectively, after mixed timothy and redtop, and redtop alone.

Following the same arrangement with regard to buckwheat, yields of from 4 to 10 bu. were produced after millet, grasses, corn, and the clovers; 13 and

15 bu., respectively, after buckwheat and oats; from 20 to 28 bu. after cabbage, beets, onions, rye, squashes, and potatoes; and 34 bu. after turnips.

The lowest yields of alsike clover for the 2 years ranged from 2.58 to 2.6 tons per acre after the clovers and carrots (formerly mixed timothy and redtop) and the highest yields from 4.16 to 4.83 tons following rye, redtop, and 2 years' failure of squashes. Yields ranging from 3.31 to 3.86 tons were obtained after the other crops.

Observations of miscellaneous instances of effects of crops on those planted the next year in a crosswise direction are noted, which are thought to indicate that these effects were less pronounced in neutralized soils. The amount of nutrients removed by the crops was determined in many instances, but it was observed that the crops which removed the largest amount of the scarcest nutrients were not always the ones which exerted the most depressing effect on a succeeding crop.

Report of agronomy department, M. A. Beeson (*Oklahoma Sta. Rpt. 1918, pp. 14–22*).—This describes the continuation of work with field crops for the year ended June 30, 1918, along the same general lines as previously noted (E. S. R., 40, p. 32), including results of variety tests with oats, cotton, wheat, cowpeas, peanuts, and grain and forage sorghums; plant breeding work with cotton, Bermuda grass, grain sorghums, and peanuts; rate and date of seeding tests and hay harvesting experiments with Sudan grass; fertilizer, rotation, and cultural tests with cereals, alfalfa, cowpeas, and Kafir corn; and depth of plowing tests with Kafir corn, cotton, and oats. Several lines of investigation dealing with increased production and the maintenance of soil fertility, which received special stimulation as war work, are also briefly outlined.

[Work with field crops in South Carolina], C. P. Blackwell and R. E. Currin (*South Carolina Sta. Rpt. 1918, pp. 18–20, 38–39, 40, 41*).—This briefly notes variety, fertilizer, and breeding tests with cotton, corn, and peanuts.

The best cotton varieties tested both at Clemson College and at the Pee Dee substation were more profitable by $100 per acre than the poorest varieties.

Observations on the effect of pollen from barren stalks of corn on the amount of barrenness in the progeny indicated a ratio of one barren to 2.36 fruitful plants. An apparent correlation was also noted between barrenness and such characters as color, size and shape of plant, length of life, etc.

Work of the Wisconsin Agricultural Experiment Association, H. W. Albertz (*Madison: Wis. Expt. Assoc., 1919, pp. 28, figs. 21*).—This briefly outlines the organization and scope of the association. Pedigreed field crops, including corn, barley, winter and spring wheat, oats, rye, soy beans, and field peas grown by the members, are described and the history and adaptation of the crops noted.

Results of cooperative experiments in agriculture, C. A. Zavitz (*Ontario Dept. Agr. Bul. 260 (1918), pp. 3–24*).—This reports the continuation of work during 1917 along the same general lines as previously noted (E. S. R., 39, p. 737). It is stated that fully 1,000 more tests were undertaken than in 1916.

Guide to experiments for 1918 [in Northumberland County, England], D. A. Gilchrist (*County Northumb. Ed. Com. Bul. 27 (1918), pp. 4–78*).—This presents an outline for a continuation of work with field crops along the same lines as those previously noted (E. S. R., 38, p. 432), together with a general summary of earlier results.

[Yielding capacity of different field crops], E. W. Ljung (*Sveriges Utsädesför. Tidskr., 28 (1918), No. 4, pp. 158–181, figs. 8*).—This article represents a paper read before the Swedish Seed Association, in which the results of experiments conducted for a series of years with various field crops at several of the more important Swedish experiment stations are summarized and compared to show the relative yielding capacity of the different crops. A tabulated summary of yields of wheat and rye at five Danish experiment stations is also presented.

It is shown that in southern Sweden on clay soils wheat produced yields perceptibly higher than those of rye. The difference in yielding capacity, greatest on the fertile soil in Skåne, decreased northwards so that in middle Sweden the yielding capacity of the two crops was practically the same. Results secured in Denmark on lighter and somewhat sandy soils showed that in some instances wheat and in others rye produced the heavier yields. Among spring-sown crops barley, at least under relatively favorable conditions, as compared with oats gave the higher yield of hulled grain. Spring wheat ranked clearly below barley in yielding power, and appeared capable of competing with oats only under the most favorable conditions. Of the different root crops beets ranked highest in yield on good soils in southern Sweden, but on the heavier and somewhat colder soils rutabagas followed quite closely. In middle Sweden rutabagas stood first, and beets were hardly able to compete successfully with turnips. Potatoes approached rutabagas in yielding capacity and surpassed turnips and carrots. Red clover gave relatively high yields, while timothy stood comparatively low in production.

[Culture experiments with root crops], P. Krosby (*Ber. Norges Landbr. Höiskoles Virks., 1916–17, pp. 7–33, pls. 5, fig. 1*).—The results of cooperative experiments with rutabagas, field beets, carrots, turnips, and potatoes are reported in tables and discussed.

In the conclusions drawn, it is stated that under favorable conditions of growth root crops produce a greater quantity of feed than is secured from other crops grown in the regions concerned. The results indicated that root crops are capable of responding profitably to heavier fertilization of the soil and better cultivation than they usually receive. This seemed specially true in the case of the slow-growing crops. In general the largest yields were obtained from potatoes, which also suffered least from drought. It was observed that beets and rutabagas, as compared with potatoes, required somewhat higher temperatures during the growing period and also were in need of more moisture. Rutabagas also preferred a little heavier soil. In yield these two crops stood a little under the potato, but in the production of fodder units a little above it. Beets gave satisfactory yields only with careful cultivation and in the southernmost sections having a favorable climate and a fertile soil.

[Report of field crops work in Madras, 1916–17 and 1917–18] (*Rpt. Dept. Agr. Madras, 1916–17, pp. 5–10, 31–56, 66–69; 1917–18, pp. 7–13, 18, 20–25, 80–83, 93–94*).—This describes cultural, fertilizer, and variety tests with sugar cane, rice, cotton, miscellaneous grain and forage crops, peanuts, and indigo at numerous experimental centers. The annual reports of the Government sugar cane expert and of the Government seed potato farm at Nanjanad are appended.

The principal forage crops of Brazil, A. da Silva Neves (*Ann. I. Conf. Nac. Pecuaria [Rio de Janeiro], 1917, pp. 77–91, pls. 7*).—In connection with a report on the First National Cattle Conference, some of the principal grasses and legumes used for forage are briefly described and illustrated.

Concerning cereals [in Argentina], A. C. Tonnelier (*Min. Agr. Nac. [Buenos Aires], Dir. Gen. Enseñanza e Invest. Agr. [Pub.], No. 74 (1917), pp. 77, figs. 19*).—Agronomic data are presented relative to varieties of wheat, barley, and rye grown during 1914 and 1915.

Statistical notes on cereals (*Internat. Inst. Agr. [Rome], Bur. Statis., Statis. Notes on Cereals, 8 (1918), pp. 108, fig. 1*).—Statistical information is presented dealing with yield, trade, consumption, prices, and rates of ocean freight for wheat, rye, barley, oats, and corn throughout the world up to October 31, 1918.

[Spring and fall applications of fertilizers on grasslands], P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 148* (*1917*), *pp. 8*).—Ten cooperative experiments were conducted in 1915 and 1916 to determine the relative value of spring and fall applications of fertilizers on grasslands. All series of plats received 200 kg. of superphosphate and 100 kg. of potash salt per hectare and one series received in addition 200 kg. and another 100 kg. of nitrate of soda per hectare (89 lbs. per acre). The applications were made from April 18 to May 1 and from October 26 to November 30.

The tabulated results show that in each of the 10 tests the complete fertilizer applications made in the spring produced a greater increase in yield than the corresponding applications made in the fall. This was specially true when the herbage consisted largely of grass, but spring application was also at least as effective as fall application when the stand included a large proportion of clover and the fertilizers used consisted of an adequate quantity of only superphosphate and potash salt.

[Fertilizer experiments with rice and cassava], A. W. K. DE JONG and C. VAN ROSSEM (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Agr. Chem. Lab., No 18* (*1918*), *pp. 36, figs. 3*).—This reports the continuation of experimental work with different fertilizing materials for rice for 1917, along the same lines as previously noted (E. S. R., 39, p. 537), together with tests of sodium nitrate and ammonium sulphate for cassava. The results obtained with rice were practically the same as those obtained in 1916. Sodium nitrate appeared to be superior to ammonium sulphate for cassava.

[Experiments with barley], K. VIK (*Aarsber. Norges Landbr. Höiskoles Akervekstforsök, 28* (*1916–17*), *pp. 65–91, fig. 1*).—The results of variety tests with barley in progress for a number of years are reported and discussed with special reference to the value of Asplund barley, a new variety. In nearly all cases under the different conditions of growth Asplund surpassed in yield, the greater yields being specially outstanding on well fertilized barley soil. This variety is reported as having exceptionally stiff straw and as yielding fully with the best varieties under conditions of drought. The quantity of straw produced was about the average for six-rowed sorts. The growing period was found to be a little longer than that of the common Norwegian six-rowed barley. The new variety is described as having somewhat small kernels, but that otherwise the grain quality is up to the six-rowed standard. The grain is heavy, has a thin hull, and appears to be richer in fat and starch but poorer in protein than the other varieties studied.

Of the older varieties Finnegut and Björneby ranked next to Asplund in the yield of grain, although their yields were lower by about 200 kg. per hectare (3.7 bu. per acre). Maskin, as compared with Mjös, both new varieties developed by the plant breeding station at Hedemarken, gave the larger yield of grain, being on a par with Finnegut. Maskin proved to be an early variety with strong straw.

Svalöf Guld and Refsum, two-rowed varieties, were equal in average yield, and while Svalöf Guld did not seem to be exacting in its requirements it was surpassed in yield under the more favorable conditions of growth. Refsum ripened about a week earlier, but stood under Svalöf Guld in quality of grain. As compared with Asplund, both varieties yielded about 370 kg. per hectare (6.9 bu. per acre) less.

A study of the seeds of the Brassica occurring in Japan: A scheme for the determination of the different sorts, M. KONDO (*Ber. Ōhara Inst. Landw. Forsch., 1* (*1917*), *No. 2, pp. 123–150, figs. 12*).—The author describes observations made upon a number of varieties of Brassica, including *B. campestris* var. *chinensis*, *B. campestris* var. *rapifera*, *B. japonica*, *B. nigra*, *B. juncea*, *B. oleracea capitata*, *B. oleracea botrytis*, and *B. oleracea caulocarpa*. Differences with regard to form, size, weight, and color of the seeds, the structure of the seed coat, and the form of the seedling plant are noted, and a key for distinguishing between the different sorts is presented based upon these characteristics.

Composition of Indo-China castor beans, E. PRUDHOMME (*Agron. Colon.*, *3* (*1918*), *No. 19*, *pp. 25–27*).—Analyses of four samples of castor beans from Indo-China and eight samples from British India are noted in which the oil content of the whole seeds ranged from 49.4 to 51.1 per cent in the former, and from 42.2 to 52.8 per cent in the latter.

Red clover seed and its impurities, J. R. DYMOND (*Canada Dept. Agr., Seed Branch Pamphlet S–2* (*1918*), *pp. 20*, *figs. 22*).—The common weed seeds found in Canadian red clover seed are briefly described and illustrated. Notes on cleaning red clover seed, varieties of red clover, growing the crop, and weed eradication are included.

Improved technique for corn pollination, P. WEATHERWAX (*Proc. Ind. Acad. Sci.*, *1917*, *pp. 105–107*, *figs. 2*).—A device is described for protecting corn silks from adventitious pollen, consisting of a sheet of typewriter paper folded in such a manner as to form a long, flat envelope open at both ends and rendered waterproof by treatment with paraffin. The envelope is slipped over the ear, made tight by means of a cotton plug, and the top folded over and fastened with a paper clip. When the silks appear, the clip is removed, the desired pollen introduced, and the clip replaced. Collecting the pollen in ordinary paper bags gave the best results.

The method is said to be capable of adaptation for use with other plants.

Variation and varieties of Zea mays, P. WEATHERWAX (*Proc. Ind. Acad. Sci.*, *1917*, *pp. 99–103*).—The author briefly indicates the range of variability in corn and discusses critically some of the technical names applied to the so-called varieties of corn. It is concluded that the best taxonomic treatment would be to consider Zea as a monotypic genus, discarding all other names than *Z. mays*, and that reference to the numerous variations should be made to the characteristics directly and not to any arbitrary variety possessing that characteristic in varying combination with other properties.

The production of grain and stalks by maize as affected by intercropping with legumes, B. R. BAUTISTA (*Philippine Agr.*, *7* (*1918*), *No. 2*, *pp. 36–43*).—The intercropping of corn with mungo, cowpeas, or soy beans in both the rainy and dry season is said to have had little if any beneficial effect upon the production of either grain or fodder in tests conducted at Los Baños during 1916 and 1917, although the value of the legume crop usually more than compensated for any decrease in corn production. Cowpeas appeared to give the best results with respect to soil renovation and weed control.

Manurial experiments with Sea Island cotton in St. Vincent in 1917–18, S. C. HARLAND (*West Indian Bul.*, *17* (*1918*), *No. 2*, *pp. 69–79*, *pls. 3*).—This reports the continuation of work previously noted (E. S. R., 39, p. 637), in which the effects of different manurial treatments on Sea Island cotton have been studied by means of flowering and bolling records in addition to the effect on yield. Weather conditions for the season 1917–18 are said to have been quite favorable.

All fertilized plats showed increased yields over the unfertilized plats, the greatest increase being obtained with potash. The complete fertilizer also gave good results, but the addition of phosphate to potash tended to lower the yield. It is stated that the fertilizers had no effect on the time of maturity or on the percentage of bolls to flowers. Considerably larger yields were obtained from two plants per hill than from one plant, while no effect on the percentage of bolls to flowers from spacing was observed. Further study of the effects of spacing on Sea Island cotton is emphasized.

The author concludes that "it has been shown clearly that, under the conditions under which the experiments were carried out, there is a striking uniformity in the time at which flowering begins, reaches its maximum, and declines to zero. If the sowing date be known, we can state with certainty when most flowers and bolls will be produced and when the crop will be finished. We can not predict what the size of the crop will be further than by stating its probable maximum. The size of the crop depends on weather conditions, and on the incidence of fungoid disease. Thus, in the West Indies, or indeed in any country where cotton depends for its water supply on rainfall and not on irrigation, the value of flowering records is very much less than in Egypt. The Egyptian bolling curve is of less amplitude than the flowering curve, chiefly through shedding. The percentage of shedding is said to be practically constant at 40 per cent. In nonirrigated countries the bolling curve represents the bolls left after shedding and disease have taken their toll, and we have seen that the percentage of bolls to flowers fluctuates greatly from season to season.

"For manurial and spacing experiments in the West Indies, it is probably sufficient to take bolling records only, at weekly intervals. . . . For the comparison of different varieties in regard to yielding capacity, both flowering and bolling records are almost essential. It is certain that considerable differences exist in Sea Island cotton in respect to the liability to shed bolls. These differences could be brought out adequately only by a careful study of the flowering and bolling records."

The maintenance of the quality of Egyptian cotton, G. C. DUDGEON (*Bul. Imp. Inst. [So. Kensington], 16 (1918), No. 2, pp. 160–170*).—The author discusses the importance and the factors involved in the maintenance of valuable strains of cotton in Egypt. The necessity for cooperation among growers and ginners, with Government assistance if necessary, in maintaining the purity of desirable types is emphasized. He concludes that "the period of life of an Egyptian commercial variety is not long, owing to the fact that the characteristic qualities which constitute its value are usually rapidly broken down by cross-fertilization in the field and by careless mixture of seed in the ginneries.

"The origin of all Egyptian commercial varieties appears to have been a single plant in each case. These plants may be assumed to have been 'mutant' strains, the nature of which, so long as they are each inbred, is to breed true to the parent type. The theory of the commercial varieties being ever-splitting hybrids is therefore apparently untenable. The assumption of the mutational origin of Egyptian commercial varieties is supported by what has been found to occur in experimental breeding from Egyptian seed in Arizona."

Egyptian commercial cottons, G. C. DUDGEON (*Min. Agr. Egypt, Tech. and Sci. Serv. Spec. Bul., 1918, pp. 11*).—This comprises a brief discussion on the advisability of making provisions for maintaining the purity of the different strains of Egyptian cotton in Egypt through Government supervision, together with notes on the origin of commercial varieties and on the means of preserving their individuality.

An old treatise on hemp, W. H. BOOMGAARD (*Cultura, 30 (1918), No. 359–360, pp. 232–238, fig. 1*).—The author presents an early account of hemp (*Cannabis sativa*) including a description of the plant and the preparation of the fiber and its uses.

The waste pulp from New Zealand hemp (*Bul. Imp. Inst. [So. Kensington], 16 (1918), No. 2, pp. 134–138*).—An examination of the pulp remaining after the preparation of the fiber from New Zealand hemp (*Phormium tenax*) indicated that it was of little value as a paper-making material but had considerable manurial value. As compared with fresh, stable manure, the pulp contained about twice as much nitrogen, approximately the same amount of phosphoric acid, and from five to six times as much potash. The water soluble ash is said to compare favorably with commercial potash except for the presence of relatively large amounts of sodium carbonate.

Some methods suitable for the study of root development, A. and G. L. C. HOWARD (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 36–39*).—In continuation of work previously noted (E. S. R., 39, p. 230), the authors describe further observations on the root development of Java indigo and on methods for studying root growth. In order to observe root development in soil aeration experiments, the use of pits from 3 to 6 ft. square and from 2 to 2.5 ft. deep is recommended in preference to ordinary pot cultures.

At Pusa heavy pruning of the first crop of indigo, leaving a few leaves, is said to have resulted in far less damage to the roots and nodules and in a much more rapid development of the second crop than completely cutting back the first growth as is the universal practice in the cultivation of indigo in Bihar.

Origin and early habitat of common and of bearded oats (Avena diffusa and A. orientalis), A. SCHULZ (*Ber. Deut. Bot. Gesell., 36 (1918), No. 4, pp. 229–232*).—Assuming that the cultivated forms of oats were derived from *A. fatua*, the author briefly discusses the probability of the latter form having occurred in western Europe at the beginning of the iron age either in limited cultivation or as a weed. *A. orientalis* is regarded as representing a distinct group, originating in eastern Europe or central Asia and only recently introduced into western Europe.

The inheritance of tight and loose paleæ in Avena nuda crosses, A. ST. C. CAPORN (*Jour. Genetics, 7 (1918), No. 4, pp. 229–246, figs. 6*).—Crosses of *A. nuda*, with different varieties of ordinary oats, including Thousand Dollar, Ligowo, and Nubischer Schwarzer, in a study of the inheritance of tight and loose paleæ led to the following conclusions, based largely on observations of the F_2 and F_3 generations:

Complete sclerosis of all the outer paleæ was found in the "pure tight" or common varieties with spikelets from two to four flowered. In *A. nuda* all, or nearly all, of the paleæ were membranous, a few tight grains occurring up to a proportion of over 40 per cent, although "pure tight" forms were never observed. The spikelets were from 6 to 10 flowered.

The range of variation in the F_1 plants was quite marked, pure tight, pure loose, and several intermediate kinds of paleæ being noted. Segregation in the F_2 generation indicated that the inheritance of the pure tight character depended upon a single factor. The number of the F_1 type appearing in the F_2 generation appeared to exceed expectation, owing to the fact that they embraced tight-containing *nuda* forms which separated out only with further breeding, such forms never giving pure tights. Much diversity existed among the F_2 individuals incapable of yielding any pure tights. These *nuda* forms appeared to result from secondary factors, for according to their type and the manner of their breeding empirical groupings could be made among them. They are said to require more extensive study. In extracted pure tights the number of grains per spikelet never exceeded four, no cross-over of the large *nuda* number being observed. There was no evidence of repulsion between grey or brown color and pure tight paleæ.

A description of some varieties of oats cultivated in Argentina, C. D. GIROLA (*An. Soc. Rural Argentina, 52 (1918), No. 7, pp. 441–447, figs. 5*).—*Avena sativa* varieties *ampuria*, *colomea*, and *común* are briefly described and illustrated.

New experiments concerning the water requirement of different oat varieties, C. VON SEELHORST (*Jour. Landw., 66 (1918), No. 11, pp. 121–127*).—In connection with work previously noted (E. S. R., 26, p. 128), the author describes observations made during 1916 and 1917 at Göttingen upon the water requirements of Lüneberger Klay, Lochows, Strubes, Göttinger, and Petkuser oats grown on soils with a moisture content of 50, 63, 76, and 89 per cent.

In general it was found that the degree of soil moisture had a much greater influence upon yield than the variety. Marked increases in the yields of all varieties followed increases in the moisture content of the soil, while the water requirements of the different varieties decreased with moisture contents of 63 and 76 per cent, respectively, and increased with 89 per cent moisture content.

Oats in Wyoming, T. S. PARSONS (*Wyoming Sta. Bul. 118 (1918), pp. 3–27, fig. 1*).—This bulletin describes work with oats grown under irrigation for the period of 1911 to 1915, inclusive, embracing variety trials, date and rate of seeding tests, comparisons of home-grown and imported seeds, and observations on crop rotation and the use of barnyard manure for oats. Leading oat varieties are briefly described and suggestions made for growing the crop, including notes on seed treatment for smut and on the eradication of wild oats.

It is stated that oats have given better results under all conditions than any of the other grains grown at the station. Large varieties such as Swedish Select are deemed best for irrigated land, while the small sorts such as Kherson have produced fair yields on dry land and have also yielded well under irrigation. Fall as compared with spring plowing showed little difference in yield provided the seed bed was packed before seeding. Rolling after seeding did not give so good results as leaving the ground in ridges. Little difference was observed between home-grown and imported seeds provided the latter came from localities having somewhat similar conditions. Early seedings gave no advantage over late seedings and required a greater number of days to reach maturity in every case. Early varieties matured in from 109 to 115 days after seeding, and late varieties from 118 to 131 days. Oats required more water than other grains, receiving on the average 2 ft. of water including rainfall. Barnyard manure was found to be beneficial to the oat crop, either when plowed under or when used as a top dressing on plowed ground and disked in before seeding. It is recommended that oats follow a cultivated crop, but that they should not be disked in the stubble.

[Potato experiments at Wisley, 1917] (*Jour. Roy. Hort. Soc., 43 (1918), No. 1, pp. 114–129*).—Extensive variety tests with wart-resistant strains of potatoes, and cultural experiments including observations upon the effect of cutting seed tubers, the influence of various dressings on the cut surfaces, a comparison of greened and not-greened seed tubers with varying numbers of sprouts *v.* tubers taken direct from storage, the effect of planting potatoes at different distances, and date of planting tests, made at the gardens of the Royal Horticultural Society in Surrey County, England, are described.

The Abundance and Great Scot types of potatoes are said to have exhibited marked resistance to wart disease.

Although cutting the seed tubers resulted in a reduced yield per plant a much greater return was secured from a given weight of seed, and the practice is deemed expedient where seed is scarce or expensive. Gypsum gave the best results in checking the loss of moisture from the cut surfaces of seed tubers.

Sprouting seed tubers before planting is said to have resulted in an average increase in yield for all varieties of 2 tons per acre. Sprouting in full light showed only a slight advantage over sprouting in the dark. It is recommended that two sprouts be left on each tuber. The use of 2 and 3 oz. tubers for seed resulted in considerably higher yields than the use of 1 oz. tubers. In the spacing tests the largest yields were obtained from the closest spacings. Plantings made the latter part of April gave the best results.

Five years' results with old and new varieties of potatoes, K. Vik (*Aarsber. Norges Landbr. Höiskoles Akervekstforsök, 28 (1916–17), pp. 33–64, pls. 2*).—The results of cooperative tests in progress for five years are set forth in tables and summarized.

Of three new table varieties, Sagerud, Abundance, and Hjelvik, Sagerud gave the best results in yield of tubers and of dry matter, but was somewhat subject to disease and, owing to lack in appearance of the tubers, did not prove to be a good market variety. Abundance stood next to Sagerud in yield and showed about the same table quality, but was found to be a more desirable market variety on account of the better appearance of its tubers. Hjelvik was observed to be about like Abundance, with the exception that it is a medium late variety while Abundance and Sagerud are medium early sorts.

Among the older varieties Louis Botha led in productiveness, yielding nearly as large a quantity of tubers as was secured from Sagerud but considerably less dry matter. It is pointed out that the market value of a variety is based largely on the yield, and that since the tubers of Louis Botha are of good form and appearance and have good keeping quality the variety meets market requirements to a very favorable extent.

Marius, a variety giving good yields and having a high dry-matter content and agreeable flavor, is recommended for home consumption. Skaun, Grahm, and Up-to-date ranked in value a little behind the varieties mentioned, especially in dry-matter content, but Grahm and Up-to-date, with satisfactory yields and well formed clean tubers, were profitable market varieites. Of the limited number of early varieties tested Dukker, the earliest, gave the largest yield but New Matador excelled in appearance.

In the test of varieties generally grown for factory purposes General Cronje and Prof. Wohltmann ranked highest in productiveness, and these two varieties, together with Louis Botha, are also considered satisfactory for feeding purposes. Rosenring, which produced the largest and most rot-resistant tubers and also gave the largest yield, ranked under Louis Botha in the production of dry matter.

The position of the flower stalk as a help in potato identification, E. A. Krantz (*Potato Mag., 1 (1918), No. 6, p. 13, figs. 3*).—This paper, a contribution from the Minnesota Experiment Station, briefly outlines differences observed in the position of the flower stalk in the Green Mountain, Rural New Yorker, Early Ohio, and other varieties which the author has found to be of value in identifying potatoes in the field. He maintains that the position of the flower stalk is a distinctive character which has not been made use of in descriptions of potato varieties.

The inheritance of characters in rice, I, F. R. Parnell, G. N. Rangaswami Ayyangar, and K. Ramiah (*Mem. Dept. Agr. India, Bot. Ser., 9 (1917), No. 2, pp. 75–106, pls. 7*).—The authors report rather extensive observations begun in 1913 on the inheritance of certain characters in rice. About 100 varieties grown on the Government Farm at Coimbatore (India) were employed, a few type plants of each variety, together with any variations found, being selected and self-fertilized.

A large proportion of their progeny grown in 1914 proved to be heterozygous, giving Mendelian ratios for various characters, and these characters were in turn studied in succeeding generations. In addition a few definite crosses were made between pure strains.

Observations on the amount of natural cross-fertilization in a number of varieties showed a range of from 0.1 per cent for Dodda Biru Bhatta to 2.9 per cent for Sadai Samba, attributed to variations in the time of dehiscence of the anthers. The characters studied included size of outer glumes; golden color of inner glumes and internode; dark furrows of inner glumes; piebald pattern of golden coloring and dark furrows of inner glumes; purple pigmentation; dark purple coloring of pulvinus and auricle; full purple self-color of leaf sheath; purple lining of internode, purple glumes, purple stigma, and purple axil; ripening black character of inner glumes; and red color in rice. Tabular statements are presented showing the frequencies and ratios of the different characters, and the data are fully discussed.

Xenia in Oryza sativa, Y. YAMAGUCHI (*Bot. Mag. [Tokyo], 32 (1918), No. 377, pp. 83–90*).—This forms a preliminary report on some observations made with grain from the F_2 progeny of a cross between common rice and so-called "Klebreis." By means of certain microchemical reactions, the heterozygous and homozygous kernels were readily recognized in an apparently homogeneous lot of seed.

An inhibitor in rice, N. B. MENDIOLA (*Philippine Agr., 7 (1918), No. 3, p. 65*).—The author suggests that the failure of the so-called pink *a* kernel, obtained from a white variety of rice and described by Jacobson (E. S. R., 32, p. 230), to produce red kernels in the F_1 generation may have been due either to the effect of environment or to the presence of an "inhibitor" in the original kernel.

Burma rice, A. MCKERRAL (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 93–102*).—This paper deals with the methods of cultivation and the nature of the rice crop grown in Burma.

The origin and early habitat of rye, A. SCHULZ (*Ber. Deut. Bot. Gesell., 36 (1918), No. 1, pp. 39–47*).—Evidence obtained from various sources is held to indicate that rye originated from *Secale anatolicum*, that it was under cultivation in Turkestan when the bronze period prevailed throughout Europe, and that it was introduced into Europe during the transition between the bronze and iron ages. German ryes are supposed to have been obtained from the Slavs during the last century before Christ and to have spread throughout Germany from the eastern shore of the Baltic.

Oil yields of different strains of Sesamum (linga) as affected by the season of the year and the method of culture, C. C. SAMONTE (*Philippine Agr. and Forester, 6 (1918), No. 10, pp. 292–299*).—This reports the results of observations made during 1917 on the effect of cultural methods and seasonal conditions upon the oil content of different strains of Sesamum.

The date of harvesting the different varieties was found to vary from 78 to 140 days from the time of planting. The crop is said to be essentially a dry season crop, the earliest maturing strains giving the highest yields of oil. Spacing the plants 50 by 30 cm. (about 20 by 12 in.) is recommended for the larger strains.

Field tests of soy beans, P. LAYOSA Y MAKALINDONG (*Philippine Agr. and Forester, 6 (1918), No. 10, pp. 276–291*).—The author describes the continuation during 1917 and 1918 of work with soy beans, begun by G. F. Grageda, in an effort to multiply desirable strains selected by the latter, to determine their commercial value, and to ascertain those sorts best suited for the rainy and for the dry seasons, respectively.

Selections from Kedilcie Wit grown during the rainy season and strains from Ami grown during the dry season have produced the highest yields. Seed obtained from a rainy season culture of Kedilcie Wit and grown during the dry season resulted in a lower yield than that obtained during the rainy season. Methods of growing the crop in the Philippines are described.

Sugar beet production in Utah, F. S. Harris and N. I. Butt (*Utah Sta. Circ. 34 (1918), pp. 3–28, figs. 15*).—Cultural methods and field practices employed in growing and harvesting the crop in the State are described, and insect pests and diseases affecting sugar beets in Utah briefly discussed. Certain economic phases of the industry in relation to the community are also indicated.

Report on the sugar-cane experiments for the season, 1916–1918, J. P. d'Albuquerque and J. R. Bovell (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts., 1916–1918, pp. 83*).—Fertilizer and variety tests with sugar cane in Barbados are reported on as heretofore (E. S. R., 39, p. 742).

The results of the fertilizer experiments were again rendered valueless by the presence on the fertilizer plats of large numbers of the root borer (*Diaprepes abbreviatus*) and the brown hard-back (*Phytalus smithi*) which attacked the canes to a considerable extent.

Tabulated data are presented showing the yields of the principal plant and first and second ratoon canes grown on numerous plantations throughout the island as compared with White Transparent, the standard variety. Additional information is given relative to selected varieties, artificial and natural hybrids, and seedling canes tested during the period indicated.

The leading plant canes were Ba. 6032 and B. H. 10 (12), with average yields on the black soils of 28.51 and 28.2 tons of cane per acre, respectively, as compared with 24.15 tons from White Transparent. On the red soils the respective yields were 32.09, 31, and 16.97 tons. The highest yielding varieties of the first ratoon canes were B. 6308, with an average yield of 25.16 tons of cane per acre on black soil, and Ba. 6032 with 26.5 tons on red soil. White Transparent produced 14.7 and 18.74 tons of cane per acre on black and red soils, respectively. B. 6450 was the highest yielding second ratoon cane grown on red soil, with an average of 20.13 tons per acre, as compared with 15.77 tons from White Transparent.

Sugar cane manurial experiments in [British Guiana], J. B. Harrison and R. Ward (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), No. 4, pp. 135–143*).—This reports the results of work done during 1917, similar to that previously noted (E. S. R., 40. p. 241).

The average yield of 18 varieties of sugar cane receiving no nitrogen and applications of sulphate of ammonia at the rate of 40 and 60 lbs. of nitrogen per acre amounted to 22.4, 30.2, and 30 tons of cane per acre, respectively. Applications of superphosphate resulted in an average increase of 1.7 tons of cane per acre without nitrogen and of 1.1 tons with nitrogen. The use of rice straw at the rate of 25,000 lbs. per acre as a mulch for sugar cane resulted in an average yield for three varieties of 34.6 tons of cane per acre as compared with 31.8 tons without the mulch. Without rice straw these same varieties gave average yields of 24.4 tons of cane per acre without nitrogen, 24.2 tons with potash alone, 28 tons with nitrogen alone, 29.8 tons with potash and 40 lbs. of nitrogen, and 38 tons with potash and 80 lbs. of nitrogen. With applications of rice straw the respective yields of the variously treated plats amounted to 25.9, 28.8, 30.5, 34.3, and 39.7 tons per acre. Applications of 150 lbs. of sulphate of potash per acre, made singly and in combination with different amounts of sulphate of ammonia and nitrate of soda, resulted in average yields of 26.5 tons of cane per acre for potash alone as compared with 25.2 tons for the untreated check. The highest yield, 47 tons per acre, was obtained with potash and 500 lbs. of sulphate of ammonia. These results are held to indicate that the supply of immediately available potash in the soil is somewhat depleted, and that the nitrogenous fertilizers as well as the available soil nitrogen can not exert their full effect without the aid of potash.

The production of new varieties of sugar cane, P. González Ríos (*Rev. Agr. Puerto Rico, 2 (1918), No. 1, pp. 29–38, figs. 8*).—This is a résumé of work done by H. B. Cowgill at the Porto Rico Insular Experiment Station in developing new varieties of sugar cane, chiefly through hybridization.

Sugar cane experiments, 1916–1918, J. de Verteuil (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 3, pp. 135–142*).—The usual statistical data on the yields of both plant and ratoon canes grown in variety tests are presented in a continuation of work previously noted (E. S. R., 39, p. 839).

The leading varieties with respect to the amount of sucrose in the juice were B 156, T 202, and B 208, with 4.54, 4.06, and 3.99 tons per acre, respectively. The yields of plant cane for these varieties amounted to 44.41, 35.32, and 32.72 tons, respectively.

Some normal and anomalous mutations in sugar cane, G. L. Fawcett (*Rev. Indus. y Agr. Tucumán, 8 (1917), No. 1–2, pp. 33–40, figs. 2*).—The author presents a general discussion of variations in different types of sugar cane, with particular reference to the coloring of the stalks and to fasciation.

Planting tests with Java and Creole sugar cane, W. E. Cross (*Rev. Indus. y Agr. Tucumán, 9 (1918), No. 3–4, pp. 48–50, fig. 1*).—Field tests made at Tucumán, Argentina, during 1918 resulted in an average yield of cane of 35,584 kg. per hectare (about 15.88 tons per acre) from Java 36 grown from seed cane cut just previous to planting, as compared with only 17,111 kg. per hectare from that grown from cane cut 9 days before planting. Under similar conditions, Creole produced 21,800 and 22,383 kg. per hectare, respectively.

Methods for preventing the decomposition of frosted sugar cane, W. E. Cross (*Rev. Indus. y Agr. Tucumán, 9 (1918), No. 3–4, pp. 51–56, figs. 2*).—Field tests made with several varieties of cane at Tucumán, Argentina, during 1918 are described, in which a comparison was made of cane left standing in the row with that placed in windrows or topped for the prevention of frost injury, as suggested by work done at the Louisiana Experiment Station (E. S. R., 7, p. 492). The results are said to indicate that these practices were not only useless but led to a much more rapid deterioration than that observed in standing cane.

[Work with sugar cane in Hawaii, 1918], H. P. Agee (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Committee, 1918, pp. 25–39*).—This reports the continuation of work along the same general lines as previously indicated (E. S. R., 39, p. 741).

An acreage census of [sugar] cane varieties for the crops of 1918, 1919, and 1920, H. P. Agee (*Hawaii. Sugar Planters' Assoc. Circ. 32 (1918), pp. 38*).—Tabulated statistics are presented showing the different varieties of sugar cane and the area devoted to each for the crops indicated on the islands of Hawaii, Kauai, Maui, and Oahu. Yellow Caledonia, occupying about 108,000 acres, is said to be by far the leading variety in point of area.

[Experimental work with sugar cane], H. T. Easterby (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 18 (1918), pp. 31*).—This reports the continuation of work conducted during the year ended October, 1918, along the same general lines as that previously noted (E. S. R., 37, p. 540).

Statistics on the distribution and production of sugar cane varieties in Java in 1917, J. VAN HARREVELD (*Arch. Suikerindus. Nederland. Indië, 26* (*1918*), *No. 48, pp. 2039–2122, figs. 2; Meded. Proefstat. Java-Suikerindus., Landbouwk. Ser., No. 13* (*1918*), *pp. 84, figs. 2*).—Tabulated data are presented similar to those previously noted (E. S. R., 40, p. 37).

The three leading sugar cane varieties, 247 B, 100 POJ, and EK 28, occupied 41, 28, and 6 per cent of the total area, respectively. The average yields of raw sugar from these varieties amounted to 135.1, 142.8, and 171 pikols per hectare, respectively, as compared with 137.2 pikols (about 8.7 tons per acre) from all other varieties.

The sugar cane in India, C. A. BARBER (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 118–130*).—The author discusses the characteristics of the native canes of India.

Sugar and the sugar cane in the Gurdaspur District, J. H. BARNES (*Agr. Research Inst. Pusa Bul. 69* (*1918*), *pp. 100, pls. 7, fig. 1*).—This publication comprises a detailed account of sugar-cane growing and of sugar production in the Gurdaspur District of India. The chemical composition of the different varieties grown in the region has been determined for the seasons of 1911–1912 to 1915–1916. The sugar trade in the district and the improvement of the existing industry are fully discussed. Considerable statistical matter supplements the text.

The classification of Indian sugar canes, C. A. BARBER (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 131–145*).—The author outlines the methods employed in the identification of sugar-cane varieties in India, and briefly notes the characteristics of the three classes of Indian sugar canes thus far identified.

Experiments in planting sugar-cane sets with a single eye-bud, and pot experiments with other seeds placed in different positions while planting, M. L. KULKARNI (*Agr. Jour. India, Indian Sci. Cong. No., 1918, pp. 125–128, pl. 1, fig. 1*).—Preliminary observations on the effect of planting different kinds of seeds in various positions in the soil are briefly noted.

Sugar-cane sets with a single eye-bud sown with the bud turned upward are said to have shown a germination of above 80 per cent, the plants germinating simultaneously and germination occurring one week earlier than with ordinary sets sown in the usual way. The cane is also said to be less liable to lodge and to facilitate cultivation between the rows. Due to the high rate of germination obtained with this method, the tillers are removed and only the mother canes allowed to develop.

In the other crops studied the earliest germination was obtained when the seed was planted as follows: Cotton with the apexes turned upward, jowar (*Andropogon sorghum*) and wheat with the apexes turned sideways, sann (*Crotalaria juncea*) with the apexes turned downward, and gram (*Cicer arietinum*) with the apexes turned either sideways or upward.

Selection experiments with Deli tobacco, II, J. A. HONING (*Meded. Deli-Proefstat. Medan, 2. ser., No. 2* [*1918*], *pp. 84, pl. 1*).—This reports the continuation during 1917 of work along the same general lines as previously noted (E. S. R., 38, p. 741).

Recent work in Australia on the improvement of wheat, F. B. GUTHRIE (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 20–47*).—This presents a review of work done since 1910 in the improvement of wheat through selection, hybridization, etc., in the different States of the Commonwealth. Notes on the possible extension of wheat production in Australia are appended.

Two important varieties of winter wheat, E. F. Gaines (*Washington Sta. Popular Bul. 116 (1919), pp. 7, fig. 1*).—As an average of 11 years, Hybrid 128 winter wheat has produced 43.8 and Red Russian 38.8 bu. per acre. The first named variety is said to test 1.8 lbs. heavier, to have a higher market value, to mature 5 days earlier, and to shatter less than the latter. Tests made during 1916 and 1917 indicated that Hybrid 128 is much better adapted to early seeding and controls wild oats fully as well as Red Russian. It is estimated that the average difference between the two sorts, in yield and price together, would amount to $12.82 per acre annually, based on Government prices in 1918.

Hybridization studies with winter wheat, B. Kajanus (*Bot. Notiser, No. 5 (1918), pp. 235–244*).—The author presents a preliminary note on 22 artificial crosses with 17 so-called pure lines representing different types of wheat, observations having been made up to the fifth generation on the form, internodal length, awning, hairiness and color of spike, number of spikelets, form and keeling of outer glumes, inner glumes, number and color of seed, internal structure of the stem, and the color of the leaf auricles.

It is concluded that the results justify a grouping of the different forms of wheat into an emmer series, including *dicoccum*, *durum*, *polonicum*, and *turgidum*, and a spelt series including *spelta*, *vulgare*, and *compactum*.

Concerning a cross between two types of spring wheat, B. Kajanus (*Bot. Notiser, No. 5 (1918), pp. 245–247*).—The author describes a cross between an awned type of wheat, designated as Mazuolo and employed as the male parent, possessing smooth, yellow spikes, red grain, and markedly red auricles at the base of the leaves, and an unawned variety from Svalöf known as Pearl and characterized by smooth, yellow spikes, red grain, and white to reddish leaf auricles. In the F_2 generation awning behaved as a recessive unit character and the red color of the leaf auricle as a dominant unit character, resulting in a 3:1 ratio in each case.

Spring wheats in Wyoming, T. S. Parsons (*Wyoming Sta. Bul. 119 (1918), pp. 29–50, figs. 2*).—This bulletin describes work with spring wheat grown under irrigation for the period of 1911 to 1915, inclusive, embracing variety tests, comparisons of home grown and imported seed, and observations on the effect of barnyard manure. The principal varieties grown in the tests are briefly described and notes presented on spring wheat production in the State, including information regarding seed treatment for smut prevention.

Marquis, Kubanka, Minnesota 163, and Minnesota 169 are said to have been the highest yielding varieties, while Douglas, John Brown, Regenerated Defiance, and Colorado No. 50 were the earliest maturing sorts. The average yield for all home grown varieties was 40.1 bu. per acre, and for all imported varieties 39.9 bu., while the number of days from seeding to harvest was practically the same. Little difference was observed between home grown and imported seed of the same variety providing the imported seed was northern grown.

The use of barnyard manure for 4 years resulted in an average yield of 51 bu. per acre for all varieties on the experiment station farm as compared with 27.7 bu. in 1911. Equally good results were obtained whether the manure was plowed under or applied as a top-dressing to plowed land and disked in.

Based on one year's results, thorough preparation of the seedbed and late seeding appeared to give better results than early seeding. Wheat sown May 7 required 33 days less to mature than that sown April 5. From May 1 to 10 is deemed the best time to sow spring wheat under local conditions. It is recommended that the first irrigation be deferred as long as possible.

Grain distributed from the station, which is located at an altitude of 7,200 ft., is said to have given good results at lower altitudes.

The production of wheat in the Tropics, A. E. Humphries (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 1–19*).—Wheat production at the higher altitudes in the Tropics is discussed with special reference to the progress made in growing the crop in Rhodesia, British East Africa, and tropical Australa, where it is said to be exotic, and in India and the Sudan, where it is described as indigenous.

Report of trial shipment of bulk wheat from Vancouver via the Panama Canal to the United Kingdom, F. J. Birchard and A. W. Alcock (*Dept. Trade and Com. [Canada] Grain Research Lab. Bul. 1 (1918), pp. 19, figs. 19*).—This describes observations made upon temperature changes occurring in a bulk shipment of wheat and on the final condition of the grain in a trial trip made during the fall of 1917.

It was concluded from the results obtained that if certain precautions are taken wheat may be carried to Europe from Vancouver via the Panama Canal without damage. It is stated that only quite sound wheat, with a moisture content not exceeding 14.5 per cent, should be shipped by this route. The temperatures became dangerously high only in those portions of the ship close to the engine room, stokehold, and propeller-shaft tunnel, and well ventilated or extended air spaces are deemed essential for the proper protection of the grain cargo. Except near the stokehold bulkhead the only damage observed in this shipment was from "sweating," and the necessity of keeping the cargo dry during loading and the prevention of the subsequent entrance of water into the holds is emphasized. The length of the voyage was regarded as an undesirable feature, and it is suggested that the use of slow ships be avoided.

The storage of English wheat, F. W. Saxby (*Jour. Bath and West and South. Counties Soc., 5. ser., 12 (1917–18), pp. 20–26*).—The author discusses briefly methods of storing the wheat obtained in England through increased production. Owing to its high moisture content (from 15 to 19 per cent) the storage of English wheat is said to offer a rather serious problem to both the farmer and miller.

Some cultivated yams from Africa and elsewhere, I. H. Burkill (*Gardens' Bul. Straits Settl., 2 (1918), No. 3, pp. 86–92, pls. 3, figs. 2*).—Some unfamiliar cultivated yams are briefly described and illustrated, including *Dioscorea cayenensis*, *D. belophylloides*, *D. dumetorum*, and different varieties of *D. pentaphylla*.

[Report of the Official Seed Testing Station of England and Wales] (*Jour. Bd. Agr. [London], 25 (1918), No. 6, pp. 641–668, fig. 1*).—This comprises the first annual report of the station, dealing with purity and germination tests of 7,744 samples of seed received during the year ended July 31, 1918.

Injurious weed seeds in feeding stuffs, H. B. Sifton (*Agr. Gaz. Canada, 5 (1918), No. 10, pp. 951–957, figs. 11*).—A microscopic examination of ground feeding stuffs which proved to be unpalatable or actually injurious to cattle, are said to have revealed the presence of certain undesirable weed seeds in the feed. Among the common weeds identified were *Brassica arvensis*, *Erysimum cheiranthoides*, *Thlaspi arvense*, *Sisymbrium altissimum*, *Agrostemma githago*, and *Saponaria vaccaria*. The various kinds of mustard are deemed most troublesome.

Objectionable weed seeds and their harmful effects are briefly described. The judicious use of a 1/14-in. perforated zinc screen is suggested as a satisfactory means for removing most of these seeds.

Weeds of the wheat fields of the Pampa, J. Williamson (*Min. Agr. Nac. [Buenos Aires], Dir. Gen. Enseñanza e Invest. Agr. [Pub.] No. 79 (1918), pp. 24, figs. 14*).—Some of the more prevalent weeds found in the wheat fields of

Argentina are briefly described and measures for their control indicated. The plants dealt with include different types of Chenopodium, Russian thistle, black oats, and *Polygonum convolvulus.*

Weed seeds and impurities in imported seeds [in New South Wales], E. BREAKWELL (*Agr. Gaz. N. S. Wales, 29 (1918), No. 9, pp. 633–638*).—A tabular statement is presented showing the percentage of weed seeds and other impurities in the poorest samples of seeds of barley, carrots, cress, clover, alfalfa, flax, and meadow foxtail examined during the year ended June, 1918, together with a list of all the weeds and impurities present in 1,000 samples of agricultural seed.

Buried weed seeds, W. E. BRENCHLEY (*Jour. Agr. Sci. [England], 9 (1918), No. 1, pp. 1–31*).—This paper gives a more detailed account of work already noted from another source (E. S. R., 39, p. 239).

Summary of cooperative experiments in weed eradication, 1912–1917, J. E. HOWITT (*Ann. Rpt. Ontario Agr. and Expt. Union, 39 (1917) pp. 10–14*).—This reports further progress with work previously noted (E. S. R., 39, p. 744).

HORTICULTURE.

Allotment gardening.—A complete guide, H. H. THOMAS (*London and New York: Cassell & Co., Ltd., 1918, pp. VIII+151, figs. 123*).—A popular garden guide, dealing especially with British conditions.

The control of garden insects and diseases, T. H. PARKS and W. G. STOVER (*Agr. Col. Ext. Bul. [Ohio State Univ.], 14 (1918–19), No. 9, pp. 32, figs. 2*).—This comprises a calendar for the control of the important insect pests and diseases of the garden, including spraying formulas and directions for seed disinfection and fumigation. As far as practical, ingredients for spray materials are expressed in small quantities suitable for garden purposes.

Asparagus growing in New Jersey, R. W. DEBAUN (*New Jersey Stas. Circ. 99 (1918), pp. 3–22, figs. 15*).—A practical treatise on asparagus culture, discussing the preparation of the soil, planting operations, cultural details, fertilizers, the control of insect enemies and disease, and harvesting and marketing the crop.

A variety test of cabbage, C. E. MYERS and J. S. GARDNER (*Pennsylvania Sta. Bul. 154 (1919), pp. 3–30, figs. 11*).—In continuation of previous reports (E. S. R., 38, p. 41), a performance record is given of recently tested varieties of eight different groups of cabbage. In all 51 early and 28 late varieties are considered with refefence to the source of the seed, number of years tested, productiveness, earliness, quality, and other characteristics.

The pollination of fruit in relation to commercial fruit growing, C. H. HOOPER (*Brit. Bee Jour., 46 (1918), Nos. 1463, pp. 13, 14; 1465, pp. 28, 29; 1467, p. 45; 1470, p. 73; 1471, pp. 79, 80; 1473, pp. 97, 98; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 11, pp. 1328–1330*).—A report of the author's investigations relating to the pollination of fruit trees, including lists of fertile and self sterile varieties of apples, pears, plums, and cherries, as well as lists of the different varieties which should be planted together. The author's observations indicate that most of the cross-pollination, especially in the case of apples, is done by insects, particularly hive and bumblebees.

[Progress report of fruit bud studies], F. M. ROLFS (*Oklahoma Sta. Rpt. 1918, pp. 43–45*).—Studies in fruit bud development were somewhat interfered with during the year by the prevalence of plum "black spot" (*Bacterium pruni*) on the peach, plum, apricot, cherry, and almond trees. A few of the peach varieties were completely defoliated by this organism. Efforts to control it by fertilizing the soil with barnyard manure have proved unsatisfactory and the department planned to apply commercial fertilizers to all infected trees.

Apple blotch (*Phyllosticta solitaria*) was also prevalent in 1917 and experiments were conducted to determine the best mixture as well as the most desirable time to apply the mixture for controlling this organism. In all the experiments lime-sulphur 1.5 gal. to 50 gal. of water plus 1.5 lbs. of arsenate of lead to control codling moth was used for the first spray application. Subsequent applications consisted of Bordeaux—arsenate of lead, lime-sulphur solution and arsenate of lead, and sulphur and arsenate of lead dust in the various plats. The trees were sprayed four times during the season. Apple blotch was fairly well controlled by the Bordeaux, whereas neither lime-sulphur nor sulphur dust were effective in controlling it. In one plat of Arkansas Black apples the Bordeaux was omitted for the fourth application and arsenate of lead applied alone. Prior to the fourth application the fruit and foliage on all the trees developed satisfactorily. In four days after the application of arsenate of lead all the leaves and fully 50 per cent of the fruit fell. The remaining fruit soon became soft and the seeds turned black.

Using the spray gun in orchards, I. P. Lewis (*Mo. Bul. Ohio Sta., 4 (1919), No. 2, pp. 59–61, figs. 2*).—The spray gun here described first came into use in 1916, and is specially adapted for power-spray outfits. It is made almost entirely of brass and consists in the main of a tube 18 to 30 in. in length, on the end of which is a large disk-type nozzle. The control is invested in a long rod running inside the spray rod proper, connecting with the inner mechanism of the nozzle at one end and terminating in a hand grip of some character at the other. By turning the grip the operator can vary the spray at will. In the spring of 1918 the station conducted a comparative test to determine the advantages of the spray gun, if any, over the pole method of spraying.

Under the conditions of the experiment, one man with a spray gun could spray 23 trees thoroughly with 150 gal. of solution in 50 minutes, whereas with the pole method two men were able to spray only 16 trees with the same amount of solution in the same time. Other advantages of the spray gun were the ease in adjusting the spray to various distances, the readiness with which the spray was shut off in going from tree to tree, its light weight, and immunity from catching in the branches. It is pointed out that the spray gun gives the best service on a power-driven pump. It should be connected with a spraying apparatus by, at least, one-half inch hose and proportionally large enough connections used that there will be the least possible stoppage and friction between the pump and the gun.

Pruning apple trees, C. W. Ellenwood and W. J. Green (*Mo. Bul. Ohio Sta., 4 (1919), No. 2, pp. 42–48, figs. 8*).—A popular discussion of methods employed in pruning young trees and bearing orchards.

New everbearing strawberries, W. Van Fleet (*Jour. Heredity, 10 (1919), No. 1, pp. 14–16, figs. 2*).—Some new everbearing strawberries developed at the Bell experiment plat, Glendale, Md., as the result of a cross between *Fragaria chiloensis* and *F. vesca* are illustrated and described.

Keeping quality of strawberries in relation to their temperature when picked, N. E. Stevens (*Phytopathology, 9 (1919), No. 4, pp. 171–177*).—Data are given on observations made in four New England States during 1918 which indicate that strawberries picked early in the morning while cool generally keep better, even though wet, than similar berries picked later after they have been warmed by the sun. A list is given of cited literature dealing with strawberry diseases and the influence of temperature on the keeping qualities of strawberries.

Commercial grape growing, P. Thayer and W. J. Green (*Mo. Bul. Ohio Sta., 4 (1919), No. 2, pp. 35–41, figs. 3*).—A descriptive list of grapes recommended for planting in southern and central Ohio, including also cultural suggestions.

The direct bearers at the National School of Agriculture at Montpellier, L. Ravaz and Antoniadis (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 40 (1919), No. 10, pp. 217–225*).—A tabular record is given of a large number of direct bearing grapes that have been tested for several years at the Montpellier agricultural school.

The herbaceous garden, A. Martineau (*London: Williams & Norgate, 1917, 3. ed., rev., pp. XX+298, pls. 35, figs. 11*).—A popular treatise, part 1 of which discusses the designing and development of various types of herbaceous gardens. Part 2 contains alphabetical lists of plants suitable for growing in herbaceous borders, together with lists of annuals, blue flowers in pure tones, and of delphiniums and phloxes tested at Wisley.

Selecting ornamental shrubbery, W. E. Bontrager (*Mo. Bul. Ohio Sta., 4 (1919), No. 2, pp. 55–58, fig. 1*).—Notes on types of ornamentals suitable for the flower garden, farmstead, and lawn.

Decorative materials in the prickly pears and their allies, D. Griffiths (*Jour. Internat. Gard. Club, 3 (1919), No. 1, pp. 5–19, pl. 1, figs. 7*).—The author presents an annotated list of the species of Opuntia with the view of showing the wealth of material available for the use of the gardener situated in regions not suited to the conventional shrubs and herbs of more humid climates.

Attractive farmsteads, L. Cady (*Univ. Minn., Col. Agr., Ext. Bul. 65 (1919), pp. 12, figs. 5*).—This bulletin contains practical suggestions on the arrangement of buildings, fences, roads, and walks, as well as on the use of trees, shrubs, and plants on the farm. A list is given of hardy shrubs and perennials suggested for use.

FORESTRY.

Report of the forestry commission for the year ended June 30, 1918, R. Dalrymple Hay et al. (*Rpt. Forestry Com. N. S. Wales, 1918, pp. 32*).—A report on the administration and management of the State forests in New South Wales for the year ended June 30, 1918, including data on the alterations in forest areas, silvicultural operations, surveys, forest protection, revenues and expenditures, yields in major and minor forest products, timber and forage, etc.

Outlines are also given on investigational work, including tables showing the results of dry distillation and mechanical tests of various timber trees. Preliminary tests were made of a number of timbers as possible substitutes for lignum vitæ, which is used for "stern tube bushes" in ship construction. The following were found to be the most satisfactory: Supple jack (*Ventilago viminalis*), ironwood (*Casuarina cambagei*), and belah (*Acacia excelsa*).

Progress report of the Forest Research Institute for the year 1917–18, B. B. Osmaston (*Rpt. Forest Research Inst. [Dehra Dun], 1917–18, pp. 24*).—The usual progress report (E. S. R., 38, p. 548) relative to investigations dealing with silviculture, forest working plans, forest botany, forest economy, forest zoology, and forest chemistry. Appended to the report are a list of forest publications issued since the establishment of the Forest Research Institute and financial statements for the year.

A combined map and panorama for orientation from lookout stations, E. Fritz (*Geogr. Rev., 6 (1918), No. 6, pp. 501–503, pl. 1, figs. 2*).—The author illustrates and describes a device combining a map and panorama that has recently come into wide use in forest protection organizations as an adjunct to lookout stations in locating forest fires. The special alidade used in drawing the panorama section is also described.

Use of airplanes in forest patrol work, H. S. GRAVES (*Aviation and Aeronaut. Engin.*, *5* (*1919*), *No. 12*, *pp. 754, 755*).—A short discussion relative to the possibilities of adapting airplanes to assist in fire detection and control.

Descriptive list of forest trees and ornamental shrubs grown at the Government forest nursery, Salisbury [Rhodesia] (*Rhodesia Agr. Jour.*, *16* (*1919*), *No. 1*, *pp. 45–53*).—The data presented in this list include common and botanical names and brief remarks on the distinguishing characteristics of the various trees and shrubs.

Sugar as a coagulant for Hevea latex, R. D. ANSTEAD (*Planters' Chron.*, *13* (*1918*), *No. 32*, *pp. 522, 523*; *Agr. Jour. India*, *14* (*1919*), *No. 1*, *pp. 171–174*).—A brief review of the literature dealing with the use of sugar as a coagulant for Hevea latex.

The possibilities of farm woodland development under the Smith-Lever Act, C. R. TILLOTSON (*Amer. Forestry*, *25* (*1919*), *No. 301*, *pp. 785–787*, *figs. 4*).—In this paper the author calls attention to the importance of the farm woodlands as sources of fire wood, posts, poles, etc., and indicates how farm woodland production can be stimulated by the use of extension agencies developed under the Smith-Lever Act.

The use of wood for fuel (*U. S. Dept. Agr. Bul. 753* (*1919*), *pp. 40*, *pls. 5*, *figs. 2*).—This is largely a compilation of information from many sources prepared with special reference to aiding in the conservation of the Nation's coal supply. It discusses the present use and supply of fuel wood, what to use for wood fuel, producing and marketing wood fuel, how to use wood fuel, efficiency of wood fuel, the production of wood fuel for the future, and methods of promoting its use. Appended to the bulletin are recent publications on wood fuel and a general bibliography on the subject.

Pulp and paper investigations of the Forest Products Laboratory in 1918, V. P. EDWARDES (*Paper Trade Jour.*, *68* (*1919*), *No. 6*, *pp. 123, 124*).—A descriptive account of the pulp and paper investigations, conducted largely to determine the various uses to which paper could be put for war purposes.

Pulp mills of the United States, H. E. SURFACE and F. H. SMITH (*Paper Trade Jour.*, *68* (*1919*), *No. 6*, *pp. 109, 111, 113, 115, 121*, *figs. 4*).—Statistical data and maps prepared under the direction of the Forest Service of the U. S. Department of Agriculture are given, showing the locations and relative capacities of the ground wood, sulphite, sulphate, and soda pulp mills in the country.

DISEASES OF PLANTS.

Effect of certain ecological factors on the morphology of the urediniospores of Puccinia graminis, E. C. STAKMAN and M. N. LEVINE (*Jour. Agr. Research* [*U. S.*], *16* (*1919*), *No. 2*, *pp. 43–77*).—In studies carried on cooperatively between the Minnesota Experiment Station and the U. S. Department of Agriculture with several biologic races of *P. graminis*, the authors investigated the quantity of inoculum to be used, optimum length of incubation, condition of urediniospores necessary to insure uniform measurements, number of measurements to be made of a given strain, and method of computation employed, as affecting the morphology of the urediniospores.

The amount of spore material used for inoculation was found to have no perceptible effect on the result of infection or size of spores, except in so far as a more extensive area of and a greater certainty for successful infection may be secured. The optimum length of the incubation period in the moist chamber was 48 hours. Biologic forms were found to be constant not only parasitically but also morphologically, the morphologic stability being exhibited in the constancy of size, shape, and color in the urediniospores of the particular form. An exception is noted in the case of stem rust of oats, the shape and size of urediniospores of which are very plastic.

Common hosts which were found congenial to different biologic forms lacked ability to unify them, as they were unable to exert any influence on spore morphology. Uncongenial hosts almost invariably tended to decrease the size of the uredinia and spores.

In computing data and comparing results, the authors claim that it is necessary to take into consideration the ecological conditions under which the rust had been cultured. Adverse environmental conditions unfavorable for the host are also unfavorable for the parasite, affecting the virulence and spore size of the latter. The optimum atmospheric temperature for the development of the rusts studied appeared to range between 66.5 and 70° F. Sufficiency of water and plentiful light were found indispensable for the best growth of the rust.

The age of the host seedlings, provided they were healthy at the time of inoculation, had no effect on the size of the urediniospores or the virulence of infection. The length of association of a rust with its host, after the first uredinia have burst the epidermis until teliospores are formed, did not impair the viability of the urediniospores nor exhibit any marked and consistent effect on their size.

New biologic forms of Puccinia graminis, E. C. STAKMAN, M. N. LEVINE, and J. G. LEACH (*Jour. Agr. Research [U. S.], 16 (1919), No. 3, pp. 103–105*).—In a preliminary report on a study of new biologic forms of *P. graminis* on wheat, carried on cooperatively between the Minnesota Experiment Station and the U. S. Department of Agriculture, the authors state that while a considerable range of parasitism had been reported previously, no forms had been found able to infect White Spring emmer and the durum variety Mindum, as well as several other varieties, mostly durums. By testing many species and varieties it was thought that probably forms of rust could be found that would be capable of attacking varieties resistant to all the known forms of stem rust. This supposition has been verified, and a form has been found which infects White Spring emmer and Mindum normally. This work has been continued, and during the summer of 1918 biologic forms were found, some of which are virulent on many varieties of wheat, while others are weak and can attack only a few varieties successfully.

The wind dissemination of the spores of bunt or stinking smut of wheat, F. D. HEALD and D. C. GEORGE (*Washington Sta. Bul. 151 (1918), pp. 3–23, figs. 2*).—The authors present some of the data on which a previous popular bulletin was based (E. S. R., 40, p. 49).

As a result of several years' study, it is concluded that in southeastern Washington and adjacent regions the principal infection of wheat by smut is through wind-borne spores liberated at thrashing time. Positive evidence of the abundant and wide dissemination of smut spores has been obtained by microscopical studies of washings from leaves and by the use of spore traps exposed at considerable distances from wheat fields. It is stated that during the thrashing season there is a smut shower or spore fall in the vicinity of Pullman, Wash., which begins in August, the exact time of the maximum depending in part on the location, on the period at which the thrashing operations are most numerous, and also upon climatic factors. The dry conditions which prevail during the thrashing season, together with frequent winds of high velocity and with a cropping system which includes summer fallow and winter wheat, have combined to make wheat smut especially severe in the Palouse country. A great amount of winter wheat is seeded in summer fallow, which receives a countless number of wind-borne spores. The maximum amount of seeding generally follows the period of maximum spore fall, and during this time both temperature and moisture conditions are specially favorable for smut.

The production of an anthracnose-resistant White Marrow bean, W. H. BURKHOLDER (*Phytopathology, 8 (1918), No. 7, pp. 353–359*).—Following the discovery of the resistance to anthracnose of the Red Kidney bean (E. S. R., 34, p. 644), the author undertook the production of an anthracnose-resistant bean by crossing the White Marrow with Wells Red Kidney bean.

The hybrid plants displayed a vining character as early as the White Marrow, but showed the pink coloration in the flower similar to the Red Kidney. Twenty-one plants were obtained which yielded an average of 24.52 seeds to a plant. These were grown and the observations on the F_2 generation were secured. The plants were grown in pots and inoculated with spores from two strains of *Colletotrichum lindemuthianum*, striking differences being observed in the number of infections. The segregation of the different forms resulting and their resistance are described.

Further work was carried on which resulted in the establishment of a definite resistant strain of the White Marrow bean, and in addition to this variety three others that are considered less important commercially have been produced. These are named the Vineless Marrow, the Red Marrow, and the White Kidney. A resistant strain of each has been obtained.

Report of the botany division, H. W. BARRE (*South Carolina Sta. Rpt. 1918, pp. 21–24*).—According to the author, as a war measure, a large number of samples of cotton seed were investigated to determine the presence of cotton anthracnose, and in this way the planting of infected seed was prevented and at the same time numerous lots of disease-free seed were located. In the course of the investigations on the cotton anthracnose, it was found that the disease affects cotton quite differently in different sections of the South, and a cooperative arrangement has been made which will include the investigation of the disease in Louisiana, Mississippi, and other Southern States. A number of strains of the organism have been isolated, and attempts are being made to determine whether or not there is a difference in the virulence of the strains collected from different parts of the country.

In continuation of the investigation of the angular leaf spot of cotton (E. S. R., 38, p. 47), it has been found that this disease can be controlled by treating the seed with sulphuric acid before planting.

A preliminary note on a bacterial disease of foxtail, H. H. ROSEN (*Science, n. ser., 49 (1919), No. 1264, p. 291*).—The author reports having observed in the vicinity of Fayetteville, Ark., a disease of foxtail which is characterized by dark brown spots and streaks occurring on the leaves, flowering stalks, and glumes. From infected material an organism has been isolated which both by spraying and needle smearing has been successfully used to inoculate wheat, oats, rye, barley, corn, Sudan grass, sorghum, and millet. Judging from the appearance of infected plants in the greenhouse, the author believes that all of the cereals mentioned, as well as various grasses, may be seriously attacked. It is considered probable that the organism is the same as that described by Manns as *Pseudomonas avenæ* (E. S. R., 22, p. 453).

Pink root of onions, J. J. TAUBENHAUS (*Science, n. ser., 49 (1919), No. 1261, pp. 217, 218*).—In a previous publication (E. S. R., 37, p. 841) the author called attention to a disease of onions characterized by pink roots. Subsequent investigations have shown that the disease is apparently due to an undescribed organism for which the name *Fusarium malli* is proposed.

As a result of laboratory and field experiments, it has been determined that the disease can be carried with infected sets or from year to year in the soil. Steam sterilization or sterilization with formaldehyde will kill the organism in the soil. In addition to onions, garlic and shallot are subject to attack, but the organism does not seem to attack any other liliaceous plants. It has been found that by the liberal use of fertilizers growth may be so stimulated that new roots are produced more rapidly than the disease can destroy them.

The growth of the potato scab organism at various hydrogen ion concentrations as related to the comparative freedom of acid soils from the potato scab, L. J. GILLESPIE (*Phytopathology, 8 (1918), No. 6, pp. 257–269, fig. 1*).—In order to ascertain a reason for the freedom from scab in potatoes grown on acid soils, the author carried on experiments to determine what intensity of acidity is inimical to the growth of *Actinomyces chromogenus* in culture media. A number of strains of the organism were studied in relation to various hydrogen ion exponents, different media being employed.

In media at an exponent of 5.2 growth was slower and generally less vigorous than at less acid exponents. Under some conditions individual strains were somewhat more sensitive to acidity, but the differences did not lead to any consistent distinctions among the strains. Sometimes the strains succeeded in growing well in a medium which had initially an exponent of 5.2 or even 4.8, but the growth was accompanied by a marked decrease of acidity. From his investigations the author concludes that the acidity of the Caribou loam soil, which is known to be generally immune from the common scab of the potato, is often of sufficient intensity to exert in the soil an injurious action on the causal organism.

A new disease of the Irish potato, C. W. CARPENTER (*Phytopathology, 8 (1918), No. 6, pp. 286–288, pl. 1*).—A disease of the Irish potato occurring in Hawaii and considered new to pathologists is described. The disease, which appears to be due to mites, is characterized by the bronzing and twisting of the young terminal and axillary leaves. Later the leaves and shoots become abnormal and soon dry up and die. The author states that with averge rainfall in potato sections mites do not appear troublesome, but in the dry periods losses estimated at as much as 50 per cent have been reported. Spraying with lime-sulphur or dusting with dry sulphur has been found an effective means of control.

Blossom drop of tomatoes, F. M. ROLFS (*Oklahoma Sta. Rpt. 1918, pp. 40–43*).—A progress report is given on investigations carried out to determine the cause of blossom drop of tomatoes in Oklahoma and methods for its control. In the period covered by the report, cultivation, irrigation, mulching, staking, and pruning were tested.

The application of water produced more vigorous vegetative growth, the fruit from this plat being smoother and better in appearance though the yield was not increased over that of the check plats. In culture and pruning experiments the use of a V-shaped trellis seemed to give somewhat larger yields, although the fruit of plants which were staked and pruned was earlier and larger. The development of individual blossom clusters was noticeably stimulated by pruning. Tests of varieties were made, but no apparent differences in 36 varieties were noted, the yields from all being very low.

Dissemination of Septoria lycopersici by insects and pickers, W. H. MARTIN (*Phytopathology, 8 (1918), No. 7, pp. 365–372*).—In connection with experiments conducted in the summer of 1917 for the control of the tomato leaf spot, studies were made to determine the possibility of dissemination by insects and pickers. The author reports that in New Jersey the tomato is visited by Colorado potato beetles (*Leptinotarsa decemlineata*), flea beetles (*Epitrix cucumeris*), tomato worms (*Protoparce carolina*), and plant lice (*Aphis pseudobrassicæ*). Studies were made of the beetles and tomato worms, which show conclusively that the spores of *S. lycopersici* and *Alternaria solani* are carried not only on the bodies of insects but in the digestive tracts as well, and that the excreted spores are viable. In connection with the possibility of pickers disseminating the spores, it was found that they carry large numbers of spores on their hands and garments, and on this account it is recommended that picking should be delayed after a rain or heavy dew until the plants are dry.

Lightning injury to herbaceous plants, L. R. Jones and W. W. Gilbert (*Phytopathology, 8 (1918), No. 6, pp. 270–282, figs. 3*).—Following the publication of notes of lightning injury to various crops (E. S. R., 38, pp. 149, 250), the authors have collected and compiled data relating to lightning injury to potatoes, cotton, tobacco, cucumbers, and tomatoes.

Lightning injury to grapevines, D. Reddick (*Phytopathology, 8 (1918), No. 6, p. 298*).—A brief description is given of an unquestioned case of lightning injury to grapevines.

Lightning injury to citrus trees in Florida, H. E. Stevens (*Phytopathology, 8 (1918), No. 6, pp. 283–285, fig. 1*).—The author describes the injury due to lightning in citrus groves within the State.

Common diseases of ornamental plants, M. T. Cook (*New Jersey Stas. Circ. 97 (1918), pp. 23, figs. 10*).—Brief discussions are given of the more common diseases of ornamental plants, with directions for their treatment.

Common diseases of shade and ornamental trees, M. T. Cook (*New Jersey Stas. Circ. 98 (1918), pp. 3–27, figs. 11*).—After a brief discussion of the care of shade and ornamental trees, the more common diseases to which the roots, stems, and foliage are subject are described and suggestions are given for their control so far as definite means are known.

Exclusion legislation and fruit tree production, V. B. Stewart (*Phytopathology, 8 (1918), No. 7, pp. 360–364*).—The author calls attention to some of the objections to proposed legislation and regulations for the importation of nursery stock.

Notes on Peridermiums from Ohio, R. G. Pierce (*Phytopathology, 8 (1918), No. 6, pp. 292–294*).—Attention is called to the occurrence of *P. carneum* on the Austrian, Corsican, and western yellow pine and on pitch pine, and to the desirability of nurserymen seeing to it that alternate host plants of this and other species are removed from the vicinity of forest nurseries.

Host relationships of the North American rusts, other than Gymnosporangiums, which attack conifers, A. S. Rhoads, G. G. Hedgcock, E. Bethel, and C. Hartley (*Phytopathology, 8 (1918), No. 7, pp. 309–352*).—The authors have attempted to assemble in concise form all available information on the rusts of conifers other than Gymnosporangiums. In addition a bibliography of 148 titles, covering some important publications of North American authors dealing with the description, life history, and genetic relationships of this group of rusts, has been appended.

Some factors affecting viability of the urediniospores of Cronartium ribicola, G. H. Duff (*Phytopathology, 8 (1918), No. 6, pp. 289–292, fig. 1*).—A series of experiments on the viability of urediniospores of Cronartium under various conditions is reported by the author. The experiments were planned to determine the possibility of the urediniospores passing the winter in a living condition on old leaves ready to cause infection of Ribes in spring, to make a general study of the viability of the urediniospores, and to test the possible toxic action of sunlight upon these spores.

In testing the possibility of the spores overwintering, lots of spores were placed in special refrigerators and examined from time to time, from which it appears that urediniospores probably do not survive a winter period of six months, even under the most favorable circumstances. The viability of the urediniospores appears to be very low, less than 50 per cent being capable of germination three days after collection. The investigation on the action of sunlight showed no toxic effects on the urediniospores as a result of exposure for a few hours.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Wild animals of North America, E. W. Nelson (*Washington: Nat. Geogr. Soc., 1918, pp. 381–612, pl. 1, figs. 194*).—This work combines the text and illustrations of papers by the author previously noted (E. S. R., 36, p. 354; 39, p. 759).

Wild life in our National Parks, [E. W.] Nelson (*Forest and Stream, 87 (1917), No. 10, pp. 464, 465, 497, figs. 2*).—The author reports experiments in restocking ranges which have been made on a sufficient scale to demonstrate that this is practicable.

The fur-bearing animals, C. Kretzschmar (*Les Animaux à Fourrures. Châlon-sur-Saône, France: Émile Bertrand, 1918, pp. XII+376, figs. 53*).—The author describes the various species, their value, use of the pelt, etc. Information for the use of the pelterer and furrier is included in the two concluding chapters.

Some observations on rats and their control, D. B. Mackie (*Philippine Bur. Agr. Circ. 37 (1918), pp. 8*).—A popular discussion, in which it is pointed out that practically 95 per cent of all damage to crops in the Philippines is chargeable to depredations of one species, the spiny rat (*Epemis mindanensis*).

The migration of North American birds, VII, H. C. Oberholser (*Bird Lore, 20 (1918), No. 6, p. 415, pl. 1*).

A second bird survey at Washington, D. C., H. C. Oberholser (*Wilson Bul., 30 (1918), No. 2, pp. 34–48*).—This is a report of a second survey (E. S. R., 39, p. 154) in which 17 parties were engaged.

Birds observed near Minco, central Oklahoma, A. Wetmore (*Wilson Bul., 30 (1918), Nos. 1, pp. 2–10; 2, pp. 56–61*).

The game birds of California, J. Grinnell, H. C. Bryant, and T. I. Storer (*Berkeley: Univ. Cal., 1918, pp. X+642, pls. 16, figs. 94*).—In this contribution from the Museum of Vertebrate Zoology of the University of California chapters on the decrease of game birds in California and its causes, introduction of exotic game birds, propagation, natural enemies, legislation, etc., are followed by keys to the species and general accounts which include technical descriptions, general distribution, distribution within the State, habits, etc. Of the 16 colored plates 12 are by L. A. Feurtes and 4 by A. Brooks.

A bibliography of 22 pages and a complete index are included.

Costa's hummingbird—Its type locality, early history, and name, T. S. Palmer (*Condor, 20 (1918), No. 3, pp. 114–116*).

The Wisconsin Napaeozapus, H. H. T. Jackson (*Proc. Biol. Soc. Wash., 32 (1919), pp. 9, 10*).—A new subspecies, *Napaeozapus insignis frutectanus*, is described.

The status of the genus Orchilus Cabanis, H. C. Oberholser (*Proc. Biol. Soc. Wash., 31 (1918), pp. 203, 204*).

Mutanda ornithologica, V, H. C. Oberholser (*Proc. Biol. Soc. Wash., 32 (1919), pp. 7, 8*).

Tenth annual report of the State ornithologist, E. H. FORBUSH (*Agr. of Mass., 1917, pt. 1, pp. 75–101, pls. 5*).—Under the heading of field work of the year 1917 a brief report is given on the status of the heath hen, food of night herons, sea bird colonies, the starling, including a new means of breaking up its roosting places and its destruction of gipsy and brown-tail moth caterpillars, pheasants, and the destruction of birds by the elements in the spring of 1917, with a list of the species found dead.

Parasitism of nestling birds by fly larvæ, O. E. PLATH (*Condor, 21 (1919), No. 1, pp. 30–38*).—Studies made by the author in the vicinity of Berkeley, Cal., have shown nestling birds of many species to be parasitized by the maggots of *Protocalliphora* azurea and that the larvæ of this parasite are dependent upon blood in order to mature. The observations indicate that the maggots attach to the nestlings at night and suck their blood, and rest in the lower parts of the nest during the day.

The chalcidid parasite *Nasonia brevicornis* was reared from the pupæ of *P. azurea*, from 15 to 25 being obtained from each pupa. Small grubs from infested birds' nests, which fed upon the pupæ of *P. azurea*, eating shell and all, when reared to maturity were found to represent several species of moths, including *Tinea occidentella*, *Tinea* sp., an oecophorid, probably *Endrosis lacteella*, etc.

In investigations conducted by the author during a period of 11 weeks, 68 nests representing six species of birds were examined of which 39 were infested by bloodsucking fly larvæ. The author's observations of the effect of this parasitism on birds are said to warrant the conclusions that from 5 to 10 per cent of the parasitized nestlings die from loss of blood; that some of the parasitized nestlings which do become full-fledged are so weakened by the loss of blood that they fall an easy prey to rapacious animals; and that the larvæ of *P. chrysorrhœa* are probably more deadly to nestling birds than those of *P. azurea*. The latter conclusion is said to be borne out by a case of parasitism recorded by Henshaw,[1] in which the mortality averaged about 90 per cent instead of only 5 to 10 per cent. Accounts of parasitism of birds by *P. azurea* by Coutant (E. S. R., 34, p. 359) and by Arnold (E. S. R., 40, p. 351) and by *P. chrysorrhœa* by Miller (E. S. R., 21, p. 356), have been previously noted.

A muscid larva of the San Francisco Bay region which sucks the blood of nestling birds, O. E. PLATH (*Univ. Cal. Pubs. Zool., 19 (1919), No. 5, pp. 191–200*).—A detailed account is noted above.

Records of some new British diplopods and pauropods, with a preliminary check list of the British Myriapoda, R. S. BAGNALL (*Jour. Zool. Research, 3 (1918), No. 2–3, pp. 87–93*).—Included in this paper is a check list of 92 forms of British Myriapoda.

The psychic life of insects, E. L. BOUVIER (*La Vie Psychique des Insectes. Paris: Ernest Flammarion, 1918, pp. 300, figs. 16*).—A small handbook.

Report of the entomology division, A. F. CONRADI (*South Carolina Sta. Rpt. 1918, pp. 27–33*).—A brief statement of the work of the year, particularly of investigations of a species of wireworm.

Eleventh report of the State entomologist and plant pathologist of Virginia, 1916–17, W. J. SCHOENE (*Rpt. State Ent. and Plant Path. Va., 11 (1916–17), pp. 68, figs. 12*).—Included in this report of the work of the years 1916 and 1917 are papers by F. D. Fromme and W. J. Schoene on Dusting and Spraying for Apple Scab and Codling Moth (pp. 22–26); by M. T. Smulyan on Observations during 1916 of the Aphids Most Common on Apple (pp. 27–39), in continuation of those previously noted (E. S. R., 35, p. 462); and by L. B.

[1] Auk, 25 (1908), pp. 87, 88.

Smith on Spinach Blight and Its Transmission by Insects (pp. 40–58), noted from another source (E. S. R., 39, p. 550).

Charts are given in the paper by Smulyan which show the occurrence or absence of the various forms of the oat or grain aphis (*Aphis avenæ*), the rosy aphis (*A. sorbi*), and the apple aphis on apple trees at Blacksburg, Va.

Forty-eighth annual report of the Entomological Society of Ontario, 1917 (*Ann. Rpt. Ent. Soc. Ontario, 48 (1917), pp. 128, figs. 22*).—Among the more important papers here presented are the following: Reports on Insects for the Year, by A. Gibson et al. (pp. 18–30); Further Notes on the Imported Onion Maggot (*Hylemyia antiqua*) and Its Control, by A. Gibson (pp. 30–33) (E. S. R., 36, p. 657); The Entomological Service of Quebec, by G. Maheux (pp. 33–36); Some Important Insects of the Season, by L. Caesar (pp. 36–44); The Apple and Thorn Skeletonizer (*Hemerophila pariana*), by E. P. Felt (pp. 44–47) (E. S. R., 38, p. 60); Some Notodontian Larvæ, by J. A. Corcoran (pp. 47–49); The Problem of Mosquito Control, by T. J. Headlee (pp. 49–59); The Black Cherry Aphis [*Myzus cerasi*], by W. A. Ross (pp. 59–68); Transcanadian Spiders, by J. H. Emerton (pp. 76–78); A Further Report on the Value of Dusting *v.* Spraying to Control Fruit Tree Insects and Fungus Diseases, by L. Caesar (pp. 79–85); A Few Notes on the Ecology of Insects, by W. Lochhead (pp. 85–91); The Effect of Stable and Horn Fly Attacks on Milk Production, by A. W. Baker (pp. 91–93); Notes on Two Unusual Garden Pests in Nova Scotia [*Gortyna micacea* and *Ceramica picta*], by W. H. Brittain (pp. 94–99); and The Entomological Record, 1917, by A. Gibson (pp. 99–127).

Report of the provincial entomologist, G. Maheux (*Rpt. Min. Agr. Prov. Quebec, 1918, pp. 86–90*).—This report refers briefly to several of the more important insect pests of the year.

Summary of entomological information during 1918, H. A. Ballou (*Agr. News [Barbados], 17 (1918), Nos. 434, pp. 394, 395; 435, p. 410*).—The occurrence of and work with the more important insects of the year is summarized.

[Economic insects in Chile], C. Camacho (*El Chape del Cerezo and El Gusano del Poroto (Pegomya chilensis). Santiago, Chile: Serv. Pol. Sanit. Vejetal, 1917, pp. 8, figs. 5; 1918 pp. 7, figs. 3*).—Brief accounts are given of the pear slug and the bean maggot (*P. chilensis*) and the injury which they cause in Chile.

Report on the occurrence of insect and fungus pests on plants in England and Wales in the year 1917 (*Bd. Agr. and Fisheries [London], Misc. Pub. 21 (1918), pp. 32*).—A brief account is given of the more important insect pests.

Destruction of agricultural pests, W. Bevan (*Ann. Rpt. Dir. Agr. Cyprus, 1917–18, pp. 11–14*).—The Mediterranean fruit fly, *Zygaena ampelophaga*, *Cecidomyia ceratoniae*, and the codling moth, were among the more important insects combated during the year ended March 31, 1918.

Report of the work of the division of entomology, D. d'Emmerez de Charmoy (*Ann. Rpt. Dept. Agr. Mauritius, 1916, pp. 9, 10*).—A brief report of the occurrence and work with the more important insects of the year.

[Economic insects in South Africa] (*Union So. Africa, Dept. Agr. Buls., 1918, Nos. 9, pp. 19, figs. 10; 10, pp. 20, figs. 7; 11, pp. 7, figs. 4*).—These bulletins relate to The Bagrada Bug (*Bagrada hilaris*), by D. Gunn; European Foul Brood, by C. P. Lounsbury; and The White-lined Grapevine Sphinx Moth (*Hippotion celerio*), by D. Gunn, respectively.

Work of the division of entomology, J. F. Illingworth (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 18 (1918), pp. 24–29*).—This report of the work of the year includes control work with *Lepidiota frenchi* which is becoming a serious pest of sugar cane at Meringa. A report of work with *L. frenchi* by Jarvis has been noted (E. S. R., 38, p. 864).

Manual of vegetable-garden insects, C. R. Crosby and M. D. Leonard (*New York: The Macmillan Co., 1918, pp. XV+391, figs. 232*).—The arrangement of this work is by chapters on the insects injurious to the principal vegetable crops, including cabbage and related crops; peas and beans; beet and spinach; cucumber, squash, and melon; potato; tomato; eggplant; carrot, celery, parsnip, and related crops; asparagus; corn; sweet potato; and onion, respectively. Chapters on insects injurious to minor vegetable crops, cutworms and army worms, blister beetles, flea-beetles, unclassified pests, and insects and insecticides follow.

[Castor insects in Ceylon] (*Trop. Agr. [Ceylon], 51 (1918), No. 5, pp. 298-300, pl. 1*).—Three insect enemies of castor in Ceylon are briefly considered, namely, the castor seed caterpillar (*Dichocrocis punctiferalis*), the castor semilooper caterpillar (*Ophiusa melicerte*), and the "green fly" (*Empoasca flavescens*).

Insects and infections at the front, F. Mesnil and E. Roubaud (*Compt. Rend. Soc. Biol. [Paris], 81 (1918), No. 20, pp. 1034-1038*).—A discussion of the relation of insects to disease transmission.

First list of the Dermaptera and Orthoptera of Plummers Island, Md., and vicinity, W. L. McAtee and A. N. Caudell (*Proc. Ent. Soc. Wash., 19 (1917), Nos. 1-4, pp. 100-122, fig. 1*).—An annotated list of 105 species, of which 73 were taken on Plummers Island, Md. A bibliography of 23 titles is included.

Schistocerca tartarica taken at sea, L. O. Howard (*Proc. Ent. Soc. Wash., 19 (1917), No. 1-4, p. 77*).—This locust was taken by Capt. B. Morthensen of the Norwegian bark Robert Scrafton 1,200 nautical miles from the African coast.

Notes on some Trinidad thrips of economic importance, C. B. Williams (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 3, pp. 143-146, pls. 4*).—The species here noted are *Franklinothrips vespiformis*, *F. tenuicornis*, *Heliothrips hæmorrhoidalis*, *Selenothrips* (*Heliothrips*) *rubrocinctus*, *Corynothrips stenopterus*, *Frankliniella insularis*, *Physothrips xanthius*, and *Sedulothrips insolens*.

The citrus thrips, A. W. Morrill (*Ariz. Col. Agr. Ext. Serv. Circ. 23 (1918), pp. 5, figs. 3*).—A popular summary of information.

Some important orchard plant lice, T. J. Headlee (*New Jersey Stas. Bul. 328 (1918), pp. 5-27, figs. 7*).—This bulletin relates to three species of plant lice, namely, the apple aphis, the rosy apple aphis (*Aphis sorbi*), and the European grain aphis, all of which attack the foliage and fruit of the apple and are capable under favorable conditions of destroying a large percentage of the crop. These three species winter over on the water sprouts, twigs, and smaller branches of the apple as small shining black oval eggs just large enough to be seen with the naked eye. The clover aphis (*A. bakeri*) has not appeared in the State.

Experiments show that the most practical method of control consists of the application of winter strength lime-sulphur, to which 40 per cent nicotin has been added at the rate of 1:500, during the green bud stage. At this time the maximum number of lice will be hatched and will be killed by the nicotin, and the unhatched eggs will be in their most sensitive state and will be destroyed by the mixture.

Notes on the biology of Schizonotus sieboldii, R. A. Cushman (*Proc. Ent. Soc. Wash., 19 (1917), No. 1-4, pp. 128, 129, pl. 1*).—The author has found 95 per cent of the pupæ of *Melasoma interruptum* on alder at North East, Pa., to be parasitized by *S. sieboldii*.

Some grass root aphids, C. P. Gillette (*Ent. News, 29 (1918), No. 8, pp. 281-284, pl. 1*).—Descriptions and notes are given on two species of Forda, the winged migrants of which have been reared at the Colorado Experiment Station for several years past, namely, *Forda formicaria* from *Melica bulbosa*, *Poa pratensis*, *Phleum alpinum*, and *Elymus* sp., and *F. olivacea* from *Hordeum* sp.

The Aphididæ of Lahore, BASHAMBAR DAS (*Mem. Indian Mus., 6 (1918), No. 4, pp. 135–274, figs. 4; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 11, p. 473*).—This is a monograph of the Aphididæ of Lahore, in which 38 forms are recognized of which 18 species are described as new. Four genera are erected, namely, Stephensonia for a new species; Brevicoryne for *Aphis brassicæ*, *A. chenopodii*, and another species; Brachyunguis for three new species; and Shivaphis for a new species. A host plant list arranged in alphabetical order, with the dates of occurrence of the aphids thereon, is appended (pp. 268–274). The plates have not been issued with the text but are to appear later.

The work is edited, with notes and an introduction, by P. van der Goot.

New economic pests of red clover, A. C. BURRILL (*Jour. Econ. Ent., 11 (1918), No. 5, pp. 421–424, pl. 1*).—A brief account is first given of the third successive outbreak of the red clover aphis (*Aphis bakeri*), which occurred in Idaho in 1916. An account of this pest by the author has been previously noted (E. S. R., 40, p. 360). The natural enemies of the aphis mentioned include several coccinellids, a hymenopterous parasite recently described by Howard (E. S. R., 37, p. 766) as *Aphelinus lapisligni*, the western dark Triphleps (*T. tristicolor*), etc.

Thrips injuring peaches, R. H. PETTIT (*Jour. Econ. Ent., 11 (1918), No. 5, pp. 434, 435, fig. 1*).—The author records the injury to peaches in the vicinity of Benton Harbor, Mich., by the flower thrips (*Euthrips tritici*) during the last five or six years. The injury consisted of shallow, gummed scars on the fruit, little more than skin deep—an injury that does not interfere with the quality to any extent, but which places what would otherwise be a fancy peach in the second class or lower because of its appearance. The damage appears to be done before the pits begin to harden, and since this takes place before thinning begins it is possible to eliminate many of the blemished fruits during thinning. The author has since observed similarly blemished fruit in various stores in other parts of the State where peaches were offered for sale.

Hemolysin (aphidolysin) in plant lice, J. DEWITZ (*Zool. Anz., 50 (1918), No. 2, pp. 33–36*).—In further investigations of the cabbage aphis (*Brevicoryne [Aphis] brassicæ*,[1] it was found that desiccated plant lice retain the hemolytic action for a period of five months and that this action is not destroyed by boiling for 15 minutes. The desiccated alcoholic precipitate from the aphid extract dissolved in sodium bicarbonate, both boiled and not boiled, retained its hemolytic action.

The grape mealy bug (Pseudococcus bakeri), R. L. NOUGARET (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 9, pp. 511–514, figs. 3*).—This is a brief account of investigations, by the Bureau of Entomology of the U. S. Department of Agriculture, of *P. bakeri*, a mealy bug commonly found on grapes in Fresno and Kings Counties and to a lesser extent in Tulare County, Cal. It is not particularly adapted to the grape but thrives well on a number of plants, including citrus trees, pear, walnut, some ornamental plants grown in the open air as well as in hothouses, certain species of bulbs, and on roots when exposed above ground. The damage consists in a depreciation of the market value of the grapes due to the filthy condition of the bunches in which the insect is present. But little or no injury is caused to the vine itself nor does the development of the grapes appear to be affected.

[1] Zool. Anz., 48 (1917), pp. 389–396.

Observations on the insect parasites of some Coccidæ.—II, On chalcid parasites of Lecanium capreæ, A. D. IMMS (*Quart. Jour. Micros. Sci.* [*London*], *n. ser., 63* (*1918*), *No. 251, pp. 293–374, figs. 35*).—This second paper (E. S. R., 37, p. 59) deals with two important chalcid parasites of *L. capreæ*, namely, *Blastothrix britannica* and *Aphycus melanostomatus*. A bibliography of 23 titles is included.

Three new lachnids with comparative notes on three others, H. F. WILSON (*Ent. News, 30* (*1919*), *No. 1, pp. 1–7, pls. 2*).—*Essigella pini* collected on *Pinus virginiana* at Plummers Island, Md.; *Eulachnus thunbergii* on twigs of *Sciadopitys verticillata* and *P. thunbergii* in Tokyo, Japan; and *Lachnus juniperivora* on *Juniperus virginiana* on Plummers Island, Md., are described as new. The genus Unilachnus is erected for *Lachnus parvus* of Wilson.

Some scale insect pests of coffee in South India, L. C. COLEMAN and K. KUNHI KANNAN (*Dept. Agr. Mysore, Ent. Ser. Bul. 4* (*1918*), *pp. 67, pls. 5, figs. 17*).—The greater part of this work deals with the "green bug," a term which stands for a number of distinct species of soft scales, including the Ceylon form (*Coccus viridis*) and the Mysore form, first discovered in 1913 and described by the junior author in 1917 as representing a new species, *C. colemani*.

It is pointed out that the green bug, which is variable in its behavior, was almost certainly introduced into the coffee estates in Mysore from Bangalore. It is spread by wind, fallen leaves, birds, ants, etc. There are two fungi which are very effective checks in its multiplication in Mysore, provided the monsoons are regular and normal, namely, the white fungus (*Cephalosporium lecanii*) and the gray or black fungus (*Empusa lecanii*). When and where the monsoons are deficient so that the fungi do not operate or operate but feebly, it is recommended that spraying and brushing be employed, fish-oil resin soap used at the rate of 1 lb. to 2 gal. of water being the best insecticide. All nests of attending ants should be systematically destroyed and fungi should be spread over the estate immediately after their appearance by tying up branches containing them to trees which do not show them.

The other coccids considered include the hemispherical scale and green mealy scale or mealy bug (*Pulvinaria psidii*).

The black scale of the olive, C. CAMACHO (*La Cochinilla Negra del Olivo Saissetia oleæ* (*Lecanium oleæ*). *Santiago, Chile: Serv. Pol. Sanit. Vejetal, 1917, pp. 2, pl. 1*).—A brief description is given of this scale and means for its control in Chile, where it is an important enemy of the olive.

Preliminary report on carbon tetrachlorid vapor as a delousing agent, M. H. FOSTER (*Pub. Health Rpts.* [*U. S.*], *33* (*1918*), *No. 43, pp. 1823–1827*).—In the search for a practical method of destroying lice which can be applied with a simple apparatus and will not injure woolen fabrics, the author experimented with carbon tetrachlorid.

The pure vapor was found to kill unprotected lice in 15 minutes but failed to destroy them in 10 minutes. It was much more toxic than either gasoline or chloroform. For 100 cu. in. of space occupied by clothing 1.82 cc. of carbon tetrachlorid, or 30.5 cc. to the cubic foot, with 2 hours' exposure, was found to be required to destroy the lice. The ova were not killed at this strength.

It is pointed out that there is no intention of substituting carbon tetrachlorid for heat and cyanid gas treatments, where these are available, since they are much more economical where large quantities of clothing are to be deloused at one time in one place.

Cattle lice and their control, G. H. LAMSON, JR. (*Connecticut Storrs Sta. Bul. 97* (*1918*), *pp. 395–414, figs. 9*).—Three species of lice are here considered, two of which, the short-nosed cattle louse (*Hæmatopinus eurysternus*) and the long-nosed cattle louse (*H. vituli*) are sucking lice, and the third, the little red cattle louse (*Trichodectes scalaris*), feeds upon the skin and hair.

It is pointed out that the largest number of lice occurs during the winter months, and treatment should begin soon after the cows are brought in from the pasture in the fall and repeated in 12 or 13 days and then every month thereafter. The application of raw linseed oil with a brush at the time of grooming was found to be very effective and not to burn or injure the skin. In addition, the treatment is quite inexpensive, costing but a few cents per animal for each application. Other control measures which have proved less satisfactory, including a test of fumigation with a tobacco preparation, are also discussed.

The hog louse (Hæmatopinus suis), H. R. WATTS (*Tennessee Sta. Bul. 120 (1918), pp. 3–16, figs. 7*).—This is a preliminary report and a popular account of the results of investigations of the life history and habits of *H. suis* at the station.

The eggs of this louse are laid only on hogs, glued to the base of the hairs and chiefly on the lower half of the body. Maturity is reached and the female begins to oviposit in from 11 to 13 days after hatching, from 3 to 4 eggs being deposited per day. The eggs hatch in from 13 to 20 days, the majority on the fifteenth, sixteenth, and seventeenth days. The longevity of the louse averages about 30 days, but a few have been found to live more than 40 days. The life cycle is normally 29 to 40 days, varying from 24 to 63. There are from 6 to 15 generations a year, the usual number being from 9 to 12.

In the treatment of hogs for lice, the application of a thin oil is considered to be the best remedy, though any oil or any mixture containing considerable oil will kill both lice and eggs. "Thick heavy greases or pasty materials should not be used, as they do not spread over the skin well enough to be very effective, and are not economical. Medicated oils, disinfectants, and various proprietary materials are no better than the common oils for killing hog lice, but may be just as good if they contain considerable oil and no substances that are injurious to the animals."

The pebrine disease of silkworms in India, C. M. HUTCHINSON (*Agr. Research Inst. Pusa Bul. 75 (1917), pp. 5, pls. 2*).—This is an interim report on the author's investigations of the Pasteur method in the elimination of pebrine, in which he describes and recommends the trial of a modification of this method, that he has devised and found successful on a small scale at Pusa.

Pebrine, C. M. HUTCHINSON (*Ann. Rpt. Bd. Sci. Advice India, 1916–17, pp. 61–65*).—A brief discussion of work with this disease of silkworms in India.

Injury caused by the pine twig borer (Evetria buoliana) at Verrieres, P. LÉVÊQUE DE VILMORIN (*Bul. Soc. Path. Veg. France, 4 (1917), No. 2, pp. 83–85; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 8, pp. 1014, 1015*).—A brief account of this pest at Verrieres, where for many years it has been a source of injury to pine. Several ichneumon parasites, first observed in 1917, may prove of value in its control.

The oriental peach moth: A Japanese fruit insect recently introduced into the United States, W. B. WOOD (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 9, pp. 523–529, figs. 9*).—This is a brief account of *Laspeyresia molesta*, a detailed account of which has been previously noted (E. S. R., 39, p. 259).

A revision of the North American Gracilariidæ from the standpoint of venation, C. R. ELY (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 29–77, figs. 20*).—This is a revision of a family of much economic importance.

A new Coleophora injurious to apple in California, C. HEINRICH (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 135, 136*).—A new species injurious to apple in California, previously noted (E. S. R., 38, p. 862), is described as *Coleophora volckei*.

Olethreutes variegana, a microlepidopteran injurious to fruit trees in Italy, A. Sarra (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 12 (1918), pp. 175–187; abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 5, pp. 645, 646*).—A report of morphological and biological studies of a lepidopteran which attacks common medlar, almond, mahaleb, plum, apricot, and apple trees in the districts of Santerama Colle (Apulia) and Matera (Basilicata), Italy. It occurs in central and southern Europe, Livonia, Finland, Sweden, and Asia Minor. Studies of its parasites have shown five species to act as important checks.

A parasite identified as belonging to the genus Copidosoma is said to be a polyembryonic form.

Two new instances of polyembryony among the Encyrtidæ, L. O. Howard (*Science, n. ser., 49 (1919), No. 1254, pp. 43, 44*).—The author refers to observations in Italy in which it is shown that *Encyrtus variicornis*, a parasite of *Anarsia lineatella*, and *Copidosoma* sp., reared from the larva of *Olethreutes variegana*, are polyembryonic forms.

A contribution to the biology of North American Diptera, C. T. Greene (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 146–161, figs. 23*).—Notes are presented on a number of dipterans reared by the author, all of which hibernate in the larval stage. Of these the larvæ of *Mydas clavatus* and *Dasyllis thoracica* are predacious on coleopterous larvæ, and the larva of Dasyllis is a secondary wood borer in addition to being predatory.

The identity of the wheat midge in Ontario, W. A. Ross (*Canad. Ent., 51 (1919), No. 1, p. 16, figs. 2*).—A study of the wheat midge or "red weevil," which reappeared in Ontario in fairly large numbers in 1917 and in lesser numbers in 1918, led to the discovery that the species concerned is *Thecodiplosis mosellana*.

The rose midge in Ontario, W. A. Ross (*Agr. Gaz. Canada, 6 (1919), No. 2, pp. 137, 138, fig. 1*).—A brief account of the rose midge, which was first discovered in Ontario in 1914 in a large rose garden near London.

The lake mosquito, Mansonia titillans, and its host plant, Pistia stratiotes, in the Canal Zone, Panama, L. H. Dunn (*Ent. News, 29 (1918), Nos. 7, pp. 260–269; 8, pp. 288–295*).—An extended account of *M. titillans*, termed the lake mosquito on account of its abundance in the lake regions. Since the formation of Gatun Lake this mosquito has increased in abundance simultaneously with the spread of water lettuce (*P. stratiotes*), which acts as a host plant by furnishing the larvæ and pupæ with their necessary air supply.

An improvised method for oiling sluggish streams continuously for the prevention of mosquito breeding, B. E. Kirwan (*U. S. Naval Med. Bul. Sup. 7 (1918), pp. 57, 58*).—A brief account of the method used by the author is given.

Dohrniphora venusta in Sarracenia flava, F. M. Jones (*Ent. News, 29 (1918), No. 8, pp. 299–302, pl. 1*).—A report of studies of the life history and morphology of this phorid, which develops in the insect remains in the pitcher plant.

Notes on North American Tachinidæ, including the description of one new genus, H. E. Smith (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 122–126*).—Included in these notes are descriptions of a new genus and species, under the name *Spilochaetosoma californica*, from Claremont, Cal.

Three new tachinid parasites of Eleodes, W. R. Walton (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 22–26, figs. 8*).—*Eleodiphaga caffreyi* n. g. and n. sp. from *Eleodes extricata* at Maxwell, N. Mex., and *E. obsoleta* at Prescott, Ariz.; *E. pollinosa* n. sp., reared from *E. hispilabrus* at Maxwell, N. Mex.; and *Biomyia eleodivora* n. sp., from *E. tricostata* at Holdredge, Nebr., are described.

The apple maggot in British Columbia, W. Downes (*Canad. Ent., 51 (1919), No. 1, pp. 2–4*).—The author records the collection of two specimens of the apple maggot at Royal Oak, near Victoria, B. C., in August, 1917, previous to which there had been only two authentic records of its capture on the Pacific slope. A search for its host resulted in finding it to infest the snowberry (*Symphoricarpos racemosus*), a very common shrub all over the drier parts of the coast and interior of British Columbia. The adult fly has since been taken by the author in the vicinity of Victoria and all over Saanich Peninsula wherever the snowberry grows. A parasite reared from the pupæ has been identified as a new species of Opius.

It is pointed out that the apple maggot was reported by Melander in 1911 (E. S. R., 26, p. 757) as destructive along the eastern border of the State of Washington.

Control of the apple maggot, L. Caesar and W. A. Ross (*Canad. Hort., 42 (1919), No. 2, pp. 27, 28*).—The results of field tests conducted in various parts of Ontario, extending over a period of five consecutive years and corroborated by laboratory tests, led the authors to conclude that the apple maggot can be successfully controlled in apple orchards by spraying.

"The first application should be given just before or as the adults begin to emerge, which in the southwestern part of the Province is about the last week in June, and in the parts with a somewhat colder climate such as Guelph, Stratford, and the district all along Lake Ontario about the first week of July, and in the still colder parts such as Ottawa and the St. Lawrence River Valley about the second week in July.

"The second application should be made when the first has begun to disappear, or usually in from two to three weeks. In wet seasons like the summer of 1915, a third application about ten days after the second will be necessary. Two years should almost completely destroy the insect in any orchard provided that infested orchards are not situated close by. In such case every effort should be made to have these treated also. In all orchards every tree, whether bearing fruit or not, should be sprayed, because the adults often frequent such trees until egg laying begins."

Comparative tests show that the results were equally good where the arsenate of lead was used alone as where combined with molasses. The authors recommend the use of 2 to 3 lbs. of the paste form of arsenate of lead or 1 to 1.5 lbs. of the powder form to 40 gals. of water.

Eumerus strigatus, the lunate onion fly in New Jersey, H. B. Weiss and A. S. Nicolay (*Ent. News, 30 (1919), No. 1, p. 27*).—The authors record the collection of this European species in a greenhouse at Rutherford, N. J., on February 6, 1918.

A new species of longhorn beetle infesting cowpeas from Mexico, W. S. Fisher (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 173, 174*).—Under the name *Lepturges spermophagus* the author describes a new longicorn beetle which is said to be the second longicorn recorded as infesting leguminous plants.

A one-year life cycle for Saperda candida reared in an apple, G. G. Becker (*Ent. News, 30 (1919), No. 1, p. 24*).—In this note, which supplements Bulletin 146 of the Arkansas Experiment Station previously noted (E. S. R., 39, p. 663), the author records having reared the round-headed apple-tree borer through all of its stages in the fruit of apple during a period of one year.

The passion vine longicorn beetle (Monohammus fistulator), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 30 (1919), No. 1, pp. 37–39, figs. 4*).—A brief account of this beetle, which is a serious pest of the cultivated passion vine in the Somersby district, near Gosford, New South Wales.

The mango tree borer (Batocera rubra) (*Dept. Agr. Mauritius, Leaflet 10 (1918), pp. 3, figs. 3*).—A brief account of this borer, which is responsible for considerable damage to several species of trees in Mauritius, including the Bois Noir, the banyan, the "Golden Apple," and the kapok tree.

A new genus (Perissarthron) of Elateridæ and a revision of the American Elateridæ of the genus Pyrophorus, with descriptions of new species, J. A. Hyslop (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 1–12, pl. 1, figs. 17*).—Four species of Pyrophorus are recognized from the United States, of which two are described as new.

The elaterid genus Oistus of Candeze, J. A. Hyslop (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 126–128*).—Under the name *Oistus edmonstoni* the author describes a new species collected on the cone of Douglas fir at Ashland, Oreg.

Notes and descriptions of some orchid weevils, H. S. Barber (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 12–22, pl. 1*).—Seven species are here described of which three are new to science, namely, *Acythopeus gilvonotatus*, probably from the Philippine Islands, from orchids in greenhouses at Washington, D. C., and in Bergen County, N. J.; *Eucactophagus weissi*, probably from tropical America, taken in orchid houses at Summit, N. J.; and *E. biocellatus* received from the Canal Zone, Panama.

How to control billbugs destructive to cereal and forage crops, A. F. Satterthwait (*U. S. Dept. Agr., Farmers' Bul. 1003 (1919), pp. 23, figs. 24*).—This is a popular summary of information on eleven species of billbugs of economic importance and their control, namely, the blue grass billbug (*Sphenophorus parvulus*), corn billbug (*S. zeæ*), clay-colored billbug (*S. æqualis*), maize billbug (*S. maidis*), "curlew bug" (*S. callosus*), tule billbug (*S. discolor*), cat-tail billbug (*S. pertinax*), destructive billbug (*S. destructor*), Y-marked billbug (*S. venatus*), Phoenix billbug (*S. phoeniciensis*), and little billbug (*S. minimus.*).

In the discussion of control measures, it is pointed out that serious injury to cultivated crops by billbugs may be easily prevented by the following simple beneficial cultural practices: Clean cultivation, fall plowing, planting of crops which are immune to billbug injury, proper rotation of crops, improved drainage of damp lands, and community action in adopting control measures.

The flower and the bee, J. H. Lovell (*New York: Charles Scribner's Sons, 1918, pp. XVII+286, pl. 1, figs. 119*).—This is a discussion of insects as related to pollination.

Negative results from attempted queen bee mating in a double tent inclosure, L. V. France (*Science, n. ser., 49 (1919), No. 1255, p. 72*).—A brief statement of an experiment at the Minnesota Experiment Station, in which negative results were obtained.

Nesting habits of Bombus and Osmia, P. F. Homer (*Trans. Utah Acad. Sci., 1 (1908–1917), pp. 16–20*).—Observations at Logan, Utah, of the nest of *Bombus morisoni*, one of the most common of the western bumblebees, show that it not only uses the pupal cases as storage cells but in addition builds both brood cells and pollen tubes of wax.

The Argentine ant and how to control it, F. L. Thomas (*Alabama Col. Sta. Circ. 39 (1918), pp. 55–58*).—A brief popular summary of information.

Notes on the larvæ of some Cephidæ, W. Middleton (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 174–179, figs. 32*).—This is the first of a series of papers which will deal with descriptions, notes, and keys of North American sawfly larvæ.

The American species of the genus Cephus, S. A. Rohwer (*Proc. Ent. Soc. Wash., 19 (1917), No. 1–4, pp. 139–141*).—A study of a large series of specimens of Cephus reared from the stems of various grass-like plants led to the recognition of *C. pygmaeus* (Linnæus) and *C. cinctus* of Norton.

Two new chalcids from the seeds of Amelanchier, R. A. Cushman (*Proc. Ent. Soc. Wash., 19 (1917), No. 1-4, pp. 79-86, figs. 6*).—*Megastigmus amelanchieris* taken at Pickens and French Creek, W. Va., and North East, Pa., and *Syntomaspis amelanchieris* at Pickens, W. Va., and North East, Pa., are described as new to science.

Oryssus is parasitic, H. E. Burke (*Proc. Ent. Soc. Wash., 19 (1917), No. 1-4, pp. 87-89*).—Observations made during the past two years by agents of the Pacific Slope Forest Insect Station definitely prove that Oryssus is parasitic on several species of the genus Buprestis, and probably also on other Buprestidæ.

A much described ichneumonid and its systematic position, R. A. Cushman (*Proc. Ent. Soc. Wash., 19 (1917), No. 1-4, pp. 162-165*).—This paper relates to *Diacritus muliebris* (Cresson).

A contribution on the control of Pieris brassicæ, G. Jegen (*Landw. Jahrb. Schweiz, 32 (1918), No. 4, pp. 525-550*).—The data here reported relate to studies of the hibernating pupæ of the cabbage butterfly, the biology of some of its ichneumonid parasites, the oviposition and life cycle of the first generation, parasitism of and pupation of larvæ of the first generation, and control measures.

Spider mite attacks on china (Peruvian bark), tea, etc., M. Kerbosch and C. Bernard (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstát. Thee, No. 60 (1918), pp. 16, pls. 7; Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Kina Proefstat., No. 4 (1918), pp. 16, pls. 7*).—The spider mites here considered are the red mite (*Tetranychus bimaculatus*) of cassava, cinchona, etc.; and the red mite (*T. bioculatus*), the orange mite (*Brevipalpus obovatus*), and the yellow mite (*Tarsonymus translucens*) of tea.

The spinose ear tick (Ornithodoros megnini), G. A. H. Bedford (*Union So. Africa, Dept. Agr. Local Ser. No. 18 [1918], pp. 6*).—This tick, first reported from South Africa by the author in 1912 (E. S. R., 29, p. 476), has become extremely common and widely distributed throughout Cape Province, Orange Free State, and Bechuanaland. It is also found in Natal, but does not appear to be common there.

A description is given of the several stages of the species, an account of its life history, and measures for eradication.

FOODS—HUMAN NUTRITION.

The palate of civilized man and its influence on agriculture, D. Fairchild (*Jour. Franklin Inst., 185 (1918), No. 3, pp. 299-316, figs. 9*).—The author discusses the food likes and dislikes of various peoples throughout the world, and shows how an eccentric palate on the part of the American people might hinder the development of agriculture in the future.

Horse flesh and its examination, C. Amberger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 5-6, pp. 81-87*).—This paper records the results of analyses of cuts from 8 different horses, with reference to the value of horse flesh as food. The water, fat, ash, organic material not fat, and the "proportionate number" for various parts of the animals were determined.

Shrinkage of meat in cooking (*Food and Cookery and Catering World [London], 22 (1918), No. 239, p. 14*).—Statistics are given showing the losses incurred by cooking some of the common cuts of meats, together with comparisons of the loss when cooked by electricity and gas.

"It has been observed that a considerable saving in meat is effected if those responsible for the cooking, whether for private establishments or for trade purposes, insist upon the joints being rather under than overcooked. The most popular joints would then show a wastage in cooking of only the average of about 35 per cent, but overcooked meat, which is sometimes half burnt up, shows a very much greater wastage."

Mussels and their preparation, P. BUTTENBERG and L. VON NOEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 1–2, pp. 1–15*).—This article includes a description of the mussel (*Mytilus edulis*), its cultivation, and its use as food.

Unlike the oyster, this shellfish is seldom eaten uncooked. Data showing the effect of heat on the mussel and the soluble material extracted during boiling are given. The mussel flesh can be preserved by smoking, salting, drying, and powdering, and it can be made into a paste and also a variety of sausage. The authors state that because of its palatability, its high content of albumin, and its cheapness it is used in the preparation of an extract similar to meat extracts. They refer to the fact that the mussels, like oysters, when grown and marketed under insanitary conditions become unsuitable for food. Some regulations pertaining to the cultivation and marketing of mussels are briefly noted.

Report by the Food (War) Committee of the Royal Society on the digestibility of breads (*London: Food (War) Committee, Roy. Soc., 1918, pp. 36, pl. 1*).—This report includes a comparison of the digestibility of breads made from wheat flour at 80 and 90 per cent extraction; a study of the digestibility of bread made from flour of which four-fifths was wheat at 80 per cent extraction and one-fifth was maize; and studies of the dietetic effect and of the palatability of bread made from wheat flour of 90 per cent extraction, either alone or diluted with cereals other than wheat, upon groups of people of varying ages and occupations.

The results obtained in feeding experiments on individuals led to the following conclusions: Breads made from 90 per cent flour are not so completely utilized as those made from 80 per cent flour, since when used as part of an ordinary mixed diet the coefficient of digestibility of the entire diet was 94.5 per cent in comparison with 96.4 per cent when breads made of the 80 per cent extraction were used. The coefficient of digestibility for the nitrogenous constituents of the diet in the case of the former is 87.3 per cent and the latter 89.4 per cent.

The observations indicate that bread made of flour of 90 per cent extraction has no ill effects upon health and will mean a gain in food value for every 100 lbs. of wheat of 13,000 total calories and 1.56 lbs. of protein.

"Bread made from flour containing 80 per cent wheaten flour and 20 per cent coarsely dressed maize flour proved to be as digestible as bread made from the same wheaten flour without admixture. Bread containing 20 per cent maize was well digested by children even when eaten in proportionately large quantities."

It was found that bread made from flour containing 80 per cent of wheat flour of 90 per cent extraction with an admixture of 20 per cent other cereals, namely, 10 per cent barley and the remainder maize and rice, or rice alone, was palatable and caused no digestive trouble.

Details pertaining to these observations are given in the following appendixes: The Milling and Baking Processes; Nature of the Wheat and Maize Flours Employed; and Flour Used and Method of Baking, by A. E. Humphries.

Ohio spring wheat retains gluten properties: Adaptability of grain shown by milling and baking tests, M. K. CORBOULD (*Mo. Bul. Ohio Sta., 4 (1919), No. 2, p. 49–51, fig. 1*).—From a study of the physical characteristics, milling record, and baking tests which are summarized of Ohio grown Marquis and Blue Ribbon wheats in comparison with such wheats grown in Wisconsin, the conclusion is reached that when grown in Ohio this wheat does not lose its natural characteristics or baking strength and that, therefore, locally-grown wheat would prove satisfactory for seed purposes.

The djali bœas (Coix lacryma jobi), P. W. VAN DEN BROEK (*Teysmannia, 29 (1918), No. 1, pp. 59–61*).—This article describes a variety of Job's tears, the seeds of which may be steamed like rice or made into a porridge, or ground into meal and used as flour in the making of bread and cake.

A bacteriological examination of green vegetables, F. W. KURK (*Amer. Jour. Pub. Health, 8 (1918), No. 9, pp. 660, 661*).—In this study attention was principally directed toward estimating the presence of the coli-typhoid group, streptococci, and anærobic organisms on green vegetables, such as lettuce, celery, watercress, etc.

Bacillus coli was found on 22 out of 29 samples, streptococci on 3, *B. cloacæ* on 5, and mold spores on 13, while 28 samples contained organisms forming gas in lactose broth. The observations, in the author's opinion, do not seem to indicate that the general sanitary conditions of the store influenced the bacterial count.

Coffee substitutes, S. ROTHENFUSSER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 3–4, pp. 54–59*).—The author discusses the following coffee substitutes: "Gesundsheitskaffee," "Nahrsalzkaffee," and "Homöopathischerkaffee."

Investigation and examination of the coffee substitute, chicory, E. SEEL and K. HILS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 12, pp. 476–479*).—This article records the results of studies of material used for coffee substitutes under the name of chicory, with a view to detecting adulteration. In an examination of five samples of so-called chicory, two were found to be pure chicory and the other three were adulterated with sand, starch, turnips, and various other impurities.

The use of the seeds of Robinia pseudacacia (the black locust) as food, W. HANIKIRSCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 5–6, pp. 110–115*).—The author drank a concoction made from 20 gm. of the roasted seeds and 200 cc. of water and felt no physiological effect. The infusion resembled coffee somewhat in taste and he believes might be, therefore, used as a coffee substitute. The seeds contain 13.3 per cent of fat, which is composed of glycerids of stearic, erucic, oleic, linoleic, and linolenic acids.

Investigation and examination of phosphate baking powders, A. BEYTHIEN and P. PANNWITZ (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 7–8, pp. 145–152*).—This paper calls attention to the fact that in Germany calcium carbonate is being used in baking powders as a substitute for starch, and describes methods for the analyses of phosphate baking powders when this is the case.

Tasty meals made from waste (*Canad. Food Bul. [Ottawa], No. 21 (1918), p. 13*).—This article includes recipes for the preparation of meat dishes from parts of animals seldom used.

Relative cost of natural gas, soft coal, coal oil, gasoline, and electricity for cooking, A. R. VAN METER, E. N. WHITE, and S. S. WYER (*Columbus, Ohio: Ohio State Univ., 1917, pp. 6, fig. 1*).—Details pertaining to a series of tests to determine the relative cost of natural gas, soft coal, coal oil, gasoline, and electricity for cooking are given. For preparing a dinner for six people the cost was found to be 6.1 times as much with coal oil as with natural gas. The corresponding values with soft coal, gasoline, and electricity were 2.8, 5, and 5.5, respectively.

Food Surveys (*U. S. Dept. Agr., Food Surveys, 2 (1919), Nos. 17, pp. 16, fig. 1; 18, pp. 8; 19, pp. 8, figs. 7*).—These numbers deal, respectively, with stocks of foodstuffs in the hands of retail dealers July 1, 1918; commercial stocks of grain, flour, and miscellaneous food products in the United States on February 1, 1919; and commercial stocks of wheat, corn, oats, barley, and rye, and their principal products, on January 1, 1919.

The weekly food purchase of a family (*London: Crowther & Goodman, Ltd., 1917, p. 1*).—Figures are given which show the amounts of different foods to be purchased by different sized families in order to obtain 3,000 calories per man per day.

Measurement of the cost of living and wages, W. F. OGBURN (*Ann. Amer. Acad. Polit. and Soc. Sci., 81 (1919), No. 170, pp. 110–122*).—In investigations of the increased cost of living it was found that food in October, 1918, had increased 75 per cent over the average price of 1914–15. From 600 dietaries collected by the United States Bureau of Labor, which cost on the average $607 per year for families averaging 3.6 equivalent males, the food per adult man was said to furnish 3,155 calories per day with no allowance for waste.

A manual of household accounts, J. C. and M. F. CRANDELL (*Boston: Whitcomb & Barrows, 1917, pp. 158*).—The authors aim to describe a system of household accounts which takes into consideration all of the principles of modern accounting and is believed to be adaptable to the accounts of any family or individual. Blank forms for keeping household accounts are also included.

A practical dietary computer, A. E. POPE (*New York: G. P. Putnam's Sons, 1917, pp. IV+170*).—This "computer" has been prepared more especially for nurses and others whose knowledge of dietetics is not very extensive. It contains tables showing the composition and caloric value of foods, and the carbohydrate equivalents. The fuel value of a large number of recipes is computed. It has been the author's purpose to make these tables practicable and easy to use.

Food saving and sharing (*Garden City, N. Y.: Doubleday, Page & Co., 1918, pp. VI+102, figs. 13*).—This book has been prepared, under the direction of the U. S. Food Administration, in cooperation with the Department of Agriculture and Bureau of Education, in response to a request from the National Education Association for use in public schools as a means of promoting among children the program of food conservation.

The limiting factors in the food supply of the nation at war, A. E. TAYLOR (*Univ. Penn., Univ. Lectures, 5 (1918), pp. 347–366*).—The author states that prior to the war our imports of foodstuffs covered the needs of 15,000,000 people, while at the time of writing in addition to feeding ourselves we had to feed at a conservative estimate 25,000,000 of the allies. He calls attention to the fact that during the year 1917, despite the deflection of labor, scarcity of fertilizer, and reduction in machinery the farmers increased the acreage of the eight principal crops 14,000,000 acres. Nevertheless, he believed that increase in production would not be able to meet the situation and that decrease in consumption must be invoked. The kind and extent of the repression of consumption is discussed.

The food supply of the United Kingdom, 1916 (*London: Food (War) Committee, Roy. Soc., 1917, pp. 11*).—Supplementing the data previously noted (E.

S. R., 37, p. 890), the actual quantities of the chief foods consumed during the year 1916 are given and compared with the prewar consumption.

Food situation in Germany November 1, 1917, to January 31, 1918, A. MAYLANDER (*Mo. Rev., U. S. Bur. Labor Statis., 6 (1918), No. 5, pp. 45-53*).—This article has been compiled from translations and digests of data which appeared in various German daily papers. It contains information concerning the quality and quantity of the individual foods then available.

Food situation in Germany during the summer of 1918, A. MAYLANDER (*Mo. Rev., U. S. Bur. Labor Statis., 7 (1918), No. 5, pp. 5-28*).—A continuation of the above.

The food requirements of a "normal" working-class family, H. THOMPSON (*Sci. Prog. [London], 13 (1918), No. 49, pp. 79-85*).—The author in attempting to solve this problem estimates the food requirement of a "normal" family to have a "man value" of 4.5, and discusses three instances in which the food actually consumed by families of the laboring class had a man value of approximately 4.5. One study was made in 1903, another in 1904, and the third in 1917. Bread and meat constituted about 60 per cent of the total energy in all cases. Three other estimates are also given illustrating a different way in which the food requirements of the family in question can be approximately determined.

Biological values of wheat and almond nitrogen, A. F. MORGAN and A. M. HEINZ (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 215-222*).—The biological values of wheat gluten and almond meal were determined by the usual minimum nitrogen feeding method and calculated according to the formulas proposed by Thomas (E. S. R., 23, p. 68). Two relatively protein-free basal rations were employed, the first rich in total carbohydrates but poor in cellulose, and the second of the same total carbohydrate content but rich in cellulose.

When as much as 0.102 gm. of gluten per kilogram of body weight was fed, a positive nitrogen balance was obtained, but when the intake fell to 0.077 gm. per kilogram the positive balance was not maintained, and at 0.068 gm. per kilogram became negative. A satisfactory positive nitrogen balance was not obtained with the largest amount of almond meal used, 0.071 gm. per kilogram of body weight.

The average biological value for the gluten nitrogen was 70.5 and for the almond meal nitrogen 94. The values of both protein foods varied considerably in the two diets. This difference is thought to be due partly to the variations in the value of the basal diets as a supplemental source of nitrogen rather than due wholly to the changes in percentage absorbed on account of different proportions of crude fiber in the basal ration. This is considered to emphasize further the limitations pointed out by Hart and Humphrey (E. S. R., 40, p. 573) of any classification of natural foods in respect to the efficiency of their proteins based on experiments involving a single food material or a single food mixture.

The constancy of the protein quotient during intensive digestion and prolonged starvation, S. HANSON (*Jour. Immunol., 3 (1918), No. 2, pp. 67-74*).—This work is a continuation of former experiments. Its object is to determine the influence on the protein quotient of a disturbance of metabolism when such a disturbance is produced by periods of digestion alternating with prolonged periods of starvation.

From results of experiments on rabbits, it was found that the protein quotient remained normal during these periods. In the opinion of the author, it is probable that a mechanism similar to that which maintains a constant and normal percentage of glucose in the blood, even during an extended period of fasting, may serve to adjust the constancy of the protein quotient.

Observations on the nutrition and growth of newborn infants, W. R. RAMSEY and A. G. ALLEY (*Amer. Jour. Diseases Children, 15 (1918), No. 6, pp. 408–412*).—The following observations were made at the University of Minnesota hospital:

Of 300 newborn infants the average weights were for males 3,391 gm. (7.47 lbs.) and females 3,276 gm. (7.22 lbs.). The average quotient was found to vary in individual cases from 43 to 75 calories per kilogram of body weight, for the first 10 days at least. In all cases where the infants received 100 calories per kilogram they were found to be overfed. The average initial loss of weight was found to be 240 gm. and the average time the loss continued was 3 days. The average daily gain in weight after the third day was about 20 gm. per day. About one-fourth of the infants regained their birth weight before leaving the hospital on the tenth day.

These figures are compared with those generally regarded as authentic.

Studies of infant feeding.—X, The digestion and absorption of fats.—I, Calcium in its relation to the absorption of fatty acids, A. W. BOSWORTH, H. I. BOWDITCH, and L. A. GIBLIN (*Amer. Jour. Diseases Children, 15 (1918), No. 6, pp. 397–407*).—Investigations have led the authors to believe that many of the troubles encountered with bottle-fed infants receiving cow's milk are due to the ill effects produced by the calcium. They believe that notwithstanding the high calcium content of cow's milk the calcium metabolism of bottle-fed infants is seldom greater and often less than that found in breast-fed infants, much of the calcium being eliminated as insoluble calcium soaps. They refer to a method of reconstructing cow's milk which permits the removal of much of the calcium, and advocate the use of this "decalcified" milk in place of the usual simple dilutions.

Is the amount of calcium usually given in dilutions of cow's milk injurious to infants? L. E. HOLT, A. M. COURTNEY, and H. L. FALES (*Amer. Jour. Diseases Children, 16 (1918), No. 1, pp. 52–56*).—The authors find that of a group of 32 bottle-fed children from 2 to 15 months of age, 29 had a fat retention of 89 per cent or more of the intake—18 having over 90 and 10 over 95 per cent—while only 2 retained less than 80 per cent. In their opinion, this seems to indicate that there is no serious loss of fat when the usual simple dilutions of cow's milk are fed. They conclude that unless the harm caused by a fairly high calcium intake can be definitely demonstrated it would seem safer to allow an excess of calcium in the intake rather than to run the risk of providing less than is needed for the normal growth of the bones.

Methods used in a class for undernourished children, C. H. SMITH (*Amer. Jour. Diseases Children, 15 (1918), No. 6, pp. 373–396, figs. 10*).—This article outlines the methods used in a nutrition class which was started November 1, 1916, in the outpatient department of the Bellevue Hospital, as an experiment to determine how much could be done to improve the nutrition of undernourished children when handled in large numbers. It was found that 57 per cent of the children enrolled in this class gained at 1.7 times the average rate for their ages, and 22 per cent at about the average rate. Of the remaining 21 per cent, the author claims there were one or more easily ascertained reasons for failure in every case.

The nursing mother as a factor of safety in the nutrition of the young, E. V. McCOLLUM and N. SIMMONDS (*Amer. Jour. Physiol., 46 (1918), No. 3, pp. 275–301, pls. 3*).—The authors call attention to the fact that the extent to which the maternal organism, through the secretion of the mammary gland, can serve as a factor of safety for the suckling is still very little understood. They believe that the lactating mother, like the growing animal, is unable to effect chemical transformations of one food complex into another, and that she can utilize food proteins for milk production only to the extent that they yield amino acids in proportion suitable for rearrangement into milk protein. The results of experimental studies led them to the conclusion that the nursing mother "is a very important factor of safety for her young in that her mammary tissues can remove from the blood all elements necessary for the production of milk, approximating more nearly the normal in quality than was the food from which it was produced. She can pass these on into the milk in decidedly more favorable relationships than they exist in her food. This the mammary gland can do when nourished by blood which contains certain inorganic elements in such relationships as render the circulatory fluids of the body a pabulum from which the tissues of the young can not secure satisfactory supplies to permit the cells to grow, even though the organic portion of the diet is satisfactory."

Beri-beri at United States Army base hospital, San Juan, Porto Rico, J. D. RIDDELL, C. H. SMITH, and P. G. IGARAVIDEZ (*Jour. Amer. Med. Assoc., 72 (1919), No. 8, pp. 569, 570*).—Laboratory investigations and clinical manifestations of 60 cases of beri-beri are reported which are said to be the first to be diagnosed as such in the island of Porto Rico.

A report of the diet of the regiment from which the majority of cases came showed that polished rice was a staple article of food, being served on an average of two meals a day. While the rations were well balanced, there was a deficiency in fresh vegetables, potatoes and beans being the only ones served in large quantities. Canned meats and canned vegetables were extensively used. The beri-beri patients had consumed all the rice of the daily ration but had eaten sparingly, if at all, of the meat. All patients began to improve when placed on a high protein diet.

ANIMAL PRODUCTION.

Variation, correlation, and inheritance of fertility in the mammals, J. A. HARRIS (*Amer. Nat., 50 (1916), No. 598, pp. 626–636*).—The data on fertility in mammals (except man) as found in the literature are submitted by the author to a statistical analysis, correlation coefficients being computed where the available material permits. The subjects considered are the relationship between order of birth and litter size, weight of dam and litter size, average weight of young and litter size, and correlations between mothers and daughters with respect to fertility.

The fixation of mammalian chromosomes, R. T. HANCE (*Anat. Rec., 12 (1917), No. 3, pp. 371–387, figs. 20*).—Improved methods of cytological technique show that the chromosome count in the pig is over 40, whereas the previously reported number is 18. The accepted counts in other mammals are deemed probably too low, due to the clumping effect of delays in fixation and other faulty cytological methods. Variations in chromosome counts published by different observers for the same species can, it is thought, also be explained on these grounds. The above results are by-products of an elaborate investigation reported by the author on methods of fixation of mammalian tissue.

Observations on the influence of isolated ovaries on the body growth of the albino rat (Mus norvegicus albinus), J. M. STOTSENBURG (*Anat. Rec., 12 (1917), No. 2, pp. 259–263, figs. 2*).—Previous work of the author and his associates at the Wistar Institute has shown that removal of both ovaries from a young rat was followed by an acceleration of growth as measured by body weight. The present paper shows that ovaries isolated from the uterus by an operation, but left in place, have the same control over growth as normal ovaries.

Intrauterine absorption of ova, A. W. MEYER (*Anat. Rec., 12 (1917), No. 2, pp. 293–307, figs. 7*).—From histological examination and other considerations it is concluded that the small dead embryos found among the live ones when a guinea pig's uterus is opened up are absorbed by the uterus and not aborted. Similar embryos are found in sheep and rabbits.

The ovulation period in rats, J. A. LONG and J. E. QUISNO (*Science, n. ser., 44 (1916), No. 1144, pp. 795, 796*).—Eighty nonpregnant and nonsuckling female rats isolated from males were killed at timed intervals during 101 days after giving birth to a litter, and their ovaries and oviducts cut into serial sections.

The 15 individuals killed during the first few days after parturition were used to study the rate of progress of unfertilized eggs through the oviduct and the changes in the corpora lutea, so that corrections could be made for time elapsed since ovulation in the case of animals killed at longer periods. Of the remaining 65 females, 34 revealed ova in the oviducts and 14 showed evidence of recent ovulation from the condition of the corpora lutea. These animals fall into groups having the following average intervals between parturition and the most recent ovulation: Eleven, 20, 30.25, 39.5, 50, 58, 69, 80, 89, and 99 days. The 17 rats not presenting evidence of recent ovulation were all killed between the periods enumerated. It is concluded that ovulation occurs on the average every 10 days.

Ovulation in mice, J. A. LONG and H. P. SMITH (*Science, n. ser., 44 (1916), No. 1144, pp. 796, 797*).—From the study of 62 female mice by the methods of Long and Quisno (see above), it is concluded that the normal ovulation period recurs at about 17.5 to 18 days.

The ovarian cycle in mice, H. P. SMITH (*Anat. Rec., 11 (1917), No. 6, pp. 407–410*).—In continuation of the above work of Long and Smith, a special study was made of the variability of the time of occurrence of the second post partum ovulation in nonpregnant mice.

Nine females killed from 18 to 20.5 days after parturition showed eggs in the oviduct. From data which the author presents as to the rate of progress of unfertilized eggs in the oviduct, it is computed that the time between this ovulation and parturition varied from 16.5 to 19 days, the average being just short of 18 days. The average interval between this and the first post partum ovulation was therefore a few hours less than 17 days. In 11 other individuals killed from the eighteenth to the twentieth day and in 4 on the twenty-first and twenty-second days no indication of recent ovulation was found. While some of these might have ovulated if they had been permitted to live a short time longer, most of them undoubtedly skipped this oestrous period. One individual killed on the ninth day showed ova that it is estimated had been extruded from the ovary 6.5 days after parturition. Sixteen other females killed from 6 to 17.5 days afterwards showed no indications of ovulation.

Oestrus and ovulation in swine, G. W. CORNER and A. E. AMSBAUGH (*Anat. Rec., 12 (1917), No. 2, pp. 287–292*).—The preliminary report of these investigations has already been noted (E. S. R., 37, p. 867) in some detail.

The corpus luteum of pregnancy, as it is in swine, G. W. CORNER (*Carnegie Inst. Washington Pub. 222 (1915), pp. 69–94, pls. 3*).—In this investigation the ovaries of 128 pregnant sows were examined, the purpose being to provide an account of the histology of the corpus luteum at different stages of pregnancy. In the material studied, which was from a slaughterhouse, from 1 to 10 corpora lutea were found in each ovary, the most common total for both ovaries being 8. The most frequent number of fetuses was 6.

The corpora lutea are from 8 to 10 mm. in diameter and are very prominent, nearly all their bulk projecting from the surface of the ovary. The fresh organ is a light pinkish gray which only changes to yellow in late stages.

Degenerating corpora lutea produced at the preceding ovulations are also present. These consist mainly of dense connective tissue, but occasionally they can not be distinguished from the recent ones by the naked eye. All the corpora lutea of the same pregnancy in both ovaries are alike in cytological structure.

The corpus luteum was found not to be the simple parenchyma of lutein cells, supported by a framework of connective tissue, figured in the manuals, for other types of cells were present, particularly toward the end of pregnancy. One is thought to be the "theca lutein cells" of other observers. The author is inclined to believe that the true lutein cells are developed entirely from the granulosa and not from the theca interna. In the early stages lutein cells show a canalicular apparatus in the outer protoplasm.

The corpus luteum of pregnancy is distinguished from that of ovulation by a more regular and uniform appearance and a lesser infiltration of fat. During pregnancy the Graafian follicles do not undergo the process of ripening and change in the theca interna that is preparatory to rupture.

In a series of 117 uteri there were 28 cases in which one horn contained an embryo more than the number of corpora lutea in the corresponding ovary, 13 in which a horn contained 2 more, and 2 in which the excess was 3. It is concluded from these facts that extra-uterine migration of the ovum is a normal and frequent occurrence in swine.

Studies on the physiology of reproduction in birds.—VIII, The effects of quinin on the production of egg yolk and egg albumin, O. Riddle and C. E. Anderson (*Amer. Jour. Physiol., 47 (1918), No. 1, pp. 92–102*).—Eleven female ringdoves, both the blond and white varieties (*Streptopelia risoria* and *S. alba*) and crossbreds, were given daily doses of from 0.25 to 0.5 grain of quinin sulphate for periods varying from three to ten weeks. The eggs and their included yolks during the feeding period weighed less than those produced before or afterwards. A lessened secretion of albumin is indicated, as the decrease in weight of yolk was not sufficient to account for all of the decrease in weight of the egg. After cessation of quinin feeding the yolk recovered its normal weight very slowly, while the weight of the albumin rose quickly, and even for a short time seemed to be above normal.

Twelve yolks from the quinin period were burned in a bomb calorimeter and the energy per gram of moist weight was found to be the same as in eggs laid under normal conditions, whence it is concluded that the ratio of lipoids to proteins in the yolk is unchanged by the quinin feeding. The author believes that quinin restricts protein metabolism, and interprets his results on this basis.

The earlier numbers of this series of papers have already been noted (E. S. R., 37, p. 772).

Sex studies.—X, The corpus luteum in the ovary of the domestic fowl, R. Pearl and A. M. Boring (*Amer. Jour. Anat., 23 (1918), No. 1, pp. 1–18, pls. 9, figs. 6*).—Continuing the series previously noted (E. S. R., 39, p. 177), a histological study was made of the ovaries of several domestic fowls and of a guinea hen. Preparations of cow ovaries were used for comparison.

In the bird ovaries certain cells of the theca interna of any follicle that had discharged its ovum or had become atretic while retaining an ovum were found to take on the appearance and chemical reactions of the lutear cells of late involution stages of the corpus luteum of the cow. These cells eventually fill up the cavity of the follicle. They contain a yellow fatty substance that stains readily with Sudan III, and in addition develop characteristic yellow granules which, judging from their reaction to histological reagents, are neither fats nor proteins.

Lutear cells and hen-feathering, A. M. Boring and T. H. Morgan (*Jour. Gen. Physiol., 1 (1918), No. 1, pp. 127–131, figs. 4*).—In a publication already briefly noted (E. S. R., 38, p. 65), Morgan stated that a hen-feathered Sebright Bantam cock when castrated develops typical male feathers, just as Goodale (E. S. R., 38, p. 170) found spayed hens to do. In the present publication a report is made of a histological examination of the testes of a Sebright cock.

Groups of cells were found in the connective tissue between the seminal tubules that were identical in appearance with the lutear cells found by Pearl and Boring, as noted above, in ovaries of hens. It is suggested that the secretion of these cells in both the cock and the hen suppresses the development of male plumage. Cells of this sort were not found by Boring and Pearl (E. S. R., 39, p. 177) in the testes of ordinary adult males, although a few were noted by Reeves (E. S. R., 34, p. 264).

Post-mortem melanin pigment formation in pigmentless retinas and choroids of white ringdoves, O. Riddle and V. K. La Mer (*Amer. Jour. Physiol., 47 (1918), No. 1, pp. 103–123*).—The author finds that melanin (black) pigment can be caused to appear in the retinas and choroids of dead embryos of the white ringdove (either pure-bred or extracted from crosses with the blond ringdove) by providing abundant oxygen. Ordinarily these areas would remain pigmentless or nearly so throughout life. High temperature but not killing by mercuric chlorid prevents pigment formation.

These results are held to confirm the senior author's theory of melanin formation (E. S. R., 21, p. 374) and to render doubtful the current views of geneticists as to the inheritance of color. "One needs to supply no new hereditary unit nor extirpate an inhibitor to obtain an abundant supply of melanin pigment."

Commercial feeding stuffs and registrations for 1918, C. S. Cathcart (*New Jersey Stas. Bul. 327 (1918), pp. 4–79*).—Report is made on 932 samples of feeding stuffs collected under the State law in 1918. The moisture, protein, fat, and fiber content of the following products are given: Alfalfa meal, brewers' dried grains, distillers' dried grains, yeast dried grains, malt sprouts, buckwheat feed, buckwheat middlings, buckwheat offal, coconut meal, copra cake meal, cottonseed feed, cottonseed meal, corn bran, corn feed meal, corn gluten feed, corn gluten meal, corn and cob meal, hominy feed, corn and oats, dried beet pulp, linseed meal, oat hulls, peanut oil meal, rye bran, rye middlings, wheat bran, wheat feeding flour, wheat feed, wheat middlings, wheat and rye middlings, various mixed feeds, calf meals, and poultry feeds. The moisture, protein, fat, and phosphoric acid content of fish scrap, meat scrap, and digester tankage is given.

Fodder substitutes: How wild vegetation is utilized in other countries (*Jour. Bd. Agr. [London], 25 (1918), No. 4, pp. 448–452*).—A summary is given of research in Germany and the Scandinavian countries on the use of heather, bracken, seaweed (especially Laminaria), reeds (Arundo), leaf fodder and twigs, acorns, horse-chestnuts, potato tops, hazel catkins, and pine and fir needles as feed substitutes for domestic animals.

A comparison of roughages for fattening steers in the South, W. F. Ward, D. T. Gray, and E. R. Lloyd (*U. S. Dept. Agr. Bul. 762 (1919), pp. 36, fig. 1*).—Steer feeding experiments using roughages readily available in the South with cottonseed meal as the sole concentrate are reported here. Four winters' work is represented, the first (1913–14) in cooperation with the Alabama College Experiment Station, the last of a series (E. S. R., 31, p. 664), and the others in cooperation with the Mississippi Experiment Station. There were two experiments, each repeated a second year with slight variations.

In the first experiment the roughage consisted of cottonseed hulls, corn silage, and a combination of these. The steers used were mostly grades of the various beef breeds 2½ to 3½ years old. Cottonseed meal was fed in equal quantities to all lots in a particular year. The steers received all the roughage twice daily that they would clean up in an hour's time. In 1913–14 the prices charged per ton for feeds were: Cottonseed meal $27.50, cottonseed hulls $9.50, corn silage $3.25. In 1914–15 in Mississippi the prices charged were less, being cottonseed meal $23.50, hulls $6.50, and silage $3. The results are given in the following table:

Steer feeding experiments in Alabama and Mississippi with cottonseed hulls and corn silage as roughages.

Year and lot.	Duration of test.	Number of steers.	Average initial weight.	Average daily feed consumption.			Average daily gain.	Dressing percentage.	Feed cost per pound of gain.
				Cottonseed meal.	Cottonseed hulls.	Corn silage.			
1913–14.	*Days.*		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*		*Cents.*
1	84	20	837	6.25	28.46	....	2.48	....	8.9
2	84	20	847	6.25	....	43.10	2.51	....	6.2
3	84	20	819	6.25	18.76	17.77	2.58	....	7.9
1914–15.									
1	143	25	814	5.90	24.12	....	1.38	56.3	10.7
2	143	26	812	5.90	....	42.89	1.15	58.4	11.3
3	143	26	814	5.90	11.68	27.98	1.67	58.0	8.9

In 1914–15 the daily gains were noticeably smaller than those of the preceding year. "This is due chiefly to slightly inferior steers, poor silage, less desirable feeding conditions, and a longer feeding period in the 1914–15 trial. . . . Notwithstanding the fact that the prices of feeds were less and the steers were sold at a greater margin in the 1914–15 trials, the three lots of steers fed the previous year in Alabama made considerably more profit. The high cost of gains in 1914–15 had offset the advantages of cheap feeds and more favorable marketing." In the second year the silage fed lots shrank a little more in transit than Lot 1.

The second experiment dealt with farm grown roughages and was carried on for two seasons. Each lot received cottonseed meal (in a fixed amount) and sorghum silage with or without corn stover or oat straw. The prices charged per ton in 1915–16 were cottonseed meal $32, sorghum silage $3, corn stover $5, and oat straw $5. The prices in 1916–17 were the same except that cottonseed meal was $33. Twenty steers were used in each lot in each year. They were grades of various beef breeds and ranged in age from 2 to 4 years. The results may be summarized as follows:

Steer feeding experiments in Mississippi with home-grown roughages.

Year and lot.	Duration of test.	Average initial weight.	Average daily feed consumption.				Average daily gain.	Dressing percentage.	Feed cost per pound of gain.
			Cottonseed. meal.	Sorghum silage.	Corn stover.	Oat straw.			
1915–16.	*Days.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*		*Cents.*
1	127	787	6.1	42.4	....	....	2.14	56.82	7.53
2	127	788	6.1	38.6	2.5	....	1.95	56.92	8.26
3	127	790	6.1	38.6	....	1.9	1.89	56.29	8.47
1916–17.									
1	120	856	5.5	43.9	....	....	1.85	57.81	8.49
2	120	856	5.5	37.6	2.9	....	1.89	58.19	8.18
3	120	856	5.5	37.4	....	2.2	1.82	57.74	8.42

"These rations indicate that while steers being fed silage will eat a little dry roughage if placed before them, the amount is small if the silage is palatable, and becomes an almost negligible factor during the latter part of the feeding period. The steers which ate some roughage did not eat so much silage. . . . The use of a small amount of dry roughage fed with good sorghum silage failed to cause the steers to make larger gains; in fact, it had just the opposite effect. The steers receiving silage alone consumed a larger amount daily and made larger daily gains."

In 1915–16, a fourth lot of steers was fed a ration of cottonseed cake, cowpea hay, oat straw, and corn stover, but it did not prove satisfactory. The animals were not well finished and brought a low price on the market.

The "optimum age" for fattening off Irish bullocks, J. Wilson (*Dept. Agr. and Tech. Instr. Ireland Jour., 18 (1918), No. 1, pp. 3–6, fig. 1*).—The author has computed the prewar costs of producing a pound of beef on steers carried for different periods, and finds for winter fattening a fairly marked minimum cost at the age of 24 months. In the case of grass-fattened steers there is not much change between 16 and 30 months but after that a marked rise.

Heather and moor burning for grouse and sheep, R. Wallace (*Edinburgh: Oliver and Boyd, 1917, pp. VIII+88, pls. 16, figs. 3*).—The thesis developed in this small volume is that a system of moorland management designed to produce the best grazing conditions for sheep by burning a portion of the heather each season results likewise in the best set of living conditions for grouse. The matter concerns a century-old controversy, for an act of Parliament in the reign of George III put a series of abritary restrictions upon heather burning in the interest of grouse preservation.

Grazing peanuts with hogs v. marketing a crop of peanuts, G. S. Templeton (*Alabama Col. Sta. Bul. 206 (1918), pp. 145–150*).—It is stated that the acreage of peanuts in Alabama has greatly increased in recent years, but that shortage of labor often makes harvesting difficult and occasionally rainy weather renders the crop unfit for market. The 2 years' experiment reported in this bulletin was conducted to see whether grazing with hogs would be a profitable method of harvesting and marketing a field of peanuts.

An acre field was used the first year and every third row harvested to secure a measure of the yield. Hogs were then turned in. In the second year the crop was harvested on a half-acre block in a 1.5 acre field and the remaining acre grazed. Seven high-grade Duroc-Jersey and Berkshire pigs were used each year. How profitable grazing was found to be is indicated in the following tabulation:

Comparison of grazing peanuts with hogs and marketing the crop.

Year.	Average initial weight of hogs.	Average daily gain per head.	Pork produced per acre.	Value of pork.	Peanut crop per acre.	Peanut hay crop per acre.	Value of crops.	Cost of harvesting.	Profit from grazing.
	Lbs.	*Lbs.*	*Lbs.*		*Lbs.*	*Lbs.*			
1917	63.5	1.67	668.2	$100.23	1,107	1,320	$76.32	$12.28	$36.19
1918	72.0	1.60	416.0	62.40	846	732	56.25	7.47	13.62

Averaging both years it is found that only 2.08 lbs. of peanuts plus the forage secured from the vines and weeds were required to produce a pound of pork.

As to carrying capacity it was found that the first year an acre yielding 39.5 bu. furnished grazing for the seven pigs for 57 days. In the second year, an acre yielding 30.2 bu. was consumed in 37 days.

Feeding trials with corn by-products, Palmo Midds, and commercial mixed hog feeds, 1917–18, J. H. Skinner and C. G. Starr (*Indiana Sta. Bul. 219 (1918), pp. 3–26, figs. 2*).—Three feeding trials designed primarily to test substitutes for corn in hog rations are reported in this bulletin. The first began August 10, 1917, lasted sixty days, and involved 9 lots of 10 hogs each. The second began November 6, 1917, lasted sixty-five days, and involved 9 lots of 7 and 1 lot of 6 hogs. The third began March 26, 1918, lasted sixty days, and included 8 lots of 7 hogs and 1 lot of 6. The products tested were three corn feed meals, hominy feed, starch corn germ meal, hominy corn germ meal, wheat middlings, Palmo Midds (a by-product resulting from the use of wheat middlings to absorb palm oil in the manufacture of tin plate), and two commercial hog feeds. These were combined in various ways with ground corn and tankage. Proximate analyses of the particular lots of feed used except tankage are reported. With one exception, the feeds of all lots were given in self feeders. In some cases the hogs had complete free choice, in others the product tested was mixed in a definite proportion with either ground corn or the tankage. In each trial a check lot was fed ground corn and tankage (free choice). The authors divide their report into five parts, as follows:

1. *Corn feed meals v. ground corn.*—Three lots in the first trial and two in the second received corn feed meal and tankage. With one exception the daily gains were higher than in the check lots. No marked differences were found in the feeding value of the three samples of corn meal feed.

2. *Hominy feeds v. ground corn.*—The use of hominy feed for fattening hogs was the subject of seven feeding tests at the station from 1908 to 1911 (E. S. R., 27, p. 571). Since then the process of manufacturing hominy feed has changed somewhat and in many factories corn oil is extracted from the germs. A lot in the first trial and a lot in the second were given hominy feed and tankage (free choice). These made somewhat smaller gains than the check lots. It is concluded that the feeding value of hominy feed has declined since 1911. In the earlier trials hominy feed was found to be about 15 per cent more efficient than corn meal.

3. *Corn germ meals.*—In three trials 14 lots received corn germ meals. The difference between the feeding stuff officially named corn germ meal, which is a by-product of the manufacture of starch, glucose, and sirups, and hominy corn germ meal derived from the manufacture of corn flour, corn meal, and hominy grits is emphasized. For purposes of distinction the former is referred to as starch corn germ meal. The method of manufacturing each is briefly outlined. Both were used in these experiments. The rations given and the results are summarized in the following table:

Corn germ meal as substitute for or supplement to corn in rations for hogs.

Trial and lot.	Kind of corn germ meal.	Average initial weight.	Average daily feed consumption.			Feed used per pound of gain.			Average daily gain.
			Corn germ meal.	Ground corn.	Tankage.	Corn germ meal.	Ground corn.	Tankage.	
Trial 1:		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
9		99.3		7.11	0.41		3.95	0.227	1.80
4	Starch	99.9	2.49			8.85			.28
7	Hominy	99.2	6.29			4.19			1.50
5	Starch	100.2	.92	6.44		.56	3.90		1.65
6	....do	99.7	2.21		1.70	3.27		2.515	.68

Corn germ meal as substitute for or supplement to corn in rations for hogs—Continued.

Trial and lot.	Kind of corn germ meal.	Average initial weight.	Average daily feed consumption.			Feed used per pound of gain.			Average daily gain.
			Corn germ meal.	Ground corn.	Tankage.	Corn germ meal.	Ground corn.	Tankage.	
Trial 2:		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
9		129.1		9.09	0.50		4.82	0.268	1.89
4	Starch	132.5	2.56			9.09			.08
7	Hominy	131.7	6.54			5.30			1.23
5 [1]	Starch	130.7	2.79	2.79		3.71	3.71		.75
6 [1]	....do	131.0	1.99	5.95		1.48	4.22		1.35
10 [1]	Hominy	131.0	6.88	2.29		4.64	1.54		1.48
1 [2]	Starch	131.0	.21	10.79	.85	.10	5.04	.165	2.14
Trial 3:									
6		95.6		7.65	1.45		3.65	.750	1.93
1 [2]	Starch	95.4	.54	7.00	.54	.31	4.05	.310	1.73
2 [2]	....do	96.1	1.40	6.24	.47	.87	3.89	.290	1.60
9 [3]	....do	100.3	1.08	5.03	.38	.79	3.69	.260	1.36
3 [2]	Hominy	95.0	1.47	5.95	.49	.75	3.02	.250	1.97

[1] Corn germ meal and ground corn fed mixed together in self-feeder.
[2] Corn germ meal and tankage fed mixed together in self-feeder.
[3] Corn germ meal and tankage fed mixed as a slop.

From the results of the fourth and seventh lots of both the first and second trials it appears that hogs do not make suitable gains when corn germ meal is fed as a sole ration, although a number of feeders follow this practice and firms selling these products advocate it. The dry starch corn germ meal proved so unpalatable that the animals would scarcely eat a maintenance ration. When the hogs had free choice of starch corn germ meal and ground corn (trial 1, lot 5), they made practically all their gains on corn. When compelled to eat the starch meal because it was mixed with corn 1:1 and 1:3 (trial 2, lots 5 and 6) they made nearly twice the gain on the more liberal corn ration. On the other hand, hominy corn germ meal and corn mixed 3:1 (trial 2, lot 10) was relished, and caused an increase of 0.25 lb. in daily gain per head over the lot receiving hominy corn germ meal alone (trial 2, lot 7), but not as rapid or as economical gains as the check lot (lot 9).

The results of lot 6 of trial 1 show that starch corn germ meal is not a satisfactory substitute for corn when supplemented with tankage. Five lots were fed with rations in which the corn germ meals were used as partial substitutes for tankage with ground corn as the basal ration. Lot 1 of the second trial made very rapid gains, but produced pork at a considerably greater expenditure of feed than the check-lot. In the third trial when mixtures of starch corn germ meal and tankage either dry or in slop were fed (lots 1, 2, and 9) daily gains and economy of production are in each case less than in lot 6, which received tankage as sole supplement. In lot 3, trial 3, hominy corn germ meal satisfactorily furnished 75 per cent of the supplement.

4. *Palmo Midds.*—A lot of hogs in the third trial fed Palmo Midds in addition to the basal ration of ground corn and tankage, gained 15.7 per cent more rapidly than a lot fed standard wheat middlings in addition to the basal ration, and required 9.5 per cent more feed per pound of gain. The percentage of crude fat in the Palmo Midds was over twice that of the middlings.

5. *Commercial mixed hog feeds.*—Two commercial mixed hog feeds did not produce pork as rapidly or as economically as a ration consisting of ground corn and tankage.

The dietetic value of wheat bran, R. G. Linton and W. S. Petrie (*Vet. Jour., 73 (1917), No. 504, pp. 185–199, pls. 2*).—The contention of some veterinarians that the consumption of wheat bran by horses results in various physiological disturbances is discussed and concluded to be largely baseless.

Practical experiments conducted by the cleansing department of the City of Edinburgh Corporation are cited to show that a ration where the energy for work is furnished by bran and oats is as satisfactory as one in which this energy is furnished by beans, maize, and oats. The authors hold that the purchase of feed for work horses on the "food unit" basis is misleading; the thermic or dynamic value must be considered. They conclude that "the chief use of bran for horses would be for those unthrifty, weedy colts which have mainly subsisted on fibrous dead grasses deficient in vitamins, and excellent results may be looked for if the bran is fresh and is fed in conjunction with a leguminous straw or inorganic calcium."

Feeding for egg production: Animal v. vegetable protein, P. Moore (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 4 (1918), Nos. 5, pp. 38–40; 6, pp. 47, 48*).—The first year's results of a long term experiment at the Idaho Experiment Station are presented, together with a summary of another experiment already published (E. S. R., 37, p. 271).

Four pens of 25 White Leghorn pullets were started November 1, 1915. Two of the pens were fed a scratch feed of peas, wheat, and corn, and a mash of bran, shorts, corn meal, wheat meal, pea meal, and linseed meal. Peas were omitted from the scratch in the other two pens, while pea meal and linseed meal were replaced by beef scrap in the mash. The feeds were so adjusted that the rations of one of the meat-fed and one of the exclusively grain-fed pens had a nutritive ratio of 1:4.2. The nutritive ratio in the case of the other two pens was 1:5.5. The egg records are not given, but it is stated that the narrow ration meat-fed pen produced during the year 55.8 per cent more eggs than the pen receiving the narrow grain ration, 51.1 per cent more than the one receiving the wide grain ration, and 35.2 per cent more than that receiving the wide meat ration. Similar results are shown where egg weights are considered.

Rearing chickens, L. E. Card and W. F. Kirkpatrick (*Connecticut Storrs Sta. Bul. 96 (1918), pp. 353–394, figs. 3*).—This bulletin is divided into two parts, each dealing with separate topics.

I. *Normal rate of growth in White Leghorns and Rhode Island Reds* (pp. 355–372).—With the object of determining the feed requirements of growing White Leghorn and Rhode Island Red chicks and of providing a growth standard for these breeds whereby the poultryman can discover whether he is getting satisfactory growth in his own flock, the authors have made weekly weighings and kept complete feed records of four lots of chicks of each breed from the date of entering the brooder to the age of 24 weeks. The observations were made during the years 1915 to 1917 and the hatching dates varied from April 21 to May 17. "In most cases enough eggs were incubated to bring off a hatch of 300 strong chicks. No obviously weak or puny chicks were placed in the brooders. A policy of rigid culling was followed throughout the series of experiments, the whole idea being to handle the flocks just as they would naturally be handled under good commercial management. This culling, of course, helped to swell the mortality figures and no attempt has been made to differentiate between chicks that were killed and those which died from natural causes." The number of Leghorns started totaled 1,028, and the number of Rhode Island Reds 865. The weighing was done in groups early in the morning as the birds came out of the house, so as to secure minimum excitement of the birds and as nearly uniform crop contents as possible. Complete data are furnished in a series of tables both for each lot separately and the average by breeds.

II. *Chick rearing methods employed at the Storrs Agricultural Experiment Station* (pp. 373-398).—Information is provided as to methods of brooding, feeding, and caring for chicks until they are put in the laying pens.

The effects of subnormal temperature upon the chick embryo in incubation, G. H. LAMSON, JR. (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 4 (1918), No. 5, pp. 35, 36*).—Experiments conducted during the years 1910-1917 at the Connecticut Storrs Station are summarized as follows: "Chick embryos from strong stock will stand from 4 to 5 hours' exposure at a temperature of 50° F. after the first 24 hours of incubation, and from this point on the time may be increased up to 15 hours for the tenth to twelfth day of incubation, but after the seventeenth day continued exposure to a temperature of 50° F. for more than 6 hours caused death to the embryos before the normal time for exclusion."

In another experiment to determine the value of the ordinary practice of daily cooling during incubation 3,799 eggs were used. It is stated that in the case of incubators which were cooled 67 per cent of the fertile eggs hatched, whereas in those incubators not cooled 70 per cent hatched. The experimental methods used were designed to make the two lots exactly comparable. Records were kept of the mortality of 250 chicks froom each group of eggs. Twenty from the cooled eggs died in a month and 14 from the uncooled eggs.

"The only advantage that the writer can see in the process of cooling is that in those cases where the temperature has been considerably above what is considered a normal temperature, the operator might help to reduce this high temperature more quickly than he would by the natural regulation of the incubator temperature."

A brief study of the mating habits of fowls with a test of the value of a single mating, A. G. PHILIPS (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 4 (1918), No. 4, pp. 30, 31*).—A small scale experiment by one of the author's students, T. W. Townsley, provides among other things some data as to the number of fertile eggs laid by hens following a single copulation. Fertility varied from 75 to 100 per cent from the second to the eighth day. Beginning with the ninth day there was a distinct drop. No fertile eggs were secured after the fifteenth day.

Fifth Irish egg-laying competition, L. MURPHY (*Dept. Agr. and Tech. Instr. Ireland Jour., 18 (1918), No. 1, pp. 33-48*).—Continuing the reports on the egg-laying contests (E. S. R., 38, p. 172) held annually at the Munster Institute, Cork, Ireland, this paper gives the details of the fifth, which was held from October 1, 1916, to August 31, 1917. Monthly egg records are given for individual hens and the number of times each was broody.

Sixth Irish egg-laying competition (*Dept. Agr. and Tech. Instr. Ireland Jour., 19 (1918), No. 1, pp. 25-29*).—Continuing the work noted above, corresponding details are given of the sixth egg-laying contest, held at the Munster Institute from October 1, 1917, to August 31, 1918.

The importance of keeping male birds used as breeders until their offspring have been tested is emphasized by the fact that two sires of some of the most successful pullets in the competition had been previously disposed of. It is stated that in the yellow-shanked breeds, good layers show a pronounced loss of pigment in shanks, skin, beak, and lobes.

A peculiar egg abnormality, B. R. Weimer (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 4 (1918), No. 10, pp. 78, 79, pl. 1*).—A large soft-shelled egg much constricted in the middle is described and figured. Only one lobe contained a yolk. Literature references to double eggs are given.

DAIRY FARMING—DAIRYING.

Feeding dairy cattle, W. W. Fitzpatrick (*South Carolina Sta. Rpt. 1918, p. 25*).—A preliminary report of a study to determine the relative economy of velvet bean meal, coconut meal, wheat bran, and molasses feed as partial substitutes for cottonseed meal in feeding dairy cows. Four lots of five cows each were used, each group receiving one of the feeds under comparison for one month. Velvet bean meal was found to be the most economical under the conditions of the experiment, with wheat bran a close second. The other two were of about the same value.

Variations and mode of secretion of milk solids, J. W. Gowen (*Jour. Agr. Research* [*U. S.*], *16* (*1919*), *No. 3, pp. 79–102*).—"The investigation reported in this paper is an attempt to analyze the variations and associations of the constituents of Holstein-Friesian milk [so as] to furnish definite mathematical evidence bearing on the problem of the kind of mechanism liberating these constituents to form the fluid known as milk." The paper is one of a series of milk studies being published by the Maine Experiment Station. The material consists mainly of the 335 semiofficial (yearly) Holstein Advanced Registry[1] records in which data on solids-not-fat are provided. The other data extracted from these records are age at beginning of lactation, pounds of milk per year, percentage of butter fat and weight of butter fat. The means, standard deviations, coefficients of variation, and the mutual correlations of these variables have been computed for this group of cows and are presented in tables. One of the solids-not-fat observations was sufficiently different from the others to make the author suspect an error. He accordingly presents his solids-not-fat data with and without this record. The figures quoted here include the aberrant observations. No noteworthy differences were found between the two sets of computations.

The correlations between age at test and percentage of butter fat (-0.0546 ± 0.0181) and between weight of milk and percentage of solids-not-fat (-0.0553 ± 0.0367) were so small in comparison with their probable errors that they are not considered significant. It is therefore concluded that "the quantity of milk produced for one year is independent of the concentration of the solids-not-fat. This, from a genetic viewpoint, means that the hereditary factors for high or low milk production are separate and distinct from those causing a high percentage of solids-not-fat." On the other hand, the correlations between weight of milk and percentage of butter fat (-0.0977 ± 0.0156) and between age at test and percentage of solids-not-fat (-0.2191 ± 0.0351) are regarded as significant. "The data above presented give us a criterion to judge the value of any hypothesis for the origin of the milk solids from a commmon mother substance. . . . The correlation of the solids-not-fat and fat might lead one to suppose such a common origin for some component of such solids and the fat. This can not be the case, however, as the correlation of fat and of solids-not-fat with amount of milk and age precludes that possibility, for if such a common origin occurred, the fat and solids-not-fat would necessarily be correlated to these other variables by comparable amounts. The milk com-

[1] Advanced Reg. Holstein-Friesian Assoc. Amer., vols. 18–28 (1907–1917).

ponents are not correlated equally with either milk quantity or with age; consequently, the hypothesis of a common origin is not tenable."

The amounts of milk, butter fat, and solids-not-fat are all highly correlated. The partial correlation between pounds of butter fat and pounds of solids-not-fat for constant volume of milk was found to be $+0.4964 \pm 0.0278$. "This correlation, together with those above, furnishes the data necessary to establish the conclusion that some of the factors responsible for high concentration of butter fat are also responsible for high concentration of some of the solids-not-fat in cow's milk."

Data are presented for a herd of 9 cows showing that for each animal the fat percentage is higher at the evening milking after an 11-hour interval than in the morning after 13 hours' rest for the mammary gland. There was a very slight average, but not consistent, increase in solids-not-fat in evening milk over morning milk. These facts are held to show that milk is a true secretion and is not produced by a breakdown of the gland cells, because on a cell disintegration theory "the cell must contain a fixed quantity of solids-not-fat, while the butter fat varies so that in the longer interval beween milkings the cell accumulates less fat than in the short time."

The author has collected from the literature and assembled in tables the available data on percentage of total solids, fat, and solids-not-fat, and the ratio of the latter two for 29 breeds of cattle and 9 species of mammals.

Cow-testing associations (*Dept. Agr. and Tech. Instr. Ireland Jour., 19 (1918), No. 1, pp. 98–101*).—Statistical data are given as to the number of cow-testing associations in Ireland and the number of cows in each, together with the best and poorest production records in several associations.

Report for three years of the educational scoring of Connecticut dairy products, H. F. Judkins (*Connecticut Storrs Sta. Bul. 98 (1918), pp. 417–446*).—A summary is given here of the results of the first 12 educational noncompetitive scoring exhibitions of dairy products that have been conducted at the Storrs Station quarterly, beginning in May, 1915. There have been 60 different exhibitors and a total of 121 milk samples and 40 butter samples. The milk was scored for bacteria, acid, flavor, fat, solids-not-fat, sediment, and package, the score card of the Dairy Division of the U. S. Department of Agriculture, designed for milk shows, being used with some modifications.

Improvement was generally shown by exhibitors in subsequent scorings. The average milk score of the first exhibits of 58 dairies was 75.56 and the average of subsequent exhibits of 24 of them was 85.01. Nineteen concerns sending butter for the first time scored 89.89; 10 exhibiting more than once scored 91.76 on their later samples.

"This study brought out the fact that milk is nearly always high or low in bacteria count. Only 15 out of 119 samples scored between 20 and 30 points on bacteria, while 31 were below 20 and 73 above 80. This means 73 samples contained an average of 7,108 bacteria per cubic centimeter, while 31 contained 568,038 per cubic centimeter, only 15 samples falling between these extremes and containing an average of 49,303 bacteria per cubic centimeter."

Most of the bulletin deals with the relation of score to the treatment of the milk as revealed by the exhibitors' answers to questions on the entry blanks. Milk that is sold in cans to contractors (26 samples) scored 73.28 points on an average, milk retailed in bottles (77 samples) scored 84.46, and milk disposed of in both ways (9 samples) 76.25 points. Milk drawn while cows were being fed scored 1.2 points less in flavor than milk produced when no feed was given at milking time, an important difference, since there is seldom more than a 5-point range in flavor score in market milk.

The influence of machine milking, type of milk pail, and sterilization of utensils on the score is indicated in the following table:

Relation of bacteria and sediment in exhibition milk to the utensils used in milking.

Utensils used in milking.	Number of samples.	Bacteria score (35 points possible).	Bacteria count.			Sediment score (10 points possible).
			Average.	Lowest.	Highest.	
All samples	121	25.82	61,800	....	....	7.79
Small-mouth pail	65	29.33	27,000	....	....	8.15
Open-mouth pail	25	27.31	47,000	....	....	7.84
Milking machine	14	12.57	433,073	3,400	2,792,000	7.39
Utensils washed and scalded	[1] 63	24.00	66,000	730	679,500	....
Utensils steamed	[1] 27	32.98	12,927	720	53,735	....

[1] Samples milked by machine excluded.

The data on machine milking came from nine farms using four different types of machines. Only one of the 14 samples had a perfect score for bacteria and 7 had zero score. The sediment test of this milk ranged from 4 to 9.7 points. The author was not able to find data in the literature on sediment in machine-drawn milk. The poor showing of machine milking indicates failure on the part of the producer to appreciate the necessity of proper cleaning of the machine, as he presumably took special care with the samples sent for exhibition.

The difference between the small mouth and open pail was not as marked as was expected. Most of the samples of milk from both types of pail had been strained, thereby reducing inequality in sediment. "There is no question but that the small-mouth pail if properly used will prevent some of the dirt from the body of the animal from falling into the milk pail. After watching several men using this type of pail it has been noted that instead of holding the pail so the covered portion slants away from the milker it is held so it slants toward the milker."

Brief statistics are given of the kinds of flavor encountered, the kinds of sediment identified, the methods of cleaning the cows, whether the milker washed his hands, methods of straining, methods of cooling, the relation between bacteria, flavor, and sediment, examples of good and poor rations fed, and the seasonal changes in percentage of fat and solids-not-fat. For one of the exhibits (14 samples) tables are given showing the individual scores of three judges for flavor of the separate samples and a comparison of the visible dirt and sediment scores.

The butter results are dealt with very briefly. A list of defects is given and the moisture and salt content of 33 samples.

Milk supply of Paris in 1917, J. E. Lucas (*Indus. Lait.* [*Paris*], *43* (*1918*), *No. 4*, *pp. 49–61*, *fig. 1*).—The author extends his statistical studies of the milk supply of Paris (E. S. R., 36, p. 273) through the year 1917. Details are given of the amount transported various distances, the railroads used, the number of cows and dairies furnishing milk, the number of persons engaged in the industry, and the prices charged.

Only 16.5 per cent of the supply came from the City of Paris and the Departments of the Seine and Seine-et-Oise. About 44 per cent was transported between 50 and 100 km. (31 and 62 miles). All Departments showed a decrease in the number of cows over the 1912 figures, and the milk supply was over 120,000,000 liters (31,200,000 gal.) lower than in 1913.

Studies in processing milk, H. F. JUDKINS and P. A. DOWNS (*Connecticut Storrs Sta. Bul. 99 (1918), pp. 449–470*).—The various studies included in this bulletin deal chiefly with clarification, pasteurization, and cooling after pasteurization, with particular reference to bacterial count and the cream line.

The clarification of both raw and pasteurized milk was found to cause an apparent increase in the bacteria count. The clarification of raw milk produced an average reduction in the cream line of 0.48 per cent, while in the case of pasteurized milk the reduction was 0.9 per cent. The reduction in both cases is so slight that it would be impossible to detect it in the ordinary milk bottle.

Very little difference was found between the vat and the in-bottle methods of pasteurization in regard to bacterial efficiency. The average efficiency for the vat is 99.95 per cent and for in-bottle pasteurization 99.96 per cent. The reduction in cream line of vat pasteurized milk when cooled in the vat was 2.9 per cent and when cooled over the cooler 1.5 per cent. Both reductions are so small that they would scarcely be noticed on bottled milk. In the case of in-bottle pasteurization there was no apparent reduction in the cream line. The higher the temperature to which the milk was heated the greater was the reduction in cream line. In vat pasteurization this reduction was found to take place mostly during the holding and cooling process.

The time and water required for cooling were slightly lower in the case of the vat cooling. The latter is also considered preferable because less equipment is needed. The air blast method of cooling in-bottle pasteurized milk is regarded as very satisfactory. The vat and the in-bottle methods of cooling were both found ideal as far as the bacteria count is concerned. The cooler method showed an average increase of 3,664 bacteria per cubic centimeter in milk passing over it.

The pumping and bottling of pasteurized milk with equipment cleaned in the ordinary manner is considered a great source of recontamination. In the tests an increase of 11,755 bacteria per cubic centimeter was due to the pump and pipe line while the bottler added 35,888 per cubic centimeter more. Milk pasteurized in the bottle showed a bacteria content of 352 per cubic centimeter, while the same milk pasteurized in the vat showed 489 per cubic centimeter. This same milk bottled showed an increase of 47,594 bacteria per cubic centimeter, a large percentage of which were liquefiers. The use of chlorid of lime solution in flushing out all equipment before processing milk was found to do away with practically all recontamination of milk after pasteurizing.

The manufacture of small cheese with improvised apparatus (*Jour. Bd. Agr. [London], 25 (1918), No. 3, pp. 269–277, fig. 1*).—A procedure in making cheese on the farm is outlined involving the use of no material not commonly available on dairy farms except a thermometer, rennet, and cheese molds.

Neufchâtel cheese, H. S. BAIRD (*California Sta. Circ. 207 (1919), pp. 4, figs. 2*).—Brief directions are given for the manufacture of Neufchâtel cheese. It is said that it can be made satisfactorily from cow's milk, but goat's milk is preferable. Its manufacture affords an outlet for surplus milk, as the necessary apparatus for making the cheese on a small scale is not expensive.

Experiments in ice cream making, A. C. BAER (*Oklahoma Sta. Rpt. 1918, p. 31*).—In a study of two types of emulsifying machines for ice cream mixes, a centrifugal emulsifier gave uniformly better results than a steam emulsifier. It was found that the steam emulsifier adds from 10 to 15 per cent of water, due to condensation of steam which is turned directly into the cream. This reduces the percentage of total solids in the mix as well as the butter fat. Milk solids can be added in the form of milk powder or condensed milk.

The emulsified milk and emulsified mixes made from butter and skim milk or butter, skim milk powder, and water are found to produce excellent ice cream under the proper conditions. It is necessary to use good flavored, sweet butter and fresh nonrancid powder.

The use of 2 per cent additional milk solids in the form of skim milk powder added at the rate of 1 lb. of such milk powder to 10 gal. of ice cream mix improved the ice cream, produced 5 per cent additional swell, and retarded crystallization of the ice cream.

The emulsification of ice cream mixes prevented to a great extent the churning of the mix during the process of freezing. None of the emulsified mixes, either from the centrifugal or from the steam emulsifiers, churned as easily in the freezer under similar conditions as mixes not emulsified.

VETERINARY MEDICINE.

Pathological technique, F. B. Mallory and J. H. Wright (*Philadelphia and London: W. B. Saunders Co., 7. ed., rev. and enl., 1918, pp. 555, pls. 2, figs. 164*).—This is the seventh revised and enlarged edition of the work previously noted (E. S. R., 26, p. 276). The subject matter has been rearranged, and several new procedures have been introduced.

Annual report of the chief veterinary officer for the year 1917, S. Stockman (*Bd. Agr. and Fisheries* [*London*], *Ann. Rpt. Chief Vet. Off., 1917, pp. 7*).—This, the usual annual report (E. S. R., 39, p. 387), deals with the occurrence of hog cholera, glanders, anthrax, sheep scab, and parasitic mange of horses.

Annual report on the Punjab Veterinary College, civil veterinary department, Punjab, and the Government Cattle Farm, Hissar, for the year 1917–18, H. T. Pease, J. Farmer, and R. Branford (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1917–18, pp. III+2+18+XVII*).—The usual annual report (E. S. R., 38, p. 482).

The function of fats in immune processes.—II, Pneumococcus and streptococcus immunity, C. C. Warden (*Jour. Infect. Diseases, 24 (1919), No. 3, pp. 283–296*).—This paper, which is a continuation of earlier work (E. S. R., 40, p. 380), deals with the quantity of antibody produced in rabbits from inoculations with the pneumococcus and streptococcus fat antigens and the amount of protection afforded against the organisms.

To test the hypothesis that the antibodies derived from active immunization with bacteria might depend on the protein fraction of the antigen for enduring and protective qualities and on the fat fraction for specificity, experiments upon rabbits were conducted in which the specific fat antigen of the pneumococcus was grafted with the protein derived from defatted typhoid bacilli. The protective value of the pneumococcus antigen was in no way increased. This is thought to indicate that protein immunization and specific cell immunization may be two quite distinct processes. "With the protein immune process occur the factors of sensitization, toxicity, specificity for type only and not for species, while with fat immunization there is no sensitizaton and no toxicity but marked species specificity."

Further experiments with the pneumococcus fat antigen are reported in which (1) the sodium salts of the fatty acids of the antigen were replaced by lithium salts and (2) the cholesterol esters were used in place of the fat. The antibody induced by the cholesterol colloidal antigen was found to afford greater protection to the rabbits than those consisting of the sodium and lithium esters. It is thought that the more stable in physicochemical characters the antigenic fats, the more stable and protective the antibody engendered.

Tests with fats of combined strains of streptococci obtained as in the case of the pneumococcus antigen (E. S. R., 39, p. 80) are reported which show that antibodies against the streptococcus are produced in the injected animals. Other experiments are reported showing the availability of subcutaneous inoculations of fat antigens for the production of immunity in man and the power of an immune serum to precipitate with the individual components of a fat antigen complex.

In conclusion, the author states that "the facts brought out in the work on the functions of antigenic fats in immunity lead one to believe that such antigens are destined to play an important part not only in active immunization of animals and man as a prophylactic measure but also in the treatment of infections. They have to commend them their purity, the dosage by weight, the absence of toxicity, and the ease and safety of either subcutaneous or intravenous administration."

The use of the final hydrogen-ion concentration in differentiation of Streptococcus hemolyticus of human and bovine types, O. T. Avery and G. E. Cullen (*Jour. Expt. Med., 29 (1919), No. 2, pp. 215–234, figs. 2*).—Studies are reported which show that there is a distinct and constant difference in the final H-ion concentration of *Streptococcus hemolyticus* from human and bovine sources under like conditions of growth. Of 124 strains of *S. hemolyticus* from known human origin, 116 reached a final H-ion concentration of from pH 5 to 5.3. Only 8 reached a pH more acid than 5 and none more acid than pH 4.8. Of 45 strains of *S. hemolyticus* from bovine sources, including 26 strains isolated from milk and the udder of cows and 19 from cream cheese, 40 reached a final H-ion concentration of pH 4.3 to 4.5. Of the remaining 5 which reached a pH of 5 to 5.2, 2 were of known human type, and 3 of uncertain diagnosis. In the application of this method to the determination of the type of *S. hemolyticus* the following procedure has been adopted:

The strain to be tested is grown in test tubes containing 5 cc. of 1 per cent dextrose broth. After the maximum growth has been reached, generally within 24 to 48 hours but depending upon the size of the inoculum and the suitability of the medium, the culture fluid is diluted with 10 per cent of distilled water, and 1 drop of 0.1 per cent alcoholic solution of methyl red is added. A faint salmon-pink color indicates the human type and a decided red the bovine type of streptococcus. This color difference is said to be so marked as to make a comparison with standard solutions unnecessary.

Horse blood or sheep blood dextrose agar plates as substitutes for human blood dextrose agar plates for the culture of pathogenic anaerobes, J. Zeissler (*Deut. Med. Wchnschr., 44 (1918), No. 34, p. 942*).—The author has found that horse blood or sheep blood can be used in place of human blood in the dextrose-blood-agar medium employed for the culture of pathogenic anaerobes. The organisms show the same characteristics as on the media usually employed.

A preliminary note on the preparation of culture media suitable for the growth of organisms used in vaccines, D. Norris (*Indian Jour. Med. Research, 6 (1918), No. 2, pp. 174–189*).—Various types of culture media have been prepared with a view to the determination of their nutritive value as regards the growth of *Bacillus typhosus* for vaccine purposes.

Of the various meat media at present in use, those prepared by means of a tryptic digestion appear to be more nutritive than an ordinary beef peptone medium or than those prepared by acid hydrolysis. The addition of nutrose or casein appeared to have no influence on growth except with a particularly non-nutritive medium. The addition, however, of a comparatively small amount of hydrolyzed nutrose to a poor medium greatly increased its nutritive power. Media obtained by the tryptic hydrolysis of nutrose, peanut press cake, and casein gave material equal in nutritive value to that obtained from meat. Concentration of the substrate appeared within limits to be of greater importance than time of hydrolysis in determining the nutritive value of the media.

Dried bacterial antigen, W. F. Harvey (*Indian Jour. Med. Research, 6 (1918), No. 2, pp. 137–142*).—The advantages in the use of a dried bacterial antigen are pointed out, and experimental data are given indicating that such an antigen is easily tolerated and is as capable of stimulating the production of antibodies as the more commonly used suspension.

The antigen is prepared by inoculating the surface of agar slopes with a 24-hour culture of the organism to be employed, incubating until a good growth has been maintained, transferring the growth to a sterile watch glass, and drying to constant weight in a desiccator over sulphuric acid at room temperature. When used, a weighed amount of the antigen is allowed to stand overnight with a small amount of sterile salt solution and is then ground to a homogeneous suspension, taken up in a sterile syringe, and administered intravenously, intraperitoneally, or subcutaneously in calculated amounts.

It is stated that such an antigen conserves its power of production of agglutinins for a long period.

Experiments on the production of specific antisera for infections of unknown cause, I, II, P. Rous, O. H. Robertson, and J. Oliver (*Jour. Expt. Med., 29 (1919), No. 3, pp. 283–320, figs. 5*).—Two papers are presented.

I. *Type experiments with known antigens—a bacterial hemotoxin (megatheriolysin), the pneumococcus, and poliomyelitic virus.*—The purpose of this investigation was to determine whether sera obtained by the immunization of animals with infected tissue of another species can be rendered available by absorption for therapeutic use in the last mentioned species. In order to test this possibility, type experiments were carried out with immune sera effective against known antigens of three different varieties: (1) Sera resulting from the injection of rabbits and a goat with normal guinea pig tissues and a bacterial hemotoxin produced by *Bacillus megatherium* which hemolyzes guinea pig cells, (2) antirabbit dog sera containing antibodies protective against pneumococcus infection, and (3) the serum of a monkey recovered from poliomyelitis and repeatedly injected with human red cells and extract of placental tissue. By means of selective absorption, the sera of the first were used successfully to protect guinea pigs from lethal doses of the megatheriolysin, of the second to protect mice against pneumococcus infection, and of the third to protect monkeys against poliomyelitic virus.

The results are thought to indicate some usefulness for the absorption method in the study of immunity to infections of unknown cause.

II. *The production of a serum effective against the agent causing a chicken sarcoma.*—This paper deals with the application of the method noted above to the treatment of a sarcoma of the fowl caused by a filterable agent. Geese were repeatedly injected with the finely ground sarcoma and with blood from fowls dying with it, and their sera acquired the power to prevent the tumor-producing agent from causing growths.

The authors point out that, as serum immunity to chicken sarcoma is weak at best, more striking results may be anticipated from the method of selective absorption in case of some other infections of unknown cause, and that by its means more sera of therapeutic usefulness may become available. It is stated, however, that much remains to be settled as regards the dangers of exhausted sera and the limitations of the method.

A method of wound treatment by the introduction of living cultures of a spore-bearing anaerobe of the proteolytic group, R. Donaldson and J. L. Joyce (*Lancet [London], 1917, II, No. 12, pp. 445–452, figs. 5*).—This is a preliminary communication in regard to a new method of wound treatment evolved from observations of the salt-pack method.

Clinical and bacteriological studies of wounds treated by the salt-pack method led to the discovery of the constant presence, in wounds which respond to this method and from which a foul odor is always emitted, of a nonpathogenic spore-bearing anaerobe belonging to the proteolytic group of organisms. In wounds which under the salt-pack method do not progress favorably and emit no odor, this bacillus is invariably absent. A brief outline is given of the morphological and cultural characteristics of the organism which has been named the Reading bacillus.

The theory is advanced that under suitable anaerobic conditions provided by salt-pack or sphagnum moss dressings, the bacillus acts in virtue of its proteolytic power on the devitalized and necrotic tissues of septic wounds and possibly on the tox-albumins contained therein. Case reports are given in which wounds which have been previously treated unsuccessfully by various methods have healed rapidly when sown with living cultures of the bacillus. As the organism is probably present in the larger number of infected wounds, it is often necessary only to open thoroughly the wound, irrigate it with sterile water or saline, and fill it completely with the salt or sphagnum dressing. The development after two or three days of the characteristic foul odor is an indication of the presence in the wound of the Reading bacillus. If no odor develops, the wound should then be sown with cultures of the bacillus. The dressing is left on without change for at least six or seven days.

Character and properties of the "Reading" bacillus, on which a new method of treatment of wounds has been based, R. Donaldson (*Jour. Path. and Bact.*, *22* (*1918*), *No. 2*, *pp. 129–151*, *pl. 1*, *fig. 1*).—This is a summary of the research work on which was based the new method of treatment of septic gunshot wounds noted above. In addition to the morphological and cultural characteristics previously noted, the following properties of the Reading bacillus are reported:

The spores were found to possess a high degree of resistance to heat and to drying. It is thought that this property may be utilized in providing the vehicle for the transmission of spores by growing the bacillus in broth containing moss, which can then be dried and used as the packing for wounds.

The bacillus did not grow readily in media containing more than 5 per cent of salt, which is thought to indicate that high concentrations of salt in the wound are not only unnecessary but detrimental to the growth of the bacillus. The limiting concentrations of certain antiseptics on the growth of the bacillus in broth solution were found to be phenol and mercuric oxid 1 per cent of a 1 in 20 solution, eusol 6 per cent, and Dakin's solution 22 per cent. The growth in any given concentration of acriflavine appeared to depend on the number of organisms sown.

The bacillus was found to be absolutely nonpathogenic to animals. It is stated that its introduction in pure culture in human beings and in horses and mules has never been followed by any pathogenic effect but, on the contrary, has invariably led to a rapid cleansing of the wounds.

Experimental evidence on its growth in the presence of other organisms and in cooked meat medium and its action on toxins confirm the conclusions previously drawn that the success of the method does not depend on inhibition by the Reading bacillus of the growth of pathogenic organisms in the wound, but that it acts by virtue of its proteoclastic enzyms as an organic catalyst which hydrolyzes the substrate of dead protein and probably also the toxic degradation products of other organisms.

An appendix contains a description of methods devised by the author for tube and plate cultures where large numbers of anaerobic cultures have to be investigated at one time.

The association of bacteria in Cryptococcus farciminosus infection, M. CARPANO (*Ann. Ig.* [*Rome*], *28* (*1918*), *No. 6, pp. 273–279*).—In cases which he has studied, the author has found *C. farciminosus* lesions to be invaded by *Staphylococcus pyogenes* and streptococci of *Streptococcus adenitis equi* type. This mixed infection is a true staphylo-strepto-cryptococcic lymphangitis.

Foot-and-mouth disease (aphthous fever) in Mauritius, G. G. AUCHINLECK and F. E. LIONNET (*Dept. Agr. Mauritius, Gen. Ser., Bul. 11* (*1918*), *English Ed., pp. 10, pl. 1*).—A summary of information on this disease, and a discussion of the outbreak in Mauritius which took place on September 21, 1916, and lasted until April 19, 1917. A total of 2,842 animals were affected before the disease was eradicated and 67 deaths resulted, many of which were suckling animals. It is thought to have been introduced with imported cattle.

The value of the use of polyvalent extracts for the serodiagnosis of glanders by means of complement deviation. Positive results with the conglutination and K. H. reaction with negative deviation, W. PFEILER (*Tierärztl. Rundschau, 24* (*1918*), *No. 49, pp. 337, 338*).—Cases are cited in which horses giving positive results for glanders with the conglutination and K. H. reactions with the use of polyvalent sera (E. S. R., 35, p. 180) and negative results in the complement-deviation test with monovalent sera proved on autopsy to be glandered. The advisability of using polyvalent sera is emphasized.

Experimental contribution to the value of local reactions for the diagnosis of tuberculosis, G. ANGELICI (*Clin. Vet.* [*Milan*], *Rass. Pol. Sanit. e Ig., 41* (*1918*), *No. 5–6, pp. 115–143*).—The results obtained with various methods in use for the diagnosis of tuberculosis are reported and compared with the post-mortem findings. Three series of studies were made, (1) a study of the comparative value of the conjunctival, intrapalpebral, and intradermic reactions, (2) the influence of lecithin on the tuberculin reaction, and (3) the use of blood serum for local diagnosis.

In the 305 cows examined in the first study the conjunctival reaction was positive in 19 cases, of which 17 gave positive results on necropsy. In 31 other cases the conjunctival reaction was negative or doubtful, while the reports on necropsy were positive. In some of these cases the conjunctival reaction remained negative or doubtful in a second or third trial, while in others the reaction became positive. In about 16 cases in which the first conjunctival test was negative and the latter positive, and in others in which the reaction remained negative, the intrapalpebral reaction was positive, as was the result on necropsy. In one case, proved positive on necropsy, a doubtful intrapalpebral reaction and a positive conjunctival reaction were obtained. In another, a positive intrapalpebral and two doubtful conjunctival tests were obtained with negative results on necropsy. Satisfactory results were not obtained with the intradermal test.

The use of lecithin with tuberculin was found to attenuate somewhat the local symptoms as well as the diagnostic reaction of the tuberculin. Normal or tuberculous blood serum was used in 81 cases in either the conjunctival or subcutaneous palpebral test with varying results, the endopalpebral injection of tuberculous serum apparently being the most reactive.

The method of the Bureau of Animal Industry for testing the potency of tuberculin, E. C. SCHROEDER and G. W. BRETT (*Jour. Amer. Vet. Med. Assoc., 54* (*1919*), *No. 4, pp. 357–361*).—The potency test for tuberculin adopted by the Bureau of Animal Industry of the U. S. Department of Agriculture, as the result of experimental work in which various species of animals are used, is based on the toxicity of tuberculin for tuberculous animals and is a modification of the standardization test originally defined and used by Koch.

Guinea pigs, practically alike in size, age, and weight, are infected with tuberculosis through the subcutaneous injection of tuberculous material prepared by making a suspension in sterile, distilled water of fresh, tuberculous guinea pig tissue. This is filtered through ordinary filter paper, and the filtrate used in amounts depending upon its concentration of tubercle bacilli as determined microscopically. Material of this nature is considered preferable to suspensions made with pure cultures, as a more even distribution of tubercle bacilli is obtained and the dangers of anaphylaxis from foreign proteins are eliminated.

In about three weeks after the guinea pigs have been infected, inoculation tests with a standard tuberculin are made to determine the degree of sensitiveness to tuberculin. The animals are considered ready for the practical tests on the day when one cattle dose of standard tuberculin per 500 gm. weight causes death within 24 hours. The average length of time required to produce this degree of sensitiveness is about 29 days.

It is necessary that any sample of tuberculin, in order to possess a reliable degree of potency, should kill within 24 hours at least half of the group of six sensitized guinea pigs injected with it, and that normal guinea pigs injected with it should be alive and well at the end of 24 hours. All animals that die must show on autopsy the characteristic lesions found when tuberculous animals die as the result of an injection of tuberculin. The normal guinea pigs are kept under observation a sufficient length of time for tuberculosis to develop in case the tuberculin happens to be contaminated with living tubercle bacilli.

The authors state that a superpotent tuberculin (provided it does not injure healthy guinea pigs injected with it) is greatly to be preferred to a tuberculin of subnormal potency.

Tuberculosis eradication, J. A. KIERNAN (*Amer. Jour. Vet. Med., 14 (1919), No. 3, pp. 103–111*).—A paper presented at the annual meeting of the U. S. Live Stock Sanitary Association, held in Chicago in December, 1918.

Tuberculosis and our live-stock industry, J. A. KIERNAN (*Jour. Amer. Vet. Med. Assoc., 54 (1918), No. 2, pp. 107–126*).

The connection of milksickness with the poisonous qualities of white snakeroot (Eupatorium urticæfolium), W. G. SACKETT (*Jour. Infect. Diseases, 24 (1919), No. 3, pp. 231–259*).—"Both the fresh, green *E. urticæfolium* and the dried leaf powder contain an active ingredient which is poisonous for rabbits. The active poisonous principle is present in plants grown in the greenhouse, as well as under natural out-of-door conditions." The active constituent is soluble in 95 per cent alcohol, and in a mixture of ether-chloroform and ammonia, and in each case its solution yields a solid extract on evaporation which is poisonous for rabbits but not for guinea pigs. The active ingredient is not yielded by extraction with physiologic salt solution. It is present in the leaves, but not, or only sparingly so, in the stems and roots of dried plants.

"There is no indication of anaphylaxis. So far as is shown by these experiments, neither the leaf powder nor the different extracts are poisonous for guinea pigs. The viscera and meat, from rabbits which had died from Eupatorium poisoning, when fed to a cat were without harmful action.

"No difference in poisonous properties could be noted between plants from a 'milksick' and 'nonmilksick' area. The fatal dose of the leaf powder differs with the different animals, ranging from 4 to 17 gm.; whereas, the ether-chloroform-ammonia extract from 15 gm. given in three doses 24 hours apart invariably caused death in 4 to 6 days.

"Rabbits suffering with Eupatorium poisoning usually manifest the first symptoms on the third or fourth day (ether-chloroform-ammonia extract). They refuse to eat, sit humped up, eyes half closed, and often keep the body swaying from side to side; the respiration is usually shallow, rapid, and jerky; on the following day (fourth or fifth) a flaccid paralysis of the head, neck, and front legs ordinarily develops; this is followed by complete prostration and death in 24 to 36 hours.

"The principal pathologic changes occur in the kidney, liver, and heart, where fatty degeneration and hyperemia are very marked. Poured agar plates made from the heart blood, liver, and kidneys were invariably sterile.

"It is not intended to claim that all cases of disease with the symptoms of trembles or milksickness are due to the ingestion of the toxic substance present in Eupatorium leaves. Jordan and Harris have shown (E. S. R., 21, p. 783) that a disease with similar, if not identical symptoms, occurs in a region in New Mexico where Eupatorium is not present."

Tick control work, J. C. F. SOHNS (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Veeartsenijk. Meded., No. 26* (*1918*), *pp. 15, pls. 2*).—A discussion of control work with ticks in Dutch East Indies, including plans for dipping vats.

The spinose ear tick and methods of treating infested animals, M. IMES (*U. S. Dept. Agr., Farmers' Bul. 980* (*1918*), *pp. 8, figs. 4*).—A brief summary of information on the life history and habits of *Ornithodoros megnini* is first given, followed by recommendations as to treatment, based upon investigations conducted by the Bureau of Animal Industry of this Department.

The investigations have shown that dipping in any of the known dips is not effective in killing the ticks or causing them to leave the ears. The remedies commonly recommended, such as bland oils, crude petroleum, various dips, etc., are not effective and they are of use only as vehicles for other remedies. Kerosene and gasoline, which have been used by live stock growers in infested areas for a number of years in treating animals for ear ticks, will kill the ticks, but they cause blistering of the tender skin lining the ear passages and may produce deafness, especially in horses or dogs. As both kerosene and gasoline evaporate rapidly, they offer no protection against immediate reinfestation. Chloroform, either undiluted or mixed with bland oils, used in the ears is effective but affords no protection against reinfestation.

An effective remedy against ear ticks has been formulated by the Bureau of Animal Industry and thoroughly tested during field investigations. This consists of a mixture of two parts by volume of ordinary commercial pine tar and one part by volume of cottonseed oil. "In mixing the ingredients add the cottonseed oil to the pine tar and stir until a uniformly smooth mixture is obtained. When the weather is cold the pine tar and cottonseed oil should be warmed so they will mix readily and flow freely, but they should not be heated more than is necessary. The mixture will remain uniform for a long time without separation or deterioration. It is relatively inexpensive, easy to prepare, and when properly applied it kills the ticks but does not injure the animals. It may be used on any species of domesticated animals."

"Cottonseed oil is a fairly good solvent for earwax, and the mixture penetrates ordinary loose masses of earwax and ticks, but it will not penetrate the hard masses. It not only kills all ear ticks with which it comes in contact but being of a sticky consistence it remains in the ears and protects the animals against reinfestation for about 30 days." When properly used one application of the pine-tar-cottonseed-oil mixture is usually sufficient to kill all ticks in the ears of the animal at the time of treatment.

A detailed report of studies of the biology of this tick, by Hooker, Bishopp, and Wood, has been previously noted (E. S. R., 27, p. 865).

Parasitic mange (*Vet. Rev., 2 (1918), No. 4, pp. 462–466*).—This is a review of the more recent literature on the subject. See also a previous note (E. S. R., 39, p. 683).

Report of an experiment on hog cholera, L. L. Lewis and C. H. McElroy (*Oklahoma Sta. Rpt. 1918, pp. 51, 52*).—To determine the length of time that blood will retain its virulence when injected into hogs for the purpose of hyperimmunizing them against cholera, two tests were made, one in which the blood was drawn from the hyperimmune hogs 18 hours and the other 24 hours after hyperimmunization. For each test four healthy hogs were injected with from 5 to 20 cc. of the blood and were placed under observation for about 30 days, at the end of which time each of the eight hogs used was given 0.5 cc. of hog cholera virus. This was followed at intervals of a few days by increasing doses of the virus up to 5 cc. at the end of a month.

In only one case of the hogs used was there any clinical evidence of infection and this was of a very light type, thus indicating that the virulence of blood used in hyperimmunization is lost in from 18 to 24 days and possibly in less time.

The authors are of the opinion that the immunity received by these hogs should be attributed to the attenuation of the virus in the hyperimmunized hogs and not to an antitoxin.

A new disease of pigs.—Pyemia due to the Bridré-Sivori bacillus, F. Sivori and A. C. Marchisotti (*Rev. Soc. Med. Vet. [Buenos Aires], 3 (1918), No. 8, pp. 249–277, figs. 10; abs. in Vet. Rev., 2 (1918), No. 4, pp. 452, 453*).—This is a discussion of an enzootic affection of suckling pigs (one to four months' old) which occurs during the spring and summer in the Provinces of Buenos Aires and Cordoba, Argentina. A high percentage of the animals is affected, one breeder having lost 500 of a herd of 700 pigs in the course of three months.

Swellings of various sizes first appear in different parts of the body, accompanied by persistent lameness. Sometimes there is slight paraplegia, or loss of locomotory power, with incoordination and a swaying gait. This may become so pronounced that the animal can not keep its feet and in such cases a fatal termination is very frequent. In other cases the respiratory system is affected, with dyspnœa, cough, and symptoms of suffocation appearing, generally in the later stages of the disease. There is a progressive and rapid emaciation, which in a short time assumes a grave character.

"On post-mortem examination the authors found abscesses, varying in size, in different parts of the body, containing a yellowish-green, thick, inodorous pus. The abscesses were circumscribed by a dense, whitish fibrous capsule from a few millimeters to 2 to 4 cm. [0.8 to 1.6 in.] in thickness. Joints contained the same kind of pus, and were surrounded by an abundant formation of fibrous tissues in which were purulent or caseous masses, either independent or two or three joined by fistulous tracts. In one case there were abscesses in the frontal and parotidean regions. A very marked and generalized congestion of the lymph glands was observed."

The tinctorial and cultural characteristics of the organism isolated from abscesses are described by the authors who identify it with the organism described by Pacella and Cortelezzi[1] as the causal agent of caseous abscesses in bovines, the Bridré-Sivori bacillus.

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[1] Rev. Facult. Agron. y Vet., 2, ser., 8 (1911), pp. 99–112.

Salt poisoning in swine, H. C. H. KERNKAMP (*Cornell Vet.*, *9* (*1919*), *No. 1*, *pp. 58–60*).—A brief account in which cases of salt poisoning among pigs are reported. The author concludes that a very small amount of salt will produce symptoms of poisoning and death in pigs, although pigs receiving a small amount of salt from day to day appear to develop a tolerance to it.

The control of lice on horses, with especial reference to winter conditions, M. C. HALL (*Vet. Jour.*, *74* (*1918*), *Nos. 517*, *pp. 247–253; 518*, *pp. 278–284*).—"The best control measure for lice on horses is eradicative dipping in summer. There are numerous aqueous solutions that are satisfactory, the ones in most common use being the coal-tar dips. These preparations are effective, uninjurious, comparatively cheap, and readily obtainable. Their use in winter is feasible at times, but is limited by the danger of chilling and consequent production of pneumonia. Eradication dipping calls for two dippings at a 20-day interval.

"Of the volatile substances that may be used for lice control in winter, methyl alcohol seems to be the most satisfactory of the things tested, as it is effective, is not too expensive, and does not injure the hair or coat. It is inflammable and somewhat unpleasant to handle. It can not be depended on to kill eggs, so two treatments at a 20-day interval are indicated.

"Of the fatty or oily substances that may be used for lice control in winter, horse fat appears to be a fairly cheap and satisfactory representative. It should be melted and applied, and the excess promptly scraped off with a sweat scraper. After treatment the horses should be thoroughly groomed daily to remove the fat which flows to the tip of the hairs. The treatment has the disadvantage of greasing the clothing, stalls, harness, and other things with which it comes in contact. Contrary to what one might expect, horses so treated will be colder in very cold weather than horses not treated.

"It is nonirritant, but if it is left on and the horses are not groomed for several days, it has a depilatory action. It appears to be injurious to eggs, but some eggs will hatch after this treatment so that eradication would call for a second treatment at a 20-day interval. Most oils, whether fixed or volatile, are depilatory for horses, and the volatile oils are commonly irritant as well, producing dermatitis.

"Powders do not appear to be very satisfactory substances for the control of lice on horses. They are not specially effective on man, where conditions are better and where many tests of various preparations have been made. They apparently exert no effect on the eggs and can only be regarded as palliative, killing a few lice and temporarily stupefying or disturbing others.

"Fumigation with sulphur dioxid appears to be a dependable measure for the control of lice on horses, but it has only limited application. It appears to be a useful measure in the Army, where it is intended primarily as a treatment for scabies."

The oviposition habit of Gastrophilus nasalis, A. E. CAMERON (*Science*, *n. ser.*, *49* (*1919*), *No. 1253*, *p. 26*).—The author finds that *G. nasalis* never strikes at the lips of the horse but always at the hairs of the skin between the mandibles and sometimes on the hairs of the cheek, and has not been observed to oviposit on the lips. Its eggs are said to be distinct from those of *G. intestinalis*, both in respect to shape and attachment to the hair. They are not adapted for the penetration of the host's skin, and are almost invariably deposited on the hairs of the throat. The author's observations differ from those of Townsend, previously noted (E. S. R., 39, p. 362).

A note on the effect of cold on the degree of parasitic infestation, M. WIGDOR (*Jour. Amer. Vet. Med. Assoc.*, *54* (*1918*), *No. 3*, *pp. 251–254*).—During the course of anthelmintic investigations with dogs, it was found that freezing temperatures of several days' duration tend to diminish the degree of parasitic infestation. "It therefore seems feasible that manure or feces might be disinfected against most parasitic ova, especially hookworm ova, by being kept at very low temperatures for several days, without destroying the value of the manure as fertilizer, were this procedure practicable."

The domestic cat a host of the dog tapeworm, Tænia pisiformis, J. E. Ackert and A. A. Grant (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 257–259*).—The authors found that *T. pisiformis* may develop in the young cat, and that evagination of *Cysticercus pisiformis* occurs in the duodenum of the domestic kitten.

The colon-typhoid intermediates as causative agents of disease in birds.—I, The paratyphoid bacteria, P. [B.] Hadley et al. (*Rhode Island Sta. Bul. 174 (1918), pp. IV+216*).—This bulletin is divided into four parts, part 1 (pp. 4–47), consisting of a historical résumé; part 2 (pp. 48–167), the results of experimental work; part 3 (pp. 168–207), a general discussion of the subject and a complete summary of the data presented; and part 4 (pp. 207–216), of a list of 117 titles of the literature cited.

Among the typhoid-like and cholera-like diseases of birds there are found six main disease types: Fowl cholera, due to *B. avisepticus* of the Pasteurella group; fowl typhoid, due to *B. gallinarum* E. Klein, of the actual paratyphoid group; paracolon infections, due to paracolon bacteria in the strict sense; bacterial white diarrhea due to *Bacterium pullorum* A; infections in adult stock with *B. pullorum* B; and an infection with intermediate strains whose position is not wholly clear. The bacteria related to these disease types respectively can be differentiated, morphologically, only in the case of *B. avisepticus*. In the other types morphological differences afford only an uncertain means of separation. Biochemically, however, these types can be distinguished from one another by the nature of their reaction in carbohydrate media.

The agglutination reactions were found definitely to support the biochemical test with reference to the main types studied, but in addition they showed evidence of antigenic relation between types which differed markedly in their biochemic characters.

The results presented show that the type of infection referred to as fowl typhoid has been recognized for many years and that the rules of priority would establish the causative agent as *B. gallinarum*, first described by Klein in 1889. Organisms from avian infections described by other writers also clearly belong in the same group or among the paracolons.

"It is indicated that the chief difference in pathogenicity between the fowl cholera and the fowl typhoid types is that, while the former are highly virulent and nontoxic, the latter are highly toxic and only slightly virulent. In the second place while the toxic strains differ greatly in their toxicity, and become rapidly attenuated, the virulent strains show little variation in virulence and maintain it for years to a marked degree.

"It is concluded that the 'hemorrhagic septicemia group' of bacteria is a heterogeneous assortment of organisms some of which are true paratyphoids, some true paracolons, some true Pasteurella types; and some which belong outside of any of these groups; and that the term should never be employed in such a sense as to imply systematic relationships of the organisms included. They may be related in no way except the common ability to call forth a type of disease in which hemorrhagic symptoms may be prominent; and this ability is by no means limited to the Pasteurella group. It is concluded that the true septicemia type of bacteria (Pasteurella) are not in any sense pleomorphic."

Three epidemics of adult fowls are reported, of which the apparent causative agent was *B. pullorum*. In one of these typical leukemia was the most obvious and characteristic symptom.

"In relation to the significance of the fowl typhoid bacillus as a pathogenic entity, it is suggested that in many instances in which this or related paratyphoid or paracolon strains are isolated these organisms are not the original cause of the disease, but this is to be sought in a filterable virus. This may be the explanation of all instances in which marked leukemia is associated with apparent fowl typhoid infections.

"It is thus suggested in certain diseases among poultry that paratyphoid and paracolon bacteria may sometimes have the same relation to the malady that the hog cholera bacteria have to hog cholera; they are the agents of a secondary infection, but in some instances may perpetuate an independent infection after their pathogenicity has been sufficiently increased through successive passages."

RURAL ECONOMICS.

After-the-war agricultural problems, A. MACAIGNE (*In Notre France d'Après-Guerre. Paris: Pierre Roger & Co., 1917, pp. 195–208*).—The author devotes this chapter to urging permanent organized Government aid in recruiting and distributing agricultural labor in France, for an industrialized agriculture, for increased use of fertilizer, and for motor power for cultivation. He urges that consolidation be encouraged, without being compelled, and that centralized storage and marketing systems be established.

Agriculture after the war, M. VACHER (*In La Réorganisation de la France. Paris: Libr. Félix Alcan, 1917 pp. 153–179*).—This paper, published with a series of lectures delivered before the School of Advanced Social Studies from November, 1915, to January, 1916, is devoted to reviewing the question of rural needs of reorganization of agricultural labor, the use of machinery, careful selection in stock raising, and agricultural legislation and teaching.

The condition of French agriculture after the war, A. BECKERICH (*Jour. Economistes [Paris], 6 ser., 51 (1916), No. 1, pp. 37–57*).—The author cites figures from agricultural statistics published in the office of the minister of agriculture and from other sources, which indicate that the movement of prices of agricultural products has been consistently upward since 1900. This tendency he attributes to temporary causes, such as poor harvests and decreased acreage, and to permanent ones, namely, increased consumption and demand, especially on the part of the working classes, the higher price of labor, and increased cost of production. He shows, also, that there was an emigration of the laboring classes from rural districts in prewar years and that the evolution of farming even then was in the direction of combination of small farms.

He urges the use of machinery to alleviate the loss of man power to rural populations and the maintenance of a higher scale of agricultural wages. He predicts the solution of the agricultural problem in modification of systems of cultivation, the establishment of agricultural societies, and the increase of the labor supply by immigration and interior colonization.

How to pay for the war: By developing the latent resources of the Empire, H. H. SMITH (*London: John Bale, Sons & Danielsson, Ltd., 1918, pp. XXXVI+186, figs. 6*).—The author urges the development and expansion of English trade in the Tropics, India, and Latin America, advocating special agricultural education for these regions and recommending policies of finance and of handling native labor. One section is devoted to the question of trade relations between Russia and English-speaking peoples.

A bibliography of magazine articles relating to the Tropics is included.

Village life after the war (*London: Headley Bros., Ltd.* [*1917*], *pp. V+118*).—This consists of official reports of two conferences held under the auspices of the Rural Organization Council in 1917. The first considered questions of small holdings, particularly for ex-service men, wages, credit to all classes, cooperation, housing, recreation, and village social plans, and the second took up questions of rural disfigurement, education, recreation, handicrafts, and village settlements for disabled service men.

Land settlement for soldiers and sailors (*Scot. Jour. Agr., 1* (*1918*), *No. 4, pp. 430–434*).—This article describes the areas in several parishes of Scotland which have been made available for experimental small-holding colonies, purchased under the Small Holding Colonies Act of 1916.

Proposal for the establishment on a voluntary basis of a county scheme for the settlement for ex-service men on the land (*London: Cent. Land Assoc., 1918, pp. 8*).—A scheme is proposed whereby the landowners might voluntarily meet the claims of ex-service men for the opportunity of becoming established on the land. County councils and parish committees would be the means of putting the landowners and soldiers in touch with each other.

Better business, better farming, better living—hints from a practical farmer to the settlers on the projects of the United States Reclamation Service, I. D. O'Donnell (*Washington: U. S. Reclam. Serv., 1918, pp. 137, figs. 16*).—Suggestions for planning the farmstead and general recommendations as to the methods and systems of farming deemed best for irrigated lands in the reclaimed areas of the United States are presented. The keeping of farm accounts is also dealt with in some detail.

The agricultural ladder, W. J. Spillman (*Fed. Bd. Vocat. Ed., Vocat. Summary, 1* (*1919*), *No. 9, pp. 19–21*).—This is a study reported in an address before the joint session of the American Association for Agricultural Legislation and the American Economic Association, January, 1919, of the rate at which men become farm owners, and includes some data previously noted (E. S. R., 40, p. 92).

It shows that a group consisting of owners who had passed through the three stages, namely, unpaid laborer on the home farm, hired man, and tenant, to that of owner, constituted 20 per cent of the 2,112 farm owners in the States of Illinois, Iowa, Kansas, Nebraska, and Minnesota, according to data collected in 1917. A second group of those who had gone from unpaid laborer to hired hand, then to owner, constituted 13 per cent of the whole, those who had skipped the hired-man stage 32 per cent, and those progressing direct from unpaid laborer on the home farm to owner 34 per cent.

A second phase of the investigation shows that "just two-thirds of these men obtained their farms by purchase. . . . Twenty-four and one-half per cent of the whole number obtained their farms by inheritance, 7 per cent by marriage, and 1.5 per cent by homesteading."

From a study of the average length of the hired-man and tenant stages in four decades before 1917, it is apparent that "we are approaching a period when the length of both these stages will become approximately fixed unless conditions change materially, which, of course, they may do."

The speaker concludes by advocating the making of new farms available at a rate no greater than that at which our population is increasing, and recommends advancement to farm ownership from the hired-man stage through tenancy if the man can show knowledge of farming sufficient to success.

Minimum wages for agricultural workers (*Scot. Jour. Agr., 1* (*1918*), *No. 4, pp. 434–441*).—A report of an investigation of the question of scale of wages and efforts to establish a minimum wage in Scotland.

The inclosures in England: An economic reconstruction, H. BRADLEY (*Columbia Univ. Studies Hist., Econ., and Pub. Law, 80 (1918), No. 2, pp. 112, fig. 1*).—In this study the author defends the thesis that the inclosure movement in England was due to a necessity of restoring fertility to the land and not to a rise in the price of wool, and that the decline of the manorial common-field system resulted from the impossibility of maintaining the productive capacity of the land at a high enough standard to provide a living for tillers.

The size of Maya farms, O. F. COOK (*Jour. Wash. Acad. Sci., 9 (1919), No. 1, pp. 11–14*).—Discussing similarities between customs of assignment of land in the ancient civilizations of Peru and Mexico, the author points out the misconception which led to the translation by D. G. Brinton in The Maya Chronicles of a sentence from Landa's Relacion de las Cosas de Yucatan, p. 130, to indicate that a plat of ground 20 ft. square was assigned to a family. He shows that Landa's account gives the area of Maya farms as 3.67 acres, while the figures that Brinton would substitute establish their size at 2.38 acres. This confirms rather than contradicts the earlier report, since they "may relate to different districts where the sticks used in measuring the fields were not of the same length."

Central storage of harvests, M. H. PORTEVIN (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 38, pp. 1039–1048*).—There is here presented a plan for central cooperative storage and marketing. This urges the economy of building silos, granaries, and sheds at convenient points in four districts to be created in the devastated territory of northeastern France, from which points harvests of each district might be handled.

[Collectivism in agriculture] (In *State Socialism, Pro and Con*, edited by W. E. WALLING and H. W. LAIDLER. *New York: Henry Holt & Co., 1917, pp. 42–59, 69–242*).—The editors have brought together, in the chapter on agricultural banks, an extract from the report to the British Board of Agriculture on Agricultural Credit and Cooperation in Germany, by J. R. Cahill (E. S. R., 30, p. 295), a discussion of personal (short-term) credit, and parts of popular and official publications relating to the Federal farm loan system in this country.

Under the subject of Agriculture and the Conservation of Natural Resources is contained a chapter on land reclamation, the information relating to the United States being compiled from reports of the Secretary of the Interior and of the Reclamation Service, that for France, India, and Egypt being taken from Geological Survey publications and other official sources. This section includes, also, notes on land tenure and colonization and State-aided land settlement in the United States and several foreign countries; a chapter on agricultural collectivism, which is concerned with Government operation of creameries, elevators, and cold storage plants, particularly in Canada; a discussion of cooperation and governmental aid for the advancement of agricultural science in Germany; and selections from official sources setting forth in detail the organization, expenditures, and activities of the U. S. Department of Agriculture. Compilations of data from similar sources are given relating to State administration and control of forests, roads, fisheries, and water power.

Deep furrows, H. MOORHOUSE (*Toronto, Canada: George J. McLeod, Ltd. [1918], pp. 299*).—This is a story of the organization of the Grain Growers' Grain Company and of affiliated organizations, showing the way in which the farmers of western Canada have achieved success in cooperation.

Syndical and mutual association and cooperation in agricultural organization in Belgium, J. WATHELET (*Egypte Contemporaine, No. 41 (1918), pp. 485–503*).—This article is a description of Belgian associations, agricultural and other, official and voluntary. The organization, function, and importance to Belgian agriculture of the voluntary agricultural societies, classified as professional unions, cooperative associations, and mutual insurance societies, are considered in some detail.

Cooperation in Danish agriculture, H. Faber (*London and New York: Longmans, Green & Co., 1918, pp. XXII+176*).—The editor endeavors to adapt to the needs of British agriculturists the description of certain phases of the Danish cooperative system presented from the Danish viewpoint in Andelsbevægelsen I Danmark, by H. Hertel. The activities described are the cooperative distributive societies, dairy societies, slaughterhouses, the Danish Cooperative Egg Export Society, butter export societies, breeding societies, control societies, societies for purchase and sale, credit associations, the Danish Cooperative Bank and cooperative village banks, insurance societies, various cooperative undertakings, and the central cooperative committee.

Appendix 1 is concerned with the number and turnover in 1915 of Danish cooperative societies connected with the central cooperative committee. In Appendix 2 are included tables compiled and condensed from official statistics and expressed in English weights and measures to show development in Denmark in matters of rural tenure, cultivation of crops, live stock, and import and export of agricultural produce.

An agricultural federation, G. Hammond (*Proc. N. Y. State Fruit Growers' Assoc., 17 (1918), pp. 101–105*).—The speaker urges the organization of farmers for representation in investigations and adjustments of agricultural problems, exemplifying with the case of the New York Federation of Agriculture organized to meet these needs.

Directory of the agricultural and similar organizations of Massachusetts (*[Boston]: State Bd. Agr., 1918, pp. 17*).—This publication includes the personnel of the State board of agriculture and of the Massachusetts Agricultural College, with the roll of agricultural societies, farmers' cooperative exchanges, farm bureaus, county agricultural schools, and miscellaneous agricultural organizations in the State.

The official organizations for aiding agriculture, P. Diffloth (*Vie Agr. et Rurale, 8 (1918), No. 51, pp. 437–439*).—A brief summary of the function of certain French official bodies for agricultural aid. The objects included the increasing of cultivated areas, encouraging the use of motor power in cultivation, and maintaining a central office for distributing chemical fertilizers, an agricultural labor bureau, an office of agricultural information, and bureaus for agricultural improvement and engineering and for the extension of agricultural credit.

Third and fourth annual report of the State of Idaho department of farm markets, 1917–1918 (*Dept. Farm Markets Idaho Ann. Rpt., 3–4 (1917–18), pp. 76*).—This records further activities along the lines previously noted (E. S. R., 38, p. 293), with notes on the resources and development of Idaho by counties; statistical tables of data regarding acreage, yields, sales of principal crops, and number of live stock for 1917 and 1918, compiled from reports of county assessors; and the text of laws governing the farm markets department as amended and passed by the fourteenth session of the Idaho Legislature, 1917.

Report of the activities of the office of farm markets (*Wash. State Off. Farm Markets Bul. 2 (1918), pp. 34, figs. 17*).—This gives an account of marketing activities from July 1, 1917, to November 1, 1918, including a survey of farmers' cooperative organizations in the State, standardization and grading, dissemination of marketing information, and adjustment of disputes between buyers and sellers of farm produce, also statistics and graphical presentations of monthly cold-storage holdings of certain food commodities from November, 1916, to October, 1918, inclusive.

Report of the Kansas State Board of Agriculture for the quarter ending December, 1917 (*Quart. Rpt Kans. Bd. Agr., 36 (1917), No. 144, pp. 50*).—This number is devoted to "tables giving the State's population by counties and cities; acres, yields, and values of agricultural products, and numbers and value of live stock, for the year 1917, together with other tables showing yields and values of numerous productions for 20 years."

[Reports of the Porto Rico commissioner of agriculture and labor and of the food commission] (*War Dept. [U. S.], Ann. Rpt. Governor P. R., 18 (1918), pp. 621–749*).—In this section of the governor's report are published notes on the work of the forest service and of the insular experiment station during the year ended June 30, 1918, various labor data, and a survey of the work of increasing the food production, marketing, and price control in Porto Rico, including statistics of the acreage of food crops, live stock, imports from the United States and foreign countries, and exports of foodstuffs from the island, together with the text of resolutions regulating the sale of food adopted by the food commission.

Farm land and farming [in New Brunswick] (*In The Province of New Brunswick: Its Natural Resources Developed and Undeveloped, 1918. Ottawa: Dept. Int., 1918, pp. 7–13, fig. 1*).—A compilation of general information, revised by the Dominion Experimental Farms Branch of the Department of Agriculture, regarding field crops, dairy farming, cheese factories, live stock, and fruit farming.

AGRICULTURAL EDUCATION.

Administrative organization of the college of agriculture, C. D. Jarvis (*U. S. Bur. Ed., Higher Ed. Circ. 8 (1918), pp. 16, fig. 1*).—This paper presents the results of a study of the administrative organization of the American colleges of agriculture, which was undertaken in response to a request from the committee on college organization and policy of the Association of American Agricultural Colleges and Experiment Stations. It includes a set of recommendations on different subjects, together with brief explanatory statements, suggesting a normal rather than an arbitrary standard.

Agricultural instruction, F. Dalencourt (*L'Enseignement Agricole. Port au Prince, Haiti: Author, 1918, pp. 36*).—The author suggests a program for the development of agriculture in Haiti. He urges that theoretical and practical agricultural instruction be made obligatory in the elementary and secondary schools and that a professor of elementary agriculture be placed in each rural and urban school. In his opinion the elementary schools should be so reorganized as to adapt their instruction to local conditions, and each school should have a garden. The schools for girls should include also instruction in home economics. It is proposed that the Farm of Thor be attached to the secondary School of Applied Science, in which purely theoretical instruction in agriculture is given. The Plantations of Haiti at Bayeux could render in the north the same service as the Farm of Thor in the east, viz, as a demonstration of experiments interesting to Haitian agriculture and commerce and as a center of truly practical agricultural instruction. Agricultural instruction in the army by means of evening schools is also recommended. Attention is called to the agricultural possibilities of Haiti, in the realization of which the departments of public instruction and agriculture should cooperate. The rôle of the clergy and the use of moving pictures in the promotion of agriculture are discussed. It is suggested that a central bureau for popular agricultural education be established in the department of agriculture.

Agricultural education: Some problems in State supervision (*Fed. Bd. Vocat. Ed. Bul. 26 (1918), pp. 31*).—This bulletin consists of three parts.

I. *State supervision of vocational agricultural education*, by L. S. Hawkins (pp. 7–17).—This is a discussion of the essential factors in the success of a State program of vocational education with emphasis on supervision and teacher training as the two most important factors; the qualifications and duties of supervisors; supervision a function of the State board; the maximum amount of Federal funds to be used; and the duties and relationships of the State supervisor of agricultural education.

The Federal Board has authorized State boards to use teacher training funds for the supervision and training of teachers in service, under conditions approved by the Federal Board, and provided that not more than 25 per cent of the maximum for teacher training in the trades and industries, home economics, or agriculture—may be used for the maintenance of supervision in that line, including salaries of supervisors, clerical service, travel, communication, printing, and supplies. The duties of the State supervisor of agricultural education are described as twofold, viz, rendering assistance to teachers who are already in service and at the same time checking up their work.

II. *Relationship between teacher-training departments under the provisions of the Vocational Education Act and State supervisors of agriculture for the State boards for vocational education*, by G. A. Works (pp. 18–23).—Two plans of organization are compared. In one the supervision and teacher training are both under the direction of one person, while in the other the responsibility is divided. The advantages of the latter plan are pointed out, and suggestions are made as to the proper organization of the work. This is at present the more common of the two methods of organization and it is thought will ultimately show greater strength as measured by results accomplished in the teaching of vocational agriculture. The cooperative work of the department of rural education and the State supervisor in the State of New York is noted as an illustration of helpful cooperation.

III. *Sectional conferences and periods of professional improvement work for teachers of agriculture in high schools*, by R. W. Stimson (pp. 24–31).—The qualifications and aims of the successful vocational agricultural teacher are outlined. In considering the professional improvement of teachers which, it is suggested, may be obtained through work with farmers and the farm management specialist of the agricultural college, through the supervision of boys' and girls' club work, and through experimental work and extension, attention is called to a sort of project method adopted in Massachusetts of teaching teachers how to teach agriculture after they have been appointed. In this plan, the teacher trainer goes from school to school and from man to man and helps each instructor on the spot. The plan also provides for seminar courses during part of the winter and part of the summer at the agricultural college to be conducted by the agricultural teacher trainer. The minimum requirement of professional improvement, which has from the beginning been a fundamental feature of the Massachusetts plan for vocational agricultural education is two weeks a year, every instructor in the agricultural educational service being required to attend a winter and a summer conference of about one week each. Such attendance is credited to each man as professional improvement work. Massachusetts has also inaugurated a scheme of sectional or itinerant conferences. The second conference, which was held in the summer of 1917, opened in the northeastern county of Essex and terminated on Cape Cod. The conference last summer was held with headquarters at the Massachusetts Agricultural College and covered visits to schools and departments of the west-central part of the State. The author considers of fundamental importance also the joint conferences of vocational agricultural directors and instructors, agricultural college, research, and extension men and agricultural county agents, which for the past six years have been held in winter, preferably Christmas week, at the Massachusetts Agricultural College. At these conferences policies to govern vocational instruction and extension work during the succeeding year have been agreed upon, thus making possible unity of aim, consistency in methods, and division of labor. Such conferences tend to prevent overlapping and overlooking and minister to economy and efficiency.

Problems of administering the Federal Act for Vocational Education (*Nat. Soc. Vocat. Ed. Bul. 26* (*1918*), *pp. 83*).—This bulletin contains the addresses delivered at the eleventh annual convention of the National Society for Vocational Education held in Philadelphia, Pa., February 21–23, 1918, including the following: Administrative problems confronting the Federal Board for Vocational Education: A National Program of Vocational Education under the Smith-Hughes Act, by J. P. Munroe; Cooperative Agricultural Extension Work under the Smith-Lever Act, by A. C. True; and Training Teachers of Agriculture, by L. S. Hawkins. Training Teachers of Agriculture under the Smith-Hughes Act: Instruction for Teachers of Agriculture under the Smith-Hughes' Vocational Education Law, by G. M. Wilson; Teaching Experience through the Apprenticeship System, by G. A. Works; State Supervision and Teacher Training Combined, by A. K. Getman; State Supervision, by Z. M. Smith; and Improvement of Teachers and Schools, by L. H. Dennis. Home Economics under the Smith-Hughes Act: Types of Schools and Classes for which the State of Pennsylvania will ask Reimbursement under the Smith-Hughes Act, by Anne C. Perry; Preparation of Teachers for Schools and Classes in Home Economics, by Mary S. Woolman; Cooperative Training of Teachers, by Anna Kloss; and Training Teachers for Part-time and Evening Schools in Manufacturing Centers, by Louisa I. Pryor.

State Board for Vocational Education (*State Bd. Vocat. Ed.* [*Wash.*], *Vocat. Bul. 1* (*1918*), *pp. 29, fig. 1*).—This is an outline of the plan of administration and supervision of vocational education in Washington, under the Smith-Hughes Act. It has been arranged to have the special teacher training in vocational agriculture conducted at the State college and that in home making at the State college and the State university. Outlines of teacher-training courses in vocational agriculture and home economics which have been approved by the State board for 1917–18 and 1918–19 are given.

Vocational education in West Virginia under the Smith-Hughes Law (*Charleston, W. Va.: Dept. of Schools* [*1917*], *pp. 12*).—This bulletin contains rules and regulations and general suggestions for the guidance of educational leaders in preparing courses of study, providing proper equipment, and formulating general plans for vocational classes, departments, and schools in West Virginia under the Smith-Hughes Act.

Plans concerning the Wisconsin system of vocational training presented to the Federal Board of Vocational Education (*Wis. State Bd. Vocat. Ed. Bul. 2* (*1918*), *pp. 55*).—The plan for the administration and supervision of vocational education in Wisconsin under the Smith-Hughes Act is outlined. The University of Wisconsin has been designated as the training place for the teaching of vocational home-making, and the River Falls Normal School as the training place for the teachers, directors, and supervisors of vocational agriculture.

Evening vocational courses for girls and women (*Nat. Soc. Prom. Indus. Ed. Bul. 23* (*1917*), *pp. 73*).—The aim of this report, which has been prepared by a special committee of the society consisting of persons directly in touch with such problems, is to define the purpose and outline plans of instruction and administration of vocational schools for girls and women. The discussion is confined primarily to industrial and home-making courses which correlate with the day's occupation. Chapters are devoted to a general statement of certain aspects common to evening classes, trade extension courses, and vocational home making courses. Appendixes deal with evening household arts and recreational courses, giving a large variety of suggestions as to aims and methods adapted to such courses, and record forms.

The fact is emphasized that vocational courses for women in the evening schools may be and should be more than the generally accepted unrelated courses in cooking and sewing. Possible correlations and adjustments of evening school work to economic conditions are indicated. The existing confusion as to essential differences between trade extension courses and household arts courses and as to the relationship of household arts training to wage-earning callings for women and girls is considered. The fundamental unlikenesses, in some cases sharp differences, of aims between household arts as a part of general education and vocational home making as an important but difficult division of vocational education are recognized in the bulletin.

Genetics laboratory manual, E. B. BABCOCK and J. L. COLLINS (*New York: McGraw-Hill Book Co., 1918, pp. XI+56, figs. 7*).—The work of the laboratory course outlined in this manual consists of breeding experiments with the vinegar fly, a study of variation in plants, work with material illustrating the Mendelian principles, and a study of some features of plant and animal breeding. In order that the same materials may not be used two years in succession and for the purpose of meeting as many conditions as possible, three alternative exercises are suggested under most of the numbers. The work outlined, therefore, is sufficient for three half-year courses consisting of one three-hour period a week for 15 or 16 weeks, and by slight modification and amplification the exercises can be adapted to a course calling for two or three periods each week.

The manual is intended in particular to supplement the textbook entitled, Genetics in Relation to Agriculture, by E. B. Babcock and R. E. Clausen (E. S. R., 39, p. 671).

Poultry laboratory manual and note book, H. R. LEWIS (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. 144, figs. 4*).—This manual is intended for use in the high school or college. The sequence and distribution of the 44 exercises outlined are specially planned to accompany the author's text, Productive Poultry Husbandry (E. S. R., 31, p. 270). They deal with the geographical distribution of America's poultry industry; locating and planning the poultry farm layout; distributing the poultryman's capital; fowl nomenclature; factors determining the classification of fowls; selecting the foundation stock; poultry house construction; feeding stuffs and rations; breeding and marketing poultry; caponizing; candling, grading, and preserving eggs; advertising; poultry records and accounts; preparing poultry for exhibition; judging poultry; diseases and medicines; and trips to successful poultry farms, wholesale and retail poultry and egg markets, and to a standard-bred poultry show.

Lessons in cookery.—Book I, Food economy, F. E. STEWART (*Chicago: Rand McNally & Co., 1918, pp. VIII+250, pls. 4, figs. 22*).—This volume, which is designed primarily for the high school student of home economics, covers a semester's work, containing 40 cooking lessons planned according to foods in season from September to February and based roughly on economic values. The lessons, consisting of work with menus and recipes, are grouped according to their economic and food values and to illustrate some economic or dietetic principle. The book is divided into six parts, dealing respectively with the classification of foods, effects of heat, moisture, and mechanical action on the cooking of foods, and general information; preservation of foods; complete dishes; cooking of the cheaper meat cuts; use of meat substitutes; and homemade bread as a means of reducing the high cost of living. Much chart work is given but only a minimum of experimental work. The book, which is to be the first of a series of four, each a unit in itself, is also published in the form of a loose-leaf "filler" suitable for class use.

Home and community hygiene, J. Broadhurst (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. XIII+428, pls. 4, figs. 116*).—This text, dealing with the principles of personal hygiene and public sanitation and their practical applications in an elementary way, is intended for nurses, teachers, and mothers. The subject is approached from the practical standpoint of the homemaker. Problems are suggested at the end of each chapter, and a glossary to aid the beginner and a list of general references are included. An appendix deals with disinfection, household pests, pasteurization of milk, plate counts, garbage disposal, and training for public health officials and workers.

MISCELLANEOUS.

Thirty-first Annual Report of New York Cornell Station, 1918 (*New York Cornell Sta. Rpt. 1918, pp. CIII, fig. 1*).—This contains the organization list, reports of the director of the station and heads of departments, and a financial statement for the fiscal year ended June 30, 1918.

Twenty-seventh Annual Report of Oklahoma Station, 1918 (*Oklahoma Sta. Rpt. 1918, pp. 56*).—This contains the organization list, reports by the director and heads of departments, a meteorological summary, and a financial statement for the fiscal year ended June 30, 1918. The experimental work reported is for the most part abstracted elsewhere in this issue. An appendix lists the annual reports, bulletins, and circulars issued by the station since its establishment.

Thirty-first Annual Report of South Carolina Station, 1918 (*South Carolina Sta. Rpt. 1918, pp. 44*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1918, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 4 (1919), No. 2, pp. 35–63, pl. 1, figs. 15*).—This contains several articles abstracted elsewhere in this issue, together with one entitled Tree Memorials for Fallen Heroes, by E. Secrest, and notes.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1918), No. 11, pp. 154–168, figs. 3*).—This contains brief articles on the following subjects: Experiences with Sheep, by W. A. Linklater; Fruit Varieties for Western Washington, by J. L. Stahl; Sprays and Spray Materials, by A. Frank; and Operation of the Room Brooder, by Mr. and Mrs. G. R. Shoup, which includes plans of an adjustable chick feeding hopper.

NOTES.

Arizona University.—A five-week summer course in range stock management is being arranged. It is expected that four weeks of the course will be spent in an observation trip through range counties.

California University and Station.—The most important annual budget of recent years for the university has just been approved by the board of regents. Salaries of the staff were materially increased, following an appropriation by the recent legislature of $75,000 for special increases in salaries, together with normal salary increases approximating $30,000. These increases were distributed among 318 members of the faculty. A new salary scale was adopted under which the pay of instructors may commence at $1,300 with an upper limit of $2,000. The average salaries paid assistant professors were raised from $1,800 to $2,400; those of associate professors from $2,400 to $3,000; and those of full professors from $3,000 to $3,600. Many members of the teaching staff will be paid above the minimum levels, and though a few remain lower it is proposed that the salaries be brought eventually to the minimum level or higher. It is stated that while the new salary levels do not wholly meet the problem of the increased cost of living or the competitive salaries offered in other fields of activity, yet, in general, the increases tend to improve conditions and to make possible the retention of many who were considering the necessity of leaving the teaching profession.

Provision has been made in the College of Agriculture for a director of resident instruction, a director of the experiment station, and a director of agricultural extension, each to be nominated annually by the dean of the college. These positions have been filled, beginning July 1, by the appointments of Walter Mulford as director of resident instruction, Dr. H. J. Webber as director of the station, and B. H. Crocheron as director of agricultural extension. These three officers will constitute a standing committee on administration, with Director Mulford as chairman. He will also serve as acting dean in the absence of the dean of the college.

Other changes in title and rank include J. T. Barrett, professor of plant pathology, acting director of the Citrus Substation, and acting dean of the Graduate School of Tropical Agriculture at Riverside; L. D. Batchelor, professor of orchard management in the Citrus substation and Graduate School of Tropical Agriculture; and R. L. Adams, professor of farm management. R. E. Clausen, assistant professor of genetics, and R. S. Vaile, assistant professor of orchard management in the Citrus substation, have recently returned from Army service. Mrs. A. A. Weigart has been appointed instructor in agricultural extension.

Connecticut Stations.—The State appropriations for the stations were appreciably increased by the last legislature. For the ensuing biennium the State Station will receive $45,000, an increase of $7,500, and the Storrs Station $25,000, an increase of $10,000.

Hawaii Federal Station.—R. A. Goff, who has been in charge of the Glenwood substation, has been appointed director of extension for the Island of Hawaii, effective April 1. Dr. Wallace Macfarlane, formerly chemist at the Oklahoma Station, was appointed April 9 in charge of the divisions of chemistry and agronomy in connection with the soil fertility investigations. F. G. Krauss, superintendent of the extension division, has been placed in charge of the Haleakala homestead demonstration farm in addition to his other duties.

The Territorial legislature, at its recent session, appropriated $5,000 for buildings and other permanent improvements. An appropriation of $25,000 was also made for an experiment station at Waimea, Island of Hawaii, but this is to be operated solely under Territorial auspices.

Idaho University.—B. F. Sheehan, assistant professor of farm crops at the Oregon Agricultural College and assistant in farm crops work at the station, has been appointed extension agronomist and State seed commissioner, effective June 1. He will work with the county agents of the State in grain standardization and crop problems, as well as carry on seed inspection and testing.

Indiana University and Station.—The management of the various outlying university and station farms has been vested by the board of trustees in a farm director, who is immediately responsible to the director of the station. H. J. Reed, assistant to the director, has been appointed to the position.

The new barn which is being built by the university for live stock work is rapidly nearing completion.

Cooperative arrangements have been completed between the station and the U. S. Department of Agriculture for soil survey work.

Miss Beatrice E. Habermann has been appointed librarian for the station.

Iowa College.—The appropriations for the ensuing biennium were materially increased by the last legislature. The total granted is $2,958,000, of which $1,754,000 is for the support of college work, $763,000 for the support of industrial service work, $141,000 for equipment and improvements, and $300,000 for a library building.

J. B. Davidson, professor of farm mechanics of the University of California, returns to the college July 1 as head of the department of agricultural engineering.

Kentucky University.—Dr. W. W. Dimock, professor of veterinary pathology and bacteriology at the Iowa College, has been appointed professor of veterinary surgery in the animal industry division.

Minnesota University and Station.—F. W. Peck has been granted leave of absence until January 1, 1920, to take up cost accounting work in the Office of Farm Management of the U. S. Department of Agriculture. William Boss has been appointed professor of farm engineering, chief of the division of farm engineering, and chairman of the agricultural engineering group. E. V. Floyd, head of the department of physics at the Kansas College, has been appointed associate professor of agricultural physics, and Dr. L. S. Palmer, assistant professor of dairy chemistry at the University of Missouri and dairy chemist at the station, has been appointed associate professor of agricultural biochemistry and dairy chemist of the station. Both these appointments are effective July 1.

Oher appointments include G. A. Lundquist as assistant professor of rural sociology; Norman J. Radder as assistant editor and assistant professor of rural journalism; Forest W. McGinnis as assistant professor of agronomy and assistant agronomist; H. H. Knight as assistant entomologist in charge of insect collections; Capt. Norris K. Carnes, recently returned from overseas service, as instructor in animal husbandry; Miss Julia Olive Newton as assistant State leader of home demonstration work; Martin J. McGowan as extension specialist in publicity work; and George E. Holm as assistant agricultural biochemist, to be assigned to studies of protein chemistry in the station.

Mississippi Station.—C. B. Anders, assistant in animal industry at the Louisiana Stations, has been appointed assistant agronomist.

Missouri University and Station.—It has been decided that the lands acquired under the Morrill land grant should be put on the market and sold, excepting such lands as may be deemed essential for instruction in forestry and such as may be of special value on account of their mineral deposits. A committee consisting of O. M. Barnett, Frederick Dunlap, and M. F. Miller has been appointed to prepare and report to the board of curators as to the plan of procedure.

R. R. Hudelson has been appointed associate professor of soils, beginning May 1. John Carter has been appointed field assistant in farm crops, beginning April 1.

Nebraska University and Station.—Professor Lawrence Bruner, after 30 years' service in the university, has been relieved of active charge of the department of entomology. Myron H. Swenk has been placed in charge of all entomological work in the State which comes under the board of regents; this including the department of entomology, the station activities, and the work in connection with the office of State entomologist.

New Jersey College and Stations.—At the last session of the legislature an appropriation was granted of $75,000 for the erection of a horticultural building. The legislature also granted certain increases in the appropriations for general maintenance and demonstration work. A law was passed providing for the collecting and testing of samples of commercial legume-inoculating cultures of bacteria. This law carries an appropriation of $2,000 for conducting the work, but the appropriation will not be available until next year.

The station policy has recently been adopted of inviting the various State agricultural associations to appoint committees for consultation in planning and carrying on experimental work. A number of these associations have already selected committees for this purpose.

Considerable new experimental work has been taken up this spring. This includes experiments on growing vegetables on the muck soils of northern New Jersey, additional studies on cranberries in southern New Jersey, fertilizer tests on tomatoes in Burlington County, and fertilizer, disease control, and seed tests with potatoes in central and southern New Jersey. The studies on artificial oyster propagation have also been resumed, this work being in charge of Thurlow C. Nelson, Ph. D., who is stationed at the oyster laboratory at Tuckerton.

A collection of garden tools and equipment valued at $1,500 has been presented to the college by the National War Garden Commission. This equipment has been in use at Camp Dix, N. J.

Dr. B. H. A. Groth, who has been for several months past completing the plant breeding work begun by the late Dr. B. D. Halsted, has accepted a position as superintendent of a large sugar plantation in Santo Domingo. E. J. Owen has accepted a position as instructor in agriculture at the Leonardo high school. William C. Skelly, assistant in pig club work at the Ohio State University, has been appointed assistant in animal husbandry. Robert Poultney has been appointed assistant extension specialist in dairying, Mrs. Catharine Griebel as assistant State home demonstration leader, and Linus H. Jones as research fellow in plant physiology.

Cornell University.—An entomological expedition to South America is projected under the auspices of the university for the twofold purpose of securing entomological specimens and forming closer relations with South American institutions of learning. Next September J. C. Bradley is expected to visit Brazil, Argentina, and Chile, and in the spring of 1920 he will be joined in Peru by C. R. Crosby and Dr. W. T. M. Forbes for a trip on the upper Amazon River to Peral.

E. O. Fippin, extension professor of soil technology, has been granted a year's leave of absence, beginning July 1, to become director of the agricultural bureau of the National Lime Association, with headquarters at Washington, D. C. C. G. Vincent has been appointed extension instructor in pomology.

Ohio State University.—A two-day short course on seed testing was held June 11 and 12, to afford opportunity for dealers and buyers to become familiar with the new pure seed law, which requires the labeling of farm seeds sold after September 1.

Pennsylvania College and Station.—Resignations have been accepted of E. L. Anthony, associate professor of dairy husbandry, effective May 15, C. H. Hadley, assistant professor of economic entomology, effective May 1, L. S. Kleinschmidt, assistant professor of poultry husbandry, effective June 1, and L. D. Jesseman, instructor in pomology, effective June 1. J. F. Adams, assistant professor of plant pathology, has returned from Army service, and Fred Hultz, instructor in animal husbandry, from Y. M. C. A. service in France. A. T. Kearney has been appointed assistant professor of rural organization extension, effective April 1. Other appointments, effective May 1, include Andrew A. Borland, previously in charge of dairy husbandry extension, as professor of dairy husbandry, R. D. Anthony as professor of pomology, and H. E. Hodgkiss as professor of entomology extension.

Tennessee University.—Dean H. A. Morgan has been appointed president, beginning July 1.

Plans have been approved for the new main building to cost about $400,000, and the agricultural building to cost $257,000.

A course in farm mechanics has been added to the curriculum.

Utah Station.—O. W. Israelsen, in charge of irrigation and drainage investigations, has been appointed agent in charge of the cooperative irrigation investigations with the U. S. Department of Agriculture.

Washington College and Station.—A State irrigation substation is being established with State funds at Prosser, where a tract of 210 acres of land is being placed under irrigation. This substation will specialize in the problems met in diversified farming under irrigation conditions throughout the State. R. P. Bean has been appointed superintendent.

The organization of a new department of farm management of the college and station has been approved by the board of regents. George Severance, vice-dean of the college of agriculture, is to head the new department.

Studies in cooperation with the Bureau of Entomology of the U. S. Department of Agriculture are being conducted in methods of control of the codling moth. E. J. Newcomer is in charge for the Bureau of Entomology and has established a laboratory at Yakima, while Dr. A. L. Melander and Anthony Spuler, in charge for the station, are carrying on the work in the Wenatchee and other fruit sections. Miss Flora A. Friese and Frank W. Carlson have been appointed assistants in entomology in cooperation with the Bureau of Entomology, the former for studies of cranberry insects and the latter for wireworm studies.

Advisory Board of American Plant Pathologists.—Following a questionnaire sent out to members of the American Phytopathological Society, a continuance of the temporary organization known as the War Emergency Board was decided upon. A permanent committee representing the society and known as the Advisory Board of American Plant Pathologists was authorized. This committee is to consist of six members appointed by the council of the society and representing the U. S. Department of Agriculture, the Northeast, South, Northwest, and Pacific Coast sections of the United States, and Canada for 3-year terms. Appointments for 1919 are as follows: Chairman, G. R. Lyman, U. S. Department of Agriculture; secretary, C. R. Orton of Pennsylvania; H. W.

Barre of South Carolina; H. S. Jackson of Indiana; H. P. Barss of Oregon; and P. A. Murphy of Prince Edward Island.

The duties of the board include the representation of the society before the National Research Council; the preparation and distribution to members annually of a list of active phytopathological projects in this country; the arrangement of conferences of groups of workers, both in phytopathology and related lines; and the promotion of international relations in phytopathology. It is expected to render service particularly in promoting cooperation among workers, notably in the testing over a wide field of results obtained in individual research.

Canadian Phytopathological Society.—A Canadian branch of the American Phytopathological Society has been organized to bring together plant pathologists in Canada. The officers selected for the ensuing year are as follows: President, J. E. Howitt, Ontario Agricultural College; vice-president, W. A. McCubbin, Dominion Department of Agriculture; secretary-treasurer, Dr. R. E. Stone, Ontario Agricultural College; and councillors, P. A. Murphy, Dominion Department of Agriculture, and W. P. Fraser, MacDonald College.

Revival of Belgium League of Family Education.—With a view to assisting in restoring the morale of people whose life has been fundamentally disturbed by the trials and hardships of war, an attempt is being made in Belgium to revive and develop the League of Family Education. This association was founded by a group of Belgian parents in 1899. Its fundamental purpose is to encourage the education of children within the home in good morals, correct physical habits, and practical efforts for the benefit of the family and society. It fully recognizes the great value of the education given by the school and the church, but holds that this can not take the place of the instruction which parents and other members of the family should give to children as they grow up in the home.

Before the war this association had a considerable development, organized numerous conferences and courses for instruction of parents, and published monographs and a monthly journal. It organized three international congresses and a fourth was about to convene in this country when the war broke out. It is now resuming its activities and by means of local, regional, and provincial committees is extending its influence throughout Belgium.

To provide a central seat of its activities this league "has decided to establish an Institute of Family Education as a memorial to lasting peace and as a starting point of a new era of intense moral progress. This institute will concern itself with the study, publication, and dissemination of the best educational methods for the family." At the institute will be located a library, a museum, an auditorium for conferences, and the central working force of the league.

Additional information about this enterprise may be obtained from Mr. Paul DeVuyst, 22 Avenue de l'Yser, Brussels, a leader in government enterprises for the benefit of the rural people of Belgium and at present Director-General in the Ministry of Agriculture.

New Publications.—*Bulletin Agricole de l'Institut Scientifique de Saigon* is being published monthly as the organ of this institute. Under a decree of November 11, 1918, the agricultural and commercial services of Cochin China were divided into two sections, an economic section attached to the Direction des Affaires at Hanoi and a scientific section attached to the institute at Saigon. The latter includes as its principal constituent parts the Garden of Botany and Zoology and the laboratory of agricultural chemistry, both at Saigon; the experimental station at Giaray and the arboretum at Trang-Bôm; and the rice-culture service and rice station at Cantho. The publication will include original articles from the staff of the institute, official notices, popular articles from various sources, etc. The initial number reports results of tests of tractors in rice growing, analyses of manioc, red and white sweet potatoes, yams, and taro, an article on *Coffea excelsa* and its culture, etc.

Revista de Agricultura de Puerto Rico is being published by the Insular Department of Agriculture and Labor. The initial number consists mostly of brief popular articles by members of the staffs of the Insular and Federal Experiment Stations.

The Agricultural Station at Guadeloupe, established in April, 1918, has recently published its initial bulletin. This is entitled *Advice to Sugar Cane Growers of Guadeloupe*, by J. Sydney Dash, director of the station.

Rivista di Biologia is being issued bimonthly at Rome. Its scope is announced as including general biology, genetics, cytology, protozoology, morphology and comparative physiology of plants and animals, practical applications of botany (forestry, vegetable pathology, etc.) and zoology (agricultural entomology, parasitology, zootechny, etc.), experimental and comparative pathology, eugenics, social hygiene, biological methods, and international progress in biology.

The Kitasato Archives of Experimental Medicine is being published semiannually by the Kitasato Institute for Infectious Diseases of Tokyo, Japan, largely for the purpose of making the results of Japanese research available to the world. Articles are to be published in English, French, or German. The initial number contains a paper entitled An Investigation of the Therapy of Tuberculosis, by K. Shida, and another dealing with the etiology, immunity to infection, prophylaxis, and serum therapy in Weil's Disease (*Spirochetosis ictero-hæmorrhagica*), by R. Onada et al.

Beginning with the May issue, *The Milk Trade Journal* has been renamed *The Milk Magazine*, with Dr. E. V. McCollum announced as the chief contributing editor.

It is announced that the *Genera Insectorum*, which was being published at Brussels at the outbreak of the war, is to be continued. Several parts about to be published in 1914 are expected to be issued this year. The supply of the parts previously published was preserved and is available for distribution.

Miscellaneous.—A women's organization known as the Federation of Women's Institutes of Canada was organized at Winnipeg, Manitoba, last February. This organization is Dominion-wide in scope, and constitutes a federation of Provincial women's rural organizations including women's institutes, homemaking clubs, and home economics societies. A Federal conference is to be held annually, that for 1919 being scheduled for Toronto.

A Scottish Station for Testing and Registration of Agricultural Plants has been opened on a farm of about 200 acres accessible to Edinburgh.

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EXPERIMENT STATION RECORD.

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[1] On leave of absence for military service.

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FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

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MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

MISCELLANEOUS. ...ment of Agriculture—Con.

[1] Printed in scientific and technical publication outside the Department.

ILLUSTRATION.

EXPERIMENT STATION RECORD.

VOL. 40. JUNE, 1919. No. 8.

It has been said that the rôle of science is prophecy. In the sense of revealing natural law and its manifestations, this is another way of saying that the rôle of science is to enable prediction regarding the operations of natural phenomena under definite conditions. For science enables the relation between cause and effect to be traced, determines the response to specific influences and conditions; and since the knowledge it establishes is exact and unvarying it becomes possible to prophesy with certainty what will take place when certain conditions meet. The statement therefore expresses broadly the final function and attribute of science.

But beyond this, science is at once the source of exact knowledge and the means by which it is advanced. It supplies a background in accumulated information, and it permits a glance into the unknown which enables further advances to be made. It thus broadens the vision of problems and their nature, stimulates speculation, and suggests courses of action which may be productive. These are essentials of prophecy in respect to natural manifestations, without which there could be no progress in science.

Progress is the keynote of science. Science is never complete; it is in continual process of being added to. An answer suggests further questions and may reveal a possible means of solution. Science is therefore constantly searching, building new theories, advancing its boundaries step by step, making prophecy more sure. Investigation which is not thus characterized falls short of its purpose.

Science not only contributes substantial facts but it discloses more clearly the real nature of complex problems, making their solution more feasible; and it propounds new ones which are practicable of productive study. To propound problems and to analyze and define their character are important functions of science. These are first steps in the direction of progress, for they provide a starting point and a clearly defined purpose.

In agriculture it has acquired long years of research to lay bare the real underlying questions and suggest how they might be approached. The starting point was naturally provided mainly by general science, but it required special insight to develop out of the traditions and practices of this ancient art the scientific aspects of the underlying problems; to show, for example, what factors were actually involved in the growing of crops and the feeding of plants. The conditions prevailing in successful practice had to be studied, data accumulated extensively under a variety of circumstances, and the results of certain definite combinations recorded. Gradually a background of fact was accumulated which although imperfectly understood gave an insight into the situation and served as a basis for specific investigation.

The ultimate solution of an agricultural question may prove to be a relatively easy task after the real nature of the question is understood. This was the case with the problems of cheese making and curing, for example, after the actual factors involved had been made clear and separated so they could be studied. For many years there was great confusion in discovering and developing the laws of heredity, but Mendel taught that success depended in fixing attention, not on the organism as a whole but upon one after another of its various attributes or characters. Thus disintegrated, the problem of inheritance became simplified and susceptible of solution by the ordinary methods of experiment.

The understanding of what is fundamentally involved in a complex question of practice is still a necessary first step. It is the rôle of science in agriculture to disclose this in order that the solution may be unfolded and prophecy made possible.

There has been material progress in this direction, which has led to differentiation of large questions and getting down to significant features in their study. But the project lists of the stations still include many which are faulty in their breadth and complexity. The subjects are viewed as entities rather than as complexes. They relate to an ill-defined field or a line of work instead of a restricted topic to be studied in its nature and influence. As matters have developed they have proved to be over ambitious in their scope, and they sometimes result in considerable unproductive effort before a differentiation is made into features which are capable of productive study. Questions of soil, of the relation of cropping to fertility, of feeding and nutrition, for example, are found to be extremely complex as to their real nature, and can not be worked out successfully in their entirety as single investigations.

There is a distinction between what it might be desirable to do in the interests of science and practice and what it is feasible to accomplish at the present state of knowledge of problems and technique. Questions are frequently brought to the attention of the stations which it is not practicable to solve at present, either because there is not sufficient background to enable the problem to be understood or the methods and technique are deficient. Investigation can not successfully progress much faster than the methods and means of study advance, and often not more rapidly than investigation in the domain of general science clears the field and enables hypothesis and theory to be advanced.

Our station investigation affords instances of attempts to push inquiry beyond the point where general science has prepared the way. While the original investigator will develop new facts and new lines of reasoning or of attack, he will necessarily rely quite largely upon adapting existing knowledge and means to his ends. The pioneer must blaze his own way and build his own path, but if he attempts to get too far in advance the complications of agricultural problems are such that he meets obstacles involving not only his particular branch of science but others. Hence, short cuts are rarely feasible. In the effort to bridge too wide a gap between what is known and what is unknown, facts and methods are assumed that have not been proved and lead to delay and confusion.

A result of selecting projects which have proved complex or impracticable is reflected in the length of time certain of these have been carried without material modification. The program of the Adams fund sheds some light on this and on tendencies in project making. This fund, of course, does not embrace the full research program of the stations, but it fairly represents the more advanced effort.

The total number of active projects under the Adams fund at present is five hundred and thirty-six. This shows a remarkable activity in setting up projects accredited to a fund subject to provisions and formalities not applied to other station funds. It reflects a desire which has been apparent in many station workers to be associated with that fund, doubtless because of the standard it has come to represent. It is regarded as a sort of hall-mark of quality; and to come under its stamp many projects are included which receive only a small part of their support from that source. This will be obvious from the fact that the total number gives an average of over eleven projects to a station, the range being from four to nineteen; ten stations have fifteen or more projects assigned to the Adams fund.

The source of support is, of course, immaterial to the investigation, provided it is adequate, but with limited resources to supplement this research fund there is danger that it may be overloaded, to the evident detriment of the work. There have been such instances.

In some cases the expense of projects was clearly underestimated at the start, and in others provision has had to be made for assistance from other departments not originally contemplated, as chemistry or bacteriology for example, which makes added demands on the fund. Again, the ambition of workers to have connection with this fund has led, it is feared, to increasing the project list beyond what can be carried advantageously.

These conditions may be responsible in part for the length of time a considerable number of these projects have been under way. There are other factors, of course, and the fact that a project has been in operation a long time should not necessarily subject it to criticism. Often the reason is easily found in the nature of the project, frequent change in leadership, and the like.

Of the five hundred and thirty-six projects listed under the Adams fund, nearly one-third are now in their tenth season or over, and a considerable additional number are still carried, although temporarily suspended. Eighty-seven, or more than one-sixth of the total number, date back to the beginning of that fund, and hence are in their twelfth or thirteenth year.

In the sense that this points to a large measure of permanence of effort, the attacking of difficult questions not quickly solved, and persistence in the attempt to secure lasting results, the condition is highly commendable and represents a marked improvement over earlier years. But the profitableness of long-continued effort is measured by the degree of success and the extent to which the progress warrants it. If it represents adherence to a theme or a plan which has proved impracticable or incompetent, long continuance may indicate bad judgment. If it drifts from year to year without change of outlook or plan, it is either unproductive or does not take advantage of the progress and its teachings. It has either become stereotyped or it has proved too ambitious an undertaking and lacks the directive force to bring it to successful issue. In either case it has become a matter for administrative attention.

A common reason for questionable longevity of projects is believed to lie in a lack of definiteness in conceiving the project or of concentration upon significant parts; in the attempt to study as a whole subjects which are so comprehensive and involved that they are impracticable as units of investigation. Even though a subject may be outlined in quite general terms at the beginning, it is reasonable to expect that the situation will be clarified as the work advances. With the nature of the problem better understood the means of organizing the inquiry will become more evident. The phase may change from time to time, but if the study is systematic, although on a broad topic, one aspect after another will be taken up in accordance with the development of the plan. This makes the project thoroughly alive and progressive.

A considerable number of these long-time projects are quite broad in character. There has been a frequent tendency, particularly at the outset, to outline work in quite general terms, in the apparent desire to avoid restriction or the imposing of limitations. Sometimes this may be due to a lack of clarity, and hence to preference for wide latitude and range, manifestly a reason not to be encouraged. The difficulty of administrative control or of holding the work within definite bounds under broad project outlines is a large one.

It will be recognized that there are many subjects, like studies in breeding with plants and animals, the physiology of nutrition, the effects of soil treatment, the working out of intricate questions of disease, etc., which necessarily require long and persistent study and can not be hurried. They may or may not be ultimately rewarded with success. There are others which require the systematic accumulation of data under a variety of conditions and over long periods. But in neither case does this warrant limitation to routine effort or neglect of technical features which will be ultimately essential.

There are instances of failure to keep up with the project—of allowing data to accumulate without study as to where the results are leading, and of postponing chemical examinations or other laboratory studies until they are several seasons in arrears. In such cases progress of investigation is not guided by the light which the results cast. For the time being the element of inquiry is lacking, and the investigation is mainly in the prospective sense. The product of the undertaking consists in the accumulation of certain data, the unanalyzed evidence. At best these data are simply records, not established facts or even theories, because the breath of life has not been infused into them by interpretation and speculation. Such a condition represents the difference between routine and constructive effort.

The process of investigation is progressive in insight, in approach, and in method. It develops with the opening up of the subject by the results secured and those of other contemporary investigation. If the work is not progressive in this sense it is not a searching inquiry and critical study, but a methodical and more or less mechanical accumulation of data. If it does not advance step by step in the effort not only to contribute to the evidence but to perfect the attack, it misses the essential feature of research and proceeds on a mistaken estimate of the necessarily inherent value of data covering long periods. Experimental data are of value to and a part of investigation as they are applied to it. Already we have a broad background for investigation in most common subjects in agriculture. It is not necessary to spend time exclusively or mainly in taking data which may serve at some future time as the basis for research. The problem and the specific question are already at hand if we can discern them.

To cite a familiar example, it has long been known that land can be cropped continuously for a long time, often with surprising returns, and that fertility or productive capacity may be maintained and even improved by combinations of cropping systems, fertilizers, and soil treatment. Whether or not this is fundamentally true is no longer a question for lengthy experiment; the general truth is now matter for demonstration. The economic phase may need some development and local adaptation, but the underlying question for research lies beyond this point. It concerns the reasons, the changes in conditions and relationships which are brought about, the reciprocal relations of various classes of factors which are in operation, the means of maintaining the proper balance in these factors, and matters of this sort. These are not solved by growing and harvesting crops in rotation through a long period, even if the greatest possible care is observed, or by the chemical analysis of the crops and of the soils at intervals of several years, or even by sampling the plats occasionally for the usual bacteriological examination. Rotation and fertilizer experiments of themselves seem at present to be contributing relatively little that is new regarding the theory of plant feeding, soil fertility, and soil management. It is where such series of experiments are being utilized to study certain definite questions of limited range that they are productive of new light.

It is the purpose and use which give life to the taking of data and make their acquisition profitable. Correlation studies, for example, proceed through long periods and result in volumes of data, but unless they are interpreted in relation to some problem they do not directly advance knowledge, and a point is soon reached where their accumulation lacks the elements of research.

There is frequent reluctance to discontinue or abandon a line of study once taken up, even though it has not progressed satisfactorily. This reluctance is not necessarily confined to the leader but is shared by the station administration. Outlines of new projects are scrutinized critically, and often passed upon by a project committee, but after the projects are added to the program there seems a considerable disposition to allow them to take their course and not to question too closely their progress or the advisability of their continuance.

This attitude has much to commend it. It hesitates to acknowledge defeat, and it recognizes the detrimental effects of frequent change and the disposition of some to give up too easily. It reflects confidence in the worker. But this attitude should not stand in the way of a critical examination as to progress and the feasibility or competency of the undertaking. It should lead to modification or realignment which has become more logical or more promising of success; and it would be unfortunate if it stood in the way of a simplification of the inquiry by a narrower limitation of its range.

There is reluctance also on the part of some investigators to terminate a project after it has been practically concluded. They hesitate to state the results and close out the investigation for the present, on the ground that some new data may later come to light or some suggestion which will lead to further inquiry. No one would urge undue haste in publication or the dropping of lines of inquiry which were contributing new light or strength, but science is never complete and publication merely expresses the "time of day" in a given line of investigation.

With every regard for the time element in research and the desirability of thoroughness and deliberation, certain individual tendencies are sometimes encountered which need to be kept under observation. Unless this is done projects are likely to be carried from year to year after they have ceased to make progress and to all intents and purposes have reached their end as research inquiries. They thus become not only an element of expense but a tax on the investigator's time, serving to dissipate his energies and attention. The difficulties of "sugaring off" are among those which the administrative officer sometimes has to meet, and in these the personal equation often figures prominently.

Intensive and concentrated effort is the price of success in agricultural research. To be productive it requires close application, with critical attention to the accuracy and the meaning of the results. It is an intensive, diligent application of the powers of inquiry. Intermittent, fragmentary effort arrives late, if at all. It is uneconomical of the station's funds, and its encouragement breeds a habit which is detrimental to highest efficiency.

Not a few of the long-continued projects would probably have been further advanced or nearer conclusion if they had been energetically and systematically pushed forward. Various causes have contributed to prevent an aggressive, sustained attack upon them. In the past it has often been due to a multiplicity of duties. Sometimes it is a result of trying to carry too many lines of work, leading to a diversion of effort and attention. The relatively small progress from season to season has its effect upon the worker's zeal and enthusiasm.

It should be possible to determine after a reasonable time whether a project is making definite advancement, such as might be anticipated, or if it is encountering difficulties to ascertain whether these lie in a lack of close application or a diversity of duties or are inherent in the problem itself. The leader is the soul of research and he deserves the sympathetic counsel of the station administration.

This leads to the question of the personnel for research. The stations have suffered many changes and interruptions in the past two years. They have lost many men temporarily, and others have been tempted into positions offering larger remuneration. The stations have had to meet competition from within and without the colleges. There has been much difficulty in filling the vacant places and this difficulty seems to be on the increase. Recently less mature or adequately prepared men have been advanced or brought in from the outside and placed in charge of divisions or lines of station work. There is danger that the standards may be lowered, and at a time when they need to be fully maintained because of the increasingly complex and difficult nature of the problems the stations now have before them.

The vision which enables the setting of practicable tasks and the formulation of theory is a large factor in broadening the field of investigation and making progress possible. It is a great asset of the investigator, and it is one of the advantages of the study of science and its accomplishments in the making of an investigator.

It is important to avoid losing sight of the fact that productive investigation calls for a type of training which instills the idea of the essentials of research and its methods, as well as provides a store of knowledge as a foundation for it. The former is not less important than the latter to give originality, initiative, judgment, and authority. Unless these can be insured agricultural investigation can not measure up to expectations, and science will not fulfill its rôle of prophecy.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Organic chemistry for advanced students.—I, Reactions. II, Structure. III, Synthesis, J. B. Cohen (*New York: Longmans, Green & Co., 1918, 2. ed., pts. 1, pp. VIII+366, figs. 4; 2, pp. VII+435, figs. 65; 3, pp. VII+378*).—In the second edition of this work, which is intended to furnish a general survey of the fundamental principles which underlie the modern developments of organic chemistry, the former two volumes have been rearranged in three parts in order to group together allied subjects. The subject matter has been revised and brought up to date.

An introduction to chemical German, E. V. Greenfield (*Boston: D. C. Heath & Co., 1918, pp. XXIII+384*).—This book consists of a series of selections from German chemical literature with accompanying notes and vocabulary, prefaced by an introductory chapter in which the peculiarities in German participial construction and word composition are explained and a list of 500 words recurring constantly in German chemical literature is given.

New laboratory apparatus, H. Vigreux (*Ann. Falsif., 11 (1918), No. 121-122, pp. 385-387, figs. 5*).—Three forms of apparatus are described and illustrated by diagrams: (1) A distilling apparatus for ammonia determinations in which large surfaces for condensation of moisture are provided by a tube and condenser set with glass points, (2) a glass safety valve which has the advantage of being demountable, and (3) a new condenser by means of which distillation can be carried on rapidly without resulting loss.

Solubility of slag in weak organic acids, M. Sirot and G. Joret (*Ann. Chim. Analyt., 2. ser., 1 (1919), No. 3, pp. 80-85*).—Determinations are reported of the solubility of the different constituents of slag—phosphoric acid, carbonates, iron, magnesium, and sulphur—in very dilute organic acids, such as are secreted by the roots of plants. The results, which are reported in tabular form, show that all of these constituents as they exist in the slag are more or less readily soluble in the dilute organic acids employed, and that to a certain extent slag can serve as a composite fertilizer.

Note on the electrolytic preparation of dilute sodium hypochlorite solutions (Dakin's solution), G. E. Cullen and R. S. Hubbard (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 519-523, figs. 3*).—The strength of electrolytically prepared solutions of sodium hypochlorite is shown to depend upon temperature and salt concentration. The recommendation is made that from experimental runs curves showing the influence of these factors be constructed for each cell. From the initial temperature of the solutions, the time required for a solution of given concentration may then be determined. Ordinary 3 per cent sodium chlorid (or sea water) is said to be satisfactory, but if necessary to operate with relatively warm solution the salt concentrations should be increased. The solution should be stabilized as soon as it comes from the cell by one of the methods noted above.

Note on the stabilization of dilute sodium hypochlorite solutions (Dakin's solution), G. E. Cullen and R. S. Hubbard (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 511–517*).—A study is reported of the influence of various substances on the rate of decomposition of dilute sodium hypochlorite solutions with a view to determining a simple method of stabilizing the electrolytically prepared solutions for use as Dakin's solution.

It was found that 0.5 per cent sodium hypochlorite prepared by the electrolysis of sodium chlorid may be conveniently stabilized for use as Dakin's solution by the addition of 0.5 per cent borax, of from 0.5 to 1 per cent of carbonate mixtures of pH 10 to 9.5, or by the addition of 0.2 gm. of sodium hydroxid per liter. The use of borax is said to combine a maximum of convenience and safety.

The solubility of casein in dilute salt solutions and its dependence on the H-ion concentration, S. Ryd (*Ark. Kemi. Min. och Geol., 7 (1917), No. 1, pp. 1–15, figs. 4*).—The solubility of casein in dilute solutions of common salt was determined by the use of an apparatus in which the exact strength of the salt is determined by titration of sodium hydroxid and hydrochloric acid, and in which the mixture of casein and salt solution is thoroughly stirred by means of a paddle operated by a small motor.

The solubility of the casein was found to depend upon the H-ion concentration of the solution. Opalescence began to appear at a constant H-ion concentration in the neighborhood of the isoelectric zone.

The chemical composition of Agave americana, with remarks on the chemistry of succulent vegetables in general, J. Zellner (*Hoppe-Seyler's Ztschr. Physiol. Chem., 103 (1918), No. 1, pp. 2–10*).—The author reports the chemical composition of *A. americana* to be as follows: Petroleum ether extract 1.03 per cent, ether extract 0.74, water extract 50.75, and insoluble matter 47.48 per cent. The water extract consisted of amorphous carbohydrates (calculated as $C_6H_{10}O_5$) 12 per cent, sugar (calculated as glucose) 12.68, malic acid (estimated) 8, free acid (in H-ions) 0.02, ash extract 7.54, and other unidentified substances 10 per cent. The insoluble matter consisted of crude cellulose 17.85 per cent, pentosan 7.44, methyl pentosan 1.01, pectin, hemicellulose, oxalates, etc. (by difference) 13, mineral matter 4.82, and crude proteins (including the so-called soluble nitrogen-containing matter) 3.25 per cent.

It is pointed out that the composition of the agave differs from that of ordinary green foliage leaves, in addition to its higher water content, in having a higher content of water-soluble material, of calcium malate, and of sugar, a considerable amount of pectin-like matter, a low content of nitrogen-containing substances, and a deficiency in iron. These differences are considered for the most part to be characteristic of succulent leaves.

The possibility is suggested of extracting the juice of the leaves and evaporating it in vacuo, the resulting product being a sweet, slightly acid marmalade suitable for human consumption.

The distribution and characters of some of the odorous principles of plants, F. B. Power (*Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 344–352*).—The botanical classification has been employed in the discussion of the distribution of the odorous principles of plants, points of chemical interest connected with them, and their important uses. The value of essential oils in commerce is noted briefly.

Para cymene.—I, Nitration, mononitrocymene, C. E. Andrews (*Jour. Indus. and Engin. Chem., 10 (1918), No. 6, pp. 453–456*).

Intermediates used in the preparation of photosensitizing dyes.—I, Quinolin bases, L. A. Mikeska, J. K. Stewart, and L. E. Wise (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 456–458*).

Intermediates used in the preparation of photosensitizing dyes.—II, Quaternary halids, C. H. Lund and L. E. Wise (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 458–460*).

Synthesis of photosensitizing dyes, pinaverdol and pinacyanol, L. E. Wise, E. Q. Adams, J. K. Stewart, and C. H. Lund (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 460–463, figs. 4*).

The determination of total nitrogen including nitric nitrogen, B. S. Davisson and J. T. Parsons (*Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 306–311, fig. 1*).—The authors, at the Ohio Experiment Station, report an investigation of the suitability for studies in soil biology of various methods of determining total nitrogen, including nitric nitrogen, and descrbe a new method which is considered to be easy of manipulation and extremely accurate.

The procedures designated as official were found to be unsuitable for use in soil biology investigations where large volumes of solutions must be employed, and the Ulsch method was found inaccurate in the presence of much organic matter. The method found most satisfactory involves a combination of the method described by Allen [1] for nitric nitrogen with the method of Mitscherlich, Herz, and Merres (E. S. R., 21, p. 208) for total nitrogen, including nitrates. The technique is as follows:

The solution (200 cc. of soil extract) is placed in a 500 cc. Kjeldahl flask and sufficient 50 per cent NaOH added to make the solution N/10 in NaOH. To the solution are added 4 drops of oil and 1 gm. of Devarda's alloy (60 mesh, made free from ammonia by heating to about 200° C. for 30 minutes), and the flask is connected with a digestion tower containing a column of glass beads and 35 cc. of H_2SO_4 (4:1). The solution is heated to boiling in minimum time and kept boiling gently for 20 minutes, during which time the acid in the tower just about reaches the boiling temperature. The flame is then removed and the acid is allowed to suck back into the flask. After boiling the solution a few minutes longer, the flame is removed and the tower is washed four times with 25 cc. of distilled water, which is allowed to suck back into the flask. The solution is then evaporated to charring, 5 gm. of K_2SO_4 added, and the digestion continued for about an hour after becoming bluish. After digestion a considerable excess of strong NaOH containing K_2S or Na_2S is added and the ammonia distilled.

It is suggested that the difficulty with foaming in fertilizers containing considerable insoluble organic matter may be avoided by heating the sample to boiling with 50 cc. of water, filtering through a small nitrogen-free filter into the Kjeldahl flask, and washing the residue and beaker several times with hot water. After reduction of the soluble nitrates as described, the filter paper with residue is added to the flask, together with 5 to 7 gm. of K_2SO_4, and the mass digested.

The results obtained by the use of this method are said to be extremely accurate, as loss of gaseous nitrogen is prevented and the amount of interfering substances reduced by the use of dilute alkali and loss of ammonia is guarded against by means of the absorption device.

A method for the rapid reduction of potassium platinic chlorid, Horsch (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 3, pp. 167–169*).—The method consists essentially of the reduction of the potassium platinic chlorid to metallic platinum by means of alcohol at boiling temperature in a platinum crucible. The reduction takes place only in the presence of platinum and with dilute solutions of the salt. Formaldehyde reduces the salt more slowly and forms

[1] Jour. Indus. and Engin. Chem., 7 (1915), No. 6, pp. 521–529.

a less even deposit of platinum. Allyl alcohol causes no reduction. The method as described is said to be rapid and complete.

The gravimetric and volumetric determination of mercury precipitated as mercury thiocyanate, G. S. JAMIESON (*Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 296, 297*).

Colorimetric determination of organic substances, H. HEIDENHAIN (*Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 297–299, fig. 1*).—A method is described for the colorimetric determination of organic substances which is an application of the author's method for the volumetric determination of organic substances.[1] This is based on the fact that organic compounds can be oxidized by a mixture of a dilute solution of potassium bichromate and sulphuric acid with the production of different shades of color from pure green to orange, depending upon the amount of the organic substance present.

The standards are prepared by boiling for five minutes with a reflux condenser a mixture of 25 cc. of N/5 bichromate solution, 30 cc. of concentrated sulphuric acid, and varying amounts (from 2.5 to 25 cc.) of the pure compound which is to be determined in the substance tested. The solutions after cooling are transferred to cylindrical bottles and made up to 80 cc.

For the determination of the substance 25 cc. of a solution of the substance to be tested, the concentration of which must not exceed that of the N/5 solution, is treated as above with 25 cc. of the N/5 bichromate solution and 30 cc. of sulphuric acid, made up to a volume of 80 cc., and compared with the standards. It is said that substances to be tested may be dissolved in alkalis, ammonia, and sulphuric and acetic acids, but that hydrochloric and nitric acids interfere with the test.

Suggested uses of the method are the determination of carbohydrates in waste liquors of glucose plants, of glycerol in soap lyes, of tartrates in baking powders, and of alcohol in vinegars.

The determination of zinc and copper in gelatin, G. S. JAMIESON (*Jour. Indus. and Engin. Chem., 11 (1919), No. 4, pp. 323–325*).—The author, at the Bureau of Chemistry of the U. S. Department of Agriculture, describes a method for determining zinc and copper in gelatin. This depends upon the hydrolysis of the gelatin with hydrochloric acid, precipitation of the zinc and copper with ammonium sulphid, and subsequent separation of the two metals by solution of the sulphids in nitric acid and reprecipitation of copper with hydrogen sulphid and of zinc from the filtrate with ammonium sulphid. Both are converted into oxids and determined gravimetrically.

The technique is described in full and it is stated that in order to obtain satisfactory results the directions must be followed in every detail.

The chemical investigation of spoiled meat, K. G. FALK, E. J. BAUMANN, and G. MCGUIRE (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 525–546, figs. 9*).—The experiments reported here were conducted for the most part on samples of meat or meat broth inoculated with organisms isolated from meat thought to be responsible for actual cases of poisoning. The general method employed was to study the chemical changes produced by the organism in the following components: Total nitrogen, nonprotein nitrogen, ammonia nitrogen, total creatinin nitrogen (creatin plus creatinin), and purin nitrogen. Most of the organisms were of the colon-typhoid group, but for comparison *Streptococcus brevis* and the spore-forming *Bacillus subtilis* were used. The methods employed for each determination are described in detail and the results obtained reported in tabular form.

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[1] Jour. Amer. Chem. Soc., 15 (1893), No. 2, pp. 71–77.

The results show marked differences as well as similarities in the action of the different strains, indicating that bacteria exert certain selective actions on definite substances or groups of substances. The one common factor was the increase in the ammonia content, the significance of which is discussed in the following paper.

Ammonia test for meat spoilage, K. G. FALK and G. McGUIRE (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 547–550*).—The marked increase in ammonia content of meat decomposing at room temperature, as noted in the above investigation, suggested the possibility of using this factor as a chemical test for indicating spoilage of meat. This paper presents a discussion of the results obtained in ammonia determinations by the aeration method and the permutite method of Folin and Bell (E. S. R., 37, p. 311) on samples of meat (beef) undergoing decomposition at room and at low temperatures.

At ordinary temperatures bacterial growth was rapid, especially at the higher temperatures, and the meat was soon unfit for use, in some cases after 24 hours. At low temperatures, there was considerable growth of mold with little bacterial growth, but after trimming off the mold the meat was still suitable for use after standing for three or four weeks at a temperature varying between 0 and 5° C., and for a much longer time with still lower temperatures.

The ammonia content of the two forms of spoiled meat differed greatly. The fresh meat (beef within 24 hours of slaughter and chilled) contained between 0.08 and 0.1 mg. of ammonia nitrogen per gram of meat. Meat decomposed at room temperature (15–25°) became unsuitable for food when the ammonia nitrogen content reached from 0.3 to 0.4 mg. per gram of meat. At low temperatures the ammonia content was much higher before the meat was unsuitable to eat, varying from 1 to 3 mg.

In interpreting these results, especially in connection with the work of Hoagland and others (E. S. R., 36, p. 759) who considered the increase in amino nitrogen to be the best measure of extent of autolysis in cold-stored meats, the authors point out that at room temperature bacterial growth "is comparatively rapid and the meat becomes unfit for food even with a low ammonia content. At low temperatures, bacterial growth is slow, but antolysis proceeds so that the cleavage products, such as ammonia and compounds rich in amino nitrogen, increase greatly without the formation of those products whose odor, appearance, and general flavor make the food unsuitable for use. If the meat is kept cold first, autolysis proceeding, and then is brought to room temperature, decomposition would be much more rapid because of the simpler products formed by autolysis, which would serve as nutriment for bacteria and greatly increase their growth. This may be one reason, in addition to the physical effects of the breakdown of cell walls by freezing, for the more rapid decomposition of meat which has been in cold storage for some time."

Note on the determination of blood sugar by the modified picric acid method, S. R. BENEDICT (*Jour. Biol. Chem., 37 (1919), No. 4, pp. 503, 504*).—The author refers to the statement of Rohde and Sweeney, previously noted (E. S. R., 40, p. 116), in regard to the failure of certain samples of the picrate-picric acid solution to precipitate proteins or chromogenic substances in the blood, and states that a study of the question has shown that for proper precipitation of the blood the solution must have an acidity as high as N/20 or N/25, as determined by titration of a portion of the solution with alkali, using phenolphthalein as indicator. Titration of the final solution is said to be necessary only when a portion fails to precipitate the blood properly. Such a solution may be corrected by the addition of a quantity of glacial acetic acid sufficient to bring the acidity between N/20 and N/25. An excess of acid should be avoided.

A simplification of the McLean-Van Slyke method for determination of plasma chlorids, D. D. Van Slyke and J. J. Donleavy (*Jour. Biol. Chem.*, *37* (*1919*), *No. 4*, *pp. 551–555*).—The authors describe a simplification of the original McLean and Van Slyke method for the determination of plasma chlorids. This consists essentially in adding picric acid to the standard silver nitrate, the technique then involving only one filtration and the measurement of an aliquot part of the filtrate for titration. The method is said to be practically identical with the one described by Rappleye (E. S. R., 39, p. 807), the only difference being the use of iodid instead of sulphocyanate for titrating excess silver.

The necessity is pointed out of exceptional accuracy in the estimation of plasma chlorids and the calibration of all glass measuring apparatus required for the determination.

Laboratory manual of Pfister and Vogel Leather Company laboratories, compiled by L. E. Levi (*Milwaukee, Wis.: Pfister & Vogel Leather Co.*, *1918*, *pp. 93*).—This manual contains laboratory directions for the preparation of standard solutions and for the analysis of leather and various tanning materials, oils, soap, urine, various acids, drugs, and dyes. The manual also contains a reprint of the official methods of the American Leather Chemists' Association, and tables of equivalents of standard solutions, chemical factors, and a comparison of Centigrade and Fahrenheit scales.

The American Leather Chemists' Association, 1918 (*Amer. Leather Chem. Assoc.* [*By-laws, etc.*], *1918*, *pp. 43*).—This is the customary annual, previously noted (E. S. R., 32, p. 314), containing the by-laws of the association; official methods for the analysis of vegetable materials containing tannin and of vegetable tanned leather, and for sampling tanning materials; and provisional methods for the analysis of one-bath chrome liquors, chrome leather, sulphonated oils, moellons, hard greases, and lactic acid.

Researches on and means to prevent rancidity of vegetable margarin, H. C. Jacobsen (*Onderzoekingen Betreffende het Ransig Worden van Plantenboter en de Middelen ter Bestrijding. Oss: Lab. "Ant. Jurgens' Margarinefabrieken,"* *1918*, *pp. 72*; *abs. in Folia Microbiol.* [*Delft*], *5* (*1918*), *No. 2*, *pp. 94–102*; *Chem. Weekbl.*, *15* (*1918*), *No. 24*, *pp. 757*, *758*).—The investigations of Jensen (E. S. R., 14, p. 289) on the causes of rancidity of butter and those of Fischer and Gruenert (E. S. R., 26, p. 778) on the action of preservatives on butter and margarin are reviewed, and similar investigations on vegetable margarin are reported.

The bacteriological studies reported indicate that the rancidity of vegetable margarin is due to the development in the presence of moisture of certain kinds of molds, particularly *Penicillium glaucum* and the yeastlike mold *Cladosporium butyri*. A study of the effect of different preservatives on the growth of these organisms in margarin showed that if salt alone is used from 2.5 to 3 per cent is necessary, according to the percentage of water in the margarin. Two per cent of salt was found sufficient with the addition of 0.075 per cent benzoic acid, 0.2 per cent sodium benzoate, a mixture of 0.05 per cent benzoic acid and 0.05 per cent sodium benzoate, or a mixture of 0.4 per cent borax and 0.2 per cent boric acid.

The author concludes that rancidity of vegetable margarin can not be prevented without the use of preservatives.

Grain as a source of fat, P. Lindner (*Umschau*, *22* (*1918*), *No. 49*, *pp. 634–636*, *figs. 6*).—The possibility is suggested of utilizing the aleurone cells of grains, such as barley, wheat, and oats, as a source of oil by digesting the cells with dilute hydrochloric acid and extracting the oil with ether in a Soxhlet extraction apparatus.

Dry sugar-beet powder and its possible utilization in Minnesota to partly replace refined sugar (*Minnesota Sta. Rpt. 1918, pp. 43, 44*).—Sugar beets were pared, washed, sliced, dried, and the dried product ground to a coarse powder, analysis of which showed a sucrose content of approximately 60 per cent and a raffinose content of approximately 8.5 per cent. The sugar-beet powder was used in making different types of products carrying sufficiently high seasoning to veil the flavor of the beet but in no case was it possible to secure a palatable product without the use of some other sweetening agent. Similar tests with sugar-beet sirup prepared by the method outlined by Townsend and Gore (E. S. R., 37, p. 511) indicate that the sugar-beet sirup can be used to much better advantage than the sugar-beet powder in replacing cane sugar.

Orange vinegar instead of apple product in citrus regions (*Cal. Citrogr., 3 (1918), No. 11, p. 257, fig. 1*).—A process for the manufacture of orange vinegar in barrel quantities is described which is said to produce vinegars equal to the best grades of cider vinegar.

METEOROLOGY.

Influence of the velocity of the wind on the vertical distribution and variations of meteorological elements in the lower layers of the atmosphere, C. E. Brazier (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 3, pp. 179–182; abs. in Rev. Sci. [Paris], 57 (1919), No. 3, p. 91*).—Observations on the Eiffel tower show that below 300 ft. the average distribution of the meteorological elements depends upon the velocity of the wind. The barometric pressure is inversely proportional to the velocity of the wind. Temperature approaches the adiabatic distribution more closely the quieter the air. At about 200 ft. the amplitude of daily variation of temperature is independent of the wind velocity.

Nocturnal cooling of the lower layers of the air and the surface of the soil in relation to the humidity of the air, A. Defant (*Met. Ztschr., 35 (1918), No. 9–10, pp. 224–245, figs. 3*).—Observations bearing on this subject are critically discussed, and are shown to indicate that the higher the humidity of the air the less is the nocturnal cooling, and that the warmer and the drier the air at sunset the greater is the nocturnal cooling.

[Observations on aerology] (*U. S. Mo. Weather Rev., Sup. 14 (1919), pp. 132, pls. 8, figs. 2*).—This supplement contains the following articles: Free-air Data at Broken Arrow, Okla., Drexel, Nebr., Ellendale, N. Dak., and Royal Center, Ind., Aerological Stations, July to September, 1918, inclusive, by W. R. Gregg; Broken Arrow Aerological Station, by J. A. Reihle; and Royal Center Aerological Station, by H. W. Ball.

A simple nonabsorbing atmometer mounting, E. S. Johnston (*Plant World, 21 (1918), No. 10, pp. 257–260, fig. 1*).—A simple modification of the Shive mounting to prevent the absorption of rain by porous cup atmometers is described.

The measurement of rainfall and snow, R. E. Horton (*Jour. New England Water Works Assoc., 33 (1919), No. 1, pp. 14–71, figs. 21*).—This paper describes methods of measuring rainfall and snow and discusses the errors and accuracy of such measurements, particularly with reference to the use of the data so secured by waterworks engineers.

Some practical uses of rainfall records, L. M. Hastings (*Jour. New England Water Works Assoc., 33 (1919), No. 1, pp. 72–81, pls. 2, figs. 5*).—This article discusses the use of rainfall records in New England in connection with the construction and management of waterworks.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 5 (1918), Nos. 11, pp. 104, pls. 5, figs. 2; 12, pp. 211, pls. 4, figs. 2*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1918, respectively.

Thirty-year synopsis: Meteorological observations made at Berkeley from July 1, 1887, to June 30, 1917, B. M. VARNEY (*Univ. Cal. Pubs. Geogr., 2 (1919), No. 1, pp. 19, figs. 7*).—This synopsis was made in accordance with the custom of summarizing the climatic data of Berkeley, Cal., at five-year intervals, and contains the same kind of data presented in the same way as in previous reports (E. S. R., 31, p. 316).

The weather of the year 1917, A. J. CONNOR (*Statis. Year Book Prov. Quebec, 1918, pp. 99–109, figs. 8*).—Observations on temperature, precipitation, and sunshine at various stations in the Province of Quebec are summarized in tables. The method, described in a previous report (E. S. R., 38, p. 716), of combining temperature data with rainfall data to produce a weather index for each month and each station is applied to the data here recorded in a series of maps giving the value of such indexes for Quebec and the adjacent portions of neighboring provinces. A modification of the method of preparing such indexes for the month of September is explained.

On warm and cold summers, G. HELLMANN (*Abs. in Sci. Abs., Sect. A—Phys., 22 (1919), No. 254, p. 57*).—"A new method of climatological classification of summers is developed and applied to the long series of observations at Berlin. In the last 90 years in which extremes of temperature have been determined by maximum and minimum thermometers, the hottest summers were those of 1834, 1868, 1911, and the coldest were those of 1840, 1844, 1871, 1913, 1916. The conditions favorable for hot summers are very similar to those favorable for cold winters."

Phenological observations during 1917 and 1918, H. BOS (*Cultura, 30 (1918), No. 364, pp. 363–370*).—The usual observations, mainly on forest and fruit trees and shrubs, at 21 places in Holland are recorded and briefly discussed.

The influence of the weather on the yield of wheat, A. HOWARD (*Agr. Jour. India, 11 (1916), No. 4, pp. 351–359*).—It is shown that the major climatic factors affecting the yield of wheat in India are the amount and distribution of rainfall, especially the latter. Next in importance to rainfall is the soil temperature, it being especially important that the soil and subsoil shall have cooled down sufficiently before wheat is seeded.

The Australian environment (especially as controlled by rainfall), G. TAYLOR (*Advisory Council Sci. and Indus., Aust., Mem. 1 (1918), pp. 188, pls. 18, figs. 167*).—This is a detailed account of "a regional study of the topography, drainage, vegetation, and settlement, and of the character and origin of the rains" of Australia. It is the third of a series of memoirs dealing with the climatic control of settlement in Australia.

An effort is first made to explain the solar control of the march of the tropical rain belt and the structure of the monsoon in Australia. The normal or average conditions in the various regions are then shown, as an aid to the forecaster, the regions where forecasting is simple being distinguished from those where it is more difficult. As a result, a "rain reliability" map is given which shows where the rainfall is dependable and where erratic, and is of special agricultural as well as meteorological value. Rainfall uniformity is also charted, which shows where continuous rainy months are to be expected. The distribution of vegetation is dealt with at length. "It is the chief response of nature to rainfall, and is very closely bound up with the season and abundance of the rain."

The results of a study of the interaction between rainfall and man are embodied in a "climograph" chart, which shows "at a glance how the seasonal changes in moisture affect the comfort and health of the people in the region concerned." By a similar graphical means, the "hythergraph," the distribution of plant life and conditions under which certain crops are likely to succeed, are indicated. Australia is divided into 15 major rainfall regions, of which the physiography and the origin, distribution, and effects of rains are discussed in detail with the aid of numerous maps and diagrams.

Discussing generalized conditions for Australia as a whole, it is pointed out that "the best known feature of Australian meteorology is the arid center and its encircling belts of progressively wetter country. This arid area is, however, eccentric—so much so that its western margin reaches the ocean at Shark's Bay in western Australia. The arid region is, of course, due to presence of constant southeast trade winds, which blow to the north of the belt of high pressures. Where these blow from sea to land, as in the east, there is a fairly uniform rainfall; where they blow from land to sea, as in the west, there is practically a desert. The central region is also traversed by these southeasters, and as the moisture has already been largely deposited on the eastern highlands, there is no supply for the center. Moreover, the wind has a southerly component, and so is gradually approaching warmer regions, and this again decreases the chances of rain. . . .

"The absence of forests in northern Australia is seen to be associated with the lack of uniform rain in that region, though the totals amount to very considerable figures."

Of the two main climatic factors, heat and moisture, the latter appears to be dominant as regards vegetation in Australia. Classifying the vegetation areas with respect to rainfall and temperature, it is found that "the agreement with the former is extremely close, but the vegetation zones lie across the isotherms and have little relation to them." Conditions under which wheat, rice, cotton, tea, and coffee are likely to succeed are indicated by means of the "hythergraphs."

The progressive desiccation of Africa: The cause and the remedy, E. H. L. Schwarz (*So. African Jour. Sci., 15 (1918), No. 3, pp. 139–190, figs.* 8).—The author explains the patent fact that Africa is drying up as due to the progressive encroachment of the coastal streams upon the interior elevated drainage area of the continent. The remedy proposed is to build a series of barrages which will prevent the inland drainage waters from being carried away uselessly to the sea. The drainage systems involved and the practicability of the protective measures proposed are discussed in detail.

SOILS—FERTILIZERS.

Soil erosion in Iowa, E. E. Eastman and J. S. Glass (*Iowa Sta. Bul. 183 (1919), pp. 345–391, pl. 1, figs. 32*).—The nature of soil erosion, its causes, and effects with respect to conditions in Iowa are discussed, and suggestions made relative to the control and prevention of erosion with particular regard for methods successfully employed in different parts of the State.

It is stated that no one method of prevention or control can be recommended for all conditions, and that preventive measures are better than remedial ones. For medium-sized and large gullies a carefully constructed earth dam with surface inlet known as the Christopher or Dickey dam is said to be the least expensive method of control and also the most generally applicable to Iowa conditions. Provision for a surface inlet for the removal of water from above the dam and a proper foundation are deemed essential to the success of any type of dam.

The estimated cost of installing the various control methods outlined is presented in each case.

Recent investigations on soil aeration, A. HOWARD and R. S. HOLE (*Agr. Jour. India, 13 (1918), No. 3, pp. 416–440, pls. 6, figs. 7; abs. in Chem. Abs., 13 (1919), No. 1, p. 51*).—This article reviews investigations by the authors and others showing the importance of soil aeration in crop production and forestry.

Vegetation on swamps and marshes as an indicator of the quality of peat soil for cultivation, T. J. DUNNEWALD (*Jour. Amer. Soc. Agron., 9 (1917), No. 7, pp. 322–324*).—This paper, a contribution from the Wisconsin Experiment Station, briefly describes field observations made on scattered marshes and swamps in the northwestern part of the State, supplemented by a laboratory examination of representative samples of peat bearing different classes of vegetation, in an effort to determine whether chemical conditions favorable or unfavorable to cultivated crops obtain in different areas of peat and whether the vegetation parallels such conditions.

The field studies indicated that spruce and tamarack peat areas were the wettest, having the water table practically at the surface of the soil, and possessed a covering of from 12 to 18 in. of spongy moss. The depth of the peat, distance from shore, and extent of decomposition of the peat appeared to have little effect on the kind of surface growth. While the rawest samples of peat occurred in the spruce and tamarack areas, it is stated that as often the peat was as well decomposed on these areas as under elm, birch, ash, or grass.

The laboratory analysis indicated that peat bearing black spruce and tamarack had approximately 20 per cent less mineral matter, a much greater degree of acidity (Truog method), and somewhat less nitrogen than that from areas bearing various mixtures of ash, birch, balsam, poplar, elm, cedar, tamarack, willow, pine, or grass. As a result of these observations, the author concludes that "while the greater acidity present in the spruce and tamarack peats may be due to more continued flooded conditions on those swamps, and while drainage experience shows that this acidity often disappears largely after the drainage and cultivation of the peat, we believe the data support the farmer's statement that such trees as ash, elm, birch, and white pine on peat indicate a better quality of the material than that where only black spruce, tamarack, sphagnum moss, blueberries, and cassandra grow."

A study of soil solutions by means of a semipermeable membrane supported on a porous clay plate, G. L. SCHUSTER (*Jour. Amer. Soc. Agron., 9 (1917), No. 7, pp. 333–340, pl. 1, figs. 3*).—This paper, a contribution from Ohio State University, describes experimental work undertaken in an effort to determine the concentration of the soil solution in terms of a given sugar solution by means of a copper ferrocyanid membrane supported on a porous clay plate. The preparation of the membrane and its use in these studies are described.

Samples of sandy loam, muck, and clay soils were taken from the surface 6 in. and placed in cylinders in as nearly a natural condition as possible, and the strength of the soil solution measured against that of a 5 per cent sugar solution in the case of the sandy loam and clay, and a 2 per cent solution in the case of the muck. The experiments were conducted in duplicate and frequent readings made on graduated pipettes of the rise in the sugar solution. Although the data are regarded as rather limited they are held to indicate that "the concentration of the soil solution (measured in terms of osmotic pressure) in sandy loam and clay appears to be below that of a 5 per cent sugar solution and that of muck below that of a 2 per cent solution."

[Report on soil work in Washington] (*Washington Sta. Bul. 153 (1919), pp. 10, 11, 27–32, figs. 2*).—This describes the progress in soil fertility investigations for the year ended June 30, 1918.

The distribution to farmers of legume inoculating material in sand is said to have given good results in the field, but to have caused some damage to drills, so that cultures are now furnished on agar media.

The application of straw appeared to have a depressing effect upon nitrification. This was overcome in about one year's time, when a beneficial residual effect was noted.

Observations covering a period of six years on Palouse soil are held to indicate that the total supply of moisture for the growing plant was not affected by variations in the tillage of the summer fallow, although its distribution in the soil was affected. Moisture held in the surface foot of soil during the warm portion of the year had a favorable effect upon nitrification. Wheat yields varied almost in direct proportion to the nitrate content of the soil.

Moisture and nitrate determinations made on tillage plats at the Lind Dry Land substation indicated that various tillage methods affected the nitrate content of the soil even more than the moisture content.

Data are presented showing the increase in nitrogen and carbon content of different soils grown to alfalfa for various lengths of time as compared with soils under clean cultivation. The maximum increase of both nitrogen and carbon occurred on Palouse soils grown to alfalfa for 12 years and amounted to 4,150 and 71,500 lbs. per acre, respectively, to a depth of 4 ft.

The "alkali" content of soils as related to crop growth, F. T. SHUTT and E. A. SMITH (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 12 (1918), Sect. III, pp. 83–97, figs. 5*).—This comprises a preliminary report on work that is to be continued over a number of seasons in order to obtain evidence as to the limits of tolerance of alkali of various farm crops and to ascertain the extent and manner of distribution of alkali by irrigation, both with and without drainage. It is proposed eventually to establish standards of safe limits of alkali for Canadian conditions similar to those employed in this country.

The present paper deals with observations made on five series of soils grown to western rye grass, native prairie grass, oats, wheat, and onions, respectively, each series including areas of good, poor, and no crop growth. Tabulated data showing the nature and total amount of the saline content of the different soil groups for depths of 0 to 0.5, 0.5 to 1.5, 1.5 to 3, and 3 to 5 ft., are depicted graphically for each crop area, and are briefly discussed.

The translocation of calcium in a soil, B. D. WILSON (*New York Cornell Sta. Mem. 17 (1918), pp. 299–324, figs. 3*).—Pot experiments are described in which an effort has been made to ascertain the nature and extent of the movement of calcium in Dunkirk clayey silt loam soil. The soil in the pots was divided into three layers by means of wire netting, the treated layer containing 3 kg. of soil, and the two remaining layers 5 kg. each. The investigations comprised three series of experiments, embracing observations on the effect of different quantities of calcium oxid and calcium carbonate (including ground limestone passed through a 100-mesh sieve and held on a 200-mesh sieve, and precipitated calcium carbonate) applied to either the surface or the bottom layer and leached for six months or one year with distilled water equivalent to a yearly rainfall of 36 in.; the effect of 9,000 lbs. per acre of calcium carbonate applied to the surface layer as ground limestone in various degrees of fineness and as precipitated calcium carbonate and leached with distilled water for one year; and a comparison of the diffusibility of calcium in cropped (oats) and uncropped soil treated with 3,000 lbs. per acre of calcium oxid and leached with distilled water for five months. All tests were made in quadruplicate.

At the end of the experiments the different soil layers were sampled and the amount of calcium occurring in the two untreated layers determined. The data are presented in tabular form and have been subjected to a statistical interpretation. The results may be summarized as follows:

Neither small nor large amounts of calcium applied to the surface layer of a clayey silt loam soil in the form of burned limestone, ground limestone, or precipitated calcium carbonate moved downward in the soil to any appreciable extent when the soil was leached in pots for one year with distilled water. Similar applications of calcium made to the bottom layer of soil failed to show any upward diffusion. The fineness of division of ground limestone did not influence the movement of calcium through the soil, there being no apparent difference between that ground to pass a 200-mesh sieve and that held on a 32-mesh sieve. Precipitated calcium carbonate gave similar results. Oats grown on soil treated with calcium oxid did not bring about a descent of calcium to the untreated soil layers.

Continuing further, the author states that "it seems logical to believe that a soil deficient in calcium will absorb this constituent from the drainage water as it percolates through the soil. No doubt this occurs, but the amount held by the soil is evidently so small that it can not be detected by a chemical analysis. Conclusions drawn from small differences of calcium found in soil upon analysis are hardly trustworthy, as it is often difficult to obtain concordant results from the same sample of soil. When small differences are calculated to pounds of calcium in an acre-foot of soil, as is often done, the real value of such results is questionable."

On an electrical method of determining the lime requirement of soils, C. J. Lynde (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 12 (1918), Sect. III, pp. 21–26*).—Observations on the lime requirements of a number of field soils receiving different manure and fertilizer treatments are described in which a comparison was made of the results found by the Rothamsted method (E. S. R., 33, p. 622) and by the so-called electrical method. By means of a Kohlrausch bridge determinations were made of the electrical resistance of solutions formed by shaking 10 gm. of each soil with 150 cc. of distilled water of the original $Ca(HCO_3)_2$ solution, and of the solution formed in the Rothamsted tests by shaking 10 gm. of each soil with 150 cc. of $Ca(HCO_3)_2$ solution.

From these data was calculated the resistance the $Ca(HCO_3)_2$ solution must exhibit after being shaken with the soil in order to give the resistance observed in the soil and $Ca(HCO_3)_2$ solution, assuming that the resistance of the soil solution remained constant. If the calculated resistance r was greater than the original resistance r_1 of the $Ca(HCO_3)_2$ solution it was thought to indicate that $CaCO_3$ had been absorbed by the soil and that the soil was acid. On the other hand if r was less than r_1 it was thought to indicate that something had been dissolved from the soil, and since there was an excess of CO_2 in the solution it was deemed likely that the substance was a carbonate and that the soil was alkaline. The ratio of r to r_1 is believed to give a measure of the alkalinity or acidity of the soil. In these tests it was noted that a ratio of 0.986 or less indicated an alkaline soil and that the lower the ratio the greater the alkalinity, while a ratio of 1.284 or above indicated an acid soil and the higher the ratio the greater the acidity.

Soil solutions were found to have the same electrical resistance when cloudy as when cleared by centrifuging.

The effect of heat on the lime requirements of soils, H. A. Noyes (*Jour. Amer. Soc. Agron., 11 (1919), No. 2, pp. 70, 71*).—This paper, a contribution from the Indiana Experiment Station, describes observations made on a residual silty clay loam soil underlain with limestone rock to ascertain whether evaporation on the steam bath occasions changes that affect the acidity as determined by the Veitch method (E. S. R., 16, p. 14). Soil samples were taken at different depths and in different places in the field, air dried, and all material except that of a stony nature reduced to pass through a 1-mm. sieve. The samples were then tested by the Hopkins potassium nitrate method and by the Veitch method, using no lime water, with and without evaporation on the steam bath.

The results are held to show that "there are reactions taking place in the soil at the steam bath temperature that do not take place when the soil and water mixture is not heated. The Veitch determination gives the reactions between soil, water, and calcium hydroxid at steam bath temperature, and does not represent the lime requirement of the soil at ordinary temperature."

Studies on proteolytic activities of soil microorganisms, with special reference to fungi, S. A. WAKSMAN (*Jour. Bact., 3 (1918), No. 5, pp. 475–492, figs. 2; abs. in Chem. Abs., 13 (1919), No. 5, p. 489*).—*Aspergillus niger*, *A. ochraceus*, *A. fuscus*, *A. clavatus*, *Citromyces glaber*, *Penicillium chrysogenum*, *Actinomyces penicilloides* n. sp., *A. violaceus-ruber*, *A. diastaticus*, and *Bacterium mycoides* were grown on Czapek's solution and in media in which peptone or casein replaced sodium nitrate or both the nitrate and cane sugar. Cultures were also made in which the nitrate was replaced by 1, 5, 10, and 25 gm. of asparagin per liter of Czapek's solution.

It was found that "different organisms behave differently in their power to attack proteins and in the production of amino nitrogen and ammonia. Most of the molds which grow very rapidly, as manifested by the increase in weight of their mycelium, allow a small amount of amino nitrogen to accumulate in the medium, while the amount of ammonia accumulated increases with the period of incubation. Certain molds, particularly the slower growing ones, the actinomyces studied, and *B. mycoides* favor a large accumulation of amino nitrogen in the medium and a comparatively smaller accumulation of ammonia. The growth of *A. niger* upon a solution containing peptone shows that the amino nitrogen produced in the medium is used up by the organism, so that no great accumulation takes place. Ammonia, on the other hand, which seems to be a waste product of the metabolism of the organism, accumulates readily in the medium, particularly when the organism stops growing and begins to autolize. The presence of available carbohydrates checks the accumulation of ammonia in the medium, due to the fact that in their presence the organism uses only as much of the protein molecule as it needs for its nitrogen metabolism, and only a small quantity of ammonia will accumulate. The process of ammonification, in the presence of available carbohydrates, is found to be an autocatalytic chemical reaction. In the absence of available carbohydrates the observed data deviated from the data calculated by the use of the curve of autocatalysis.

"The study of ammonification is of doubtful importance in revealing to us the proteolytic activities of microorganisms, since the quantity of ammonia accumulated in the medium depends on a great number of controlling factors; it has not been proven as yet that ammonia is an end product of protein metabolism.

"Asparagin nitrogen is rapidly converted into ammonia nitrogen, after the organism has made its maximum growth; but, where the amount of asparagin nitrogen is small, particularly in the presence of a comparatively large excess of available carbohydrates, no ammonia or only a very small quantity of it will accumulate in the medium."

The effect of prolonged growing of alfalfa on the nitrogen content of the soil, C. O. SWANSON (*Jour. Amer. Soc. Agron., 9 (1917), No. 7, pp. 305–314*).—This paper, a contribution from the Kansas Experiment Station, forms a partial report on work still in progress, the essential features of which have already been noted from another source (E. S. R., 40, p. 319). Summarizing briefly, it may be stated that the observations show that on the whole the growing of alfalfa has not added to the amount of nitrogen present in the soil except in a few instances in the semiarid portion of the State, and that all that the alfalfa accomplished was to prevent further losses of nitrogen, that is, to maintain an equilibrium.

Influence of salts on the nitric-nitrogen accumulation in the soil, J. E. GREAVES, E. G. CARTER, and H. C. GOLDTHORPE (*Jour. Agr. Research [U. S.], 16 (1919), No. 4, pp. 107–135, figs. 5*).—In these investigations, made at the Utah Experiment Station, "the soil used was a sandy loam very high in acid-soluble constituents, but the water-soluble constituents were not excessive. The calcium and magnesium contents were very high and mainly in the form of the carbonate. The soil was well supplied with phosphorus and potassium, and there was a fairly large quantity of iron present. In fact, all of the elements of plant food were present in abundance, with the exception of nitrogen, which was low. The soil was very productive, and previous work had shown the ammonifying and nitrifying powers of the soil to be about the average for the soils of the arid regions. The nitrogen-fixing powers of the soil were above the average, and previous work had shown it to have an intensely interesting bacterial flora."

To 100-gm. portions of the soil (air-dried in the dark) 2 gm. of dried blood and the salts to be tested were added, the moisture content made up to 20 per cent, and the whole incubated at 28 to 30° C. for 21 days. At the end of this time the nitric nitrogen was determined. The salts tested included the chlorids, nitrates, sulphates, and carbonates of sodium, potassium, calcium, magnesium, manganese, and iron. The proportion of salts used varied from nothing to several thousand parts per million of soil.

Summarizing the results the authors conclude that the toxicity of the salts as regards nitrification is determined by the specific salt and not by the electronegative ion, and that "with the exceptions of the manganous chlorid and sulphate and the chlorids of iron and sodium, the salts tested all become toxic at a lower concentration to the nitrifiers than to the ammonifiers. The quantity of a salt which can be applied to a soil without decreasing the nitric-nitrogen accumulation in the soil varies with the salt, and for the soil under investigation it is in the order of decreasing toxicity of the salts as follows: Sodium sulphate, sodium carbonate, calcium carbonate, potassium sulphate, potassium carbonate, ferric nitrate, sodium nitrate, magnesium sulphate, ferric sulphate, calcium nitrate, potassium nitrate, potassium chlorid, magnesium nitrate, manganous carbonate, manganous chlorid, manganous sulphate, ferric carbonate, magnesium chlorid, manganous nitrate, ferric chlorid, magnesium carbonate, sodium chlorid, calcium chlorid, and calcium sulphate. It is not necessarily those compounds which become toxic in the lowest concentrations which are most toxic in higher concentrations, as the toxicity of some salts increases more rapidly than the toxicity of others."

Osmotic pressure appeared to play only a minor part in retarding bacterial activity.

"The common soil 'alkalis,' calcium chlorid, sodium sulphate, sodium carbonate, and the less common one, calcium nitrate, are very toxic to the nitrifying organisms, and if present in soil to any great extent will greatly reduce the nitric-nitrogen accumulation in such a soil." All of the salts except sodium sulphate, sodium carbonate, calcium carbonate, potassium sulphate, potassium carbonate, and iron nitrate, in some of the concentrations tested, acted as stimulants, the extent of the stimulation and quantity of salt necessary for maximum stimulation varying with the specific compound. "Naming them in the order of increasing efficiency, they are: Sodium nitrate, magnesium sulphate, ferric sulphate, calcium nitrate, potassium nitrate, potassium chlorid, magnesium nitrate, manganous carbonate, manganous chlorid, manganous sulphate, ferric carbonate, magnesium chlorid, manganous nitrate, ferric chlorid, magnesium carbonate, sodium chlorid, calcium chlorid, and calcium sulphate. The last two increased the nitric-nitrogen accumulation of the soil 67 and 97 per cent, respectively. Those compounds which are the strongest plant stimulants are also the most active in increasing the nitric-nitrogen accumulation of the soil. . . . Many of the nitrates caused large losses of nitric nitrogen from the soil; this is due to the stimulation of other species which transform the nitric nitrogen into protein nitrogen and not to denitrification. Magnesium nitrate, ferric nitrate, calcium nitrate, and manganous nitrate are very active stimulants of the nitrogen-fixing organisms. In some cases these compounds increased nitrogen fixation many times over that in the normal soil."

In general it is concluded that "the ammonifying powers of a soil containing alkalis are a better index of its crop-producing powers than are the nitrifying powers."

A list of references to literature cited is given.

Stable manure and nitrification in the soil, C. BARTHEL and N. BENGTSSON (*K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), pp. 353–367; abs. in Chem. Abs., 13 (1919), No. 5, pp. 490*).—In the experiments here reported, it was found that calcium carbonate in ordinary amounts appeared to have no influence upon nitrification. Applied in amounts much larger than are used in practice, it exerted an inhibitive influence.

Decomposition and preservation of liquid manure, E. BLANCK (*Landw. Vers. Stat., 91 (1918), pp. 253–269, 271–290, 309–343; abs. in Jour. Soc. Chem. Indus., 37 (1918), No. 17, p. 522A; Chem. Abs., 13 (1919), No. 1, p. 53*).—It was found in the experiments here reported that the treatment of liquid manure with sulphuric acid prevented loss of nitrogen by fixation up to a certain limit of the ammonia formed. Formaldehyde preserved the liquid manure, but its use is not recommended because of its injurious effect on plant growth.

Fertilizer experiments on DeKalb soil. Yields of clover, corn, and Kentucky blue grass, J. W. WHITE (*Pennsylvania Sta. Bul. 155 (1919), pp. 3–20, figs. 8*).—Continuing work previously noted (E. S. R., 39, p. 22), this bulletin presents the results obtained during 1918 with corn and Kentucky blue grass on DeKalb soil under various fertilizer treatments. Results obtained in 1917 and with clover hay are included for purpose of comparison.

Based on the net value per acre of corn and stover, the greatest return in the fertilizer and manure experiment, \$56.16, was secured from the plat receiving limestone, acid phosphate, and potash, followed by that receiving limestone, acid phosphate, and manure with a return of \$53.36, and the limestone and complete fertilizer plat with \$51.40. Manure reinforced with 45 lbs. of phosphoric acid in acid phosphate produced a net return of \$13.53 in excess of that reinforced with 180 lbs. of phosphoric acid in rock phosphate. In the phosphoric-acid series the increased yields and value of the corn crop was in the order of increased applications of acid phosphate, the highest net return, \$51.28, following the use of limestone and 600 lbs. of acid phosphate. The same amount of acid phosphate used with limestone, nitrogen, and potash produced a net return of \$49.99.

Applications of limestone and a complete fertilizer on the permanent pasture plats with Kentucky blue grass resulted in the highest net return amounting to $30.12.

A comparison of the results obtained on Hagerstown soil receiving similar fertilizer treatment is held to emphasize the depleted condition of DeKalb soils, but also indicates that under proper management and favorable weather conditions the latter are capable of producing yields equal to or surpassing those secured on rich limestone soils.

[Work with fertilizers on the Canada Experimental Farms, 1916] (*Canada Expt. Farms Rpts. 1917, pp. 24, 28–29, 31, 98*).—The fertilizer investigations embraced observations on the nitrogen content of rain and snow; tests of different quantities and of varying compositions of fertilizers and of different nitrogen and phosphoric acid carriers; experiments with seaweed, lime, and fish scrap; a comparison of clover and manure as a source of humus; and tests with commercial fertilizers as a partial substitute for barnyard manure.

Based on the results obtained during a 10-year period, it is estimated that 6.583 lbs. of nitrogen per acre available for plant growth are obtained annually from rain and snow. The average results secured from more than 40 experiments indicated that ground seaweed alone produced appreciable increases in yield and when supplemented with a phosphatic fertilizer a considerable increase over the unfertilized checks. At the Cap Rouge Experiment Station (Quebec) observations for 2 years with potatoes and oats showed 100 lbs. each of sodium nitrate, a 2:2.5 mixture of acid phosphate and basic slag, and muriate of potash, to be equivalent to 930, 736, and 1,920 lbs. of ground seaweed, respectively.

Can Ohio farmers afford to buy complete fertilizers? C. E. Thorne (*Mo. Bul. Ohio Sta., 4 (1919), No. 3, pp. 95, 96*).—Indicating the estimated cost and the total and net returns per acre of different fertilizers applied to crops grown in rotation at Germantown (Montgomery Co.) and Carpenter (Meigs Co.) for four years, together with results obtained at Wooster over a period of 21 years, it is deemed best under present conditions "to limit the purchase of fertilizers to acid phosphate and depend upon the manure heap for nitrogen and potash."

Decomposition of cyanamid and dicyanodiamid in the soil, G. A. Cowie (*Jour. Agr. Sci. [England], 9 (1919), No. 2, pp. 113–136, figs. 6*).—The chemistry of the process of decomposition of cyanamid and dicyanodiamid in the soil and of the production of ammonia and nitrate from these compounds is briefly discussed, and vegetation experiments with the compounds at Rothamsted and Woburn are reviewed. The author reports pot experiments to determine the effect of the compounds on mustard, barley, and rye, as well as studies of their effect on soil bacteria, especially nitrifying organisms. The results are summarized as follows:

"Cyanamid readily breaks down in the soil, yielding ammonia, which then nitrifies in the usual way. The conversion of cyanamid nitrogen into nitrate is practically quantitative, and its effectiveness as a fertilizer is approximately equal to that of ammonium sulphate.

"Dicyanodiamid has given no evidence of nitrification in the soil even after several months. On the contrary, it is actually toxic to plants, although in small amounts it causes no appreciable injury. It does not affect germination at any of the concentrations used. Dicyanodiamid is also toxic to the nitrifying organisms and stops the normal oxidation of ammonia in soils containing ammonium sulphate. It likewise inhibits the transformation into nitrate of the ammonia produced from cyanamid in the soil and causes an accumulation of ammonia under these conditions. It does not sensibly retard the formation of ammonia from cyanamid. Dicyanodiamid does not appear to affect so drastically the other organisms of the soil, especially those concerned in the decomposition of protein. It exerts little influence upon the numbers developing on gelatin plates or the rate and extent of the decomposition of dried blood."

A geologic reconnaissance for phosphate and coal in southeastern Idaho and western Wyoming, A. R. Schultz (*U. S. Geol. Survey Bul. 680* (*1918*), *pp. 84, pls. 2, figs. 8; abs. in U. S. Geol. Survey Press Bul. 401* (*1919*), *p. 1*).—This bulletin describes extensive phosphate deposits in the region of the Bighole Mountains in Teton County, Idaho, and in other districts in this part of Idaho and adjacent areas of Wyoming. The phosphate areas are mapped in detail, and the quality of phosphate is described.

Analyses reported indicate the presence of some high-grade ore containing approximately the equivalent of 70 per cent tricalcium phosphate.

Rational preparation of superphosphates, A. Aita (*Ann. Chim. Appl.* [*Rome*], *10* (*1918*), *No. 5–8, pp. 45–103, figs. 8; abs. in Chem. Abs., 13* (*1919*), *No. 5, pp. 491–493*).—This is an account of a somewhat detailed study of the relation of the technical process of manufacturing superphosphates to the chemical and mechanical character of the product.

Conversion of insoluble phosphates, A. McA. Johnston (*Jour. Chem. Metallurg. and Min. Soc. So. Africa, 18* (*1917*), *No. 5, pp. 140, 141; abs. in Chem. Abs., 13* (*1919*), *No. 1, p. 53*).—Tests of a fusion process similar to that of Wolters are reported. By fusing 25 gm. of 21 per cent Saldanha Bay phosphate with 17.5 gm. of $NaHSO_4$, 11 gm. calcium carbonate, and 1.5 gm. of powdered coke, there was obtained a product containing 18.8 per cent of phosphoric acid, 12.4 per cent of which was soluble in 2 per cent citric acid.

Potash in 1917, H. S. Gale and W. B. Hicks (*U. S. Geol. Survey, Min. Resources U. S., 1917, pt. 2, pp. IV+397–481, fig. 1*).—This is a detailed report upon the production of potash in the United States and elsewhere during 1917, with a full bibliography of the subject.

Potash, W. W. Bradley (*Cal. State Min. Bur. Bul. 83* (*1918*), *pp. 109–111*).—The total output of potash materials in California in 1917 is given as 129,022 tons, including refined muriate and sulphate, kelp ash and dried kelp, and cement-mill dust. It is stated that the larger part of the output is used by fertilizer manufacturers. The crude salts from Searles Lake are stated to contain approximately 60 per cent of potassium chlorid and 30 per cent of borax, with smaller amounts of other constituents.

Chemical analyses of marine algæ, C. Sauvageau (*Rev. Gén. Sci., 29* (*1918*), *No. 19, pp. 541–551; rev. in Nature* [*London*], *102* (*1919*), *No. 2573, pp. 494, 495*).—The unsatisfactory state of knowledge regarding the exact chemical composition of different kinds of seaweed is discussed. More exact separation and identification of the species analyzed and determinations of their age and conditions of growth are especially urged.

Sulphate of potash and sulphate of potash and magnesia as potato fertilizers, Schneidewind (*Landw. Wchnschr. Sachsen, 19* (*1917*), *No. 5; Zentbl. Agr. Chem., 47* (*1918*), *No. 2–3, pp. 67, 68; abs. in Chem. Abs., 12* (*1918*), *No. 23, p. 2650*).—"As the result of 3-year experiments these salts are recommended for spring fertilizers for potatoes in preference to those containing chlorin."

Waste lime from acetylene manufacture (*Jour. Bd. Agr.* [*London*], *25* (*1919*), *No. 10, pp. 1203–1205*).—Tests made in pots and field plats of the fertilizing value of this material at Oxford and Leeds Universities and at Rothamsted are reported.

The results indicated that the carbid waste was practically as effective as calcium carbonate, whether applied one month before sowing or at the time of sowing, and that when it is thoroughly disintegrated it may be applied in fairly large quantities without injurious effects. The main difficulty attending the use of the material is due to its wet condition.

Magnesium and sulphur nutrition of plants (*Arkansas Sta. Bul. 158 (1918), pp. 24, 25*).—Observations made in the greenhouse with soy beans grown on Orangeburg fine sandy loam soil to study the effect of magnesium compounds on the oil content of the seed are briefly described.

Additions of magnesium carbonate and oxid are said to have resulted in an increase of about 18 per cent in the air-dry weight of the plant, and a slight increase in the yield of seed, while the fat content of the latter increased about 10 per cent with the carbonate and 8 per cent with the oxid. The increased production of fat amounted to 28 and 20 per cent, respectively. Magnesium in plant parts other than the seed showed an increase of about 50 per cent, while the calcium content decreased. This is thought to support the view that any influence magnesium absorption may exert unpon the composition of the seed is associated with chlorophyl formation and carbon dioxid assimilation.

Contribution to the agricultural study of iron, A. Monnier and L. Kuczynski (*Arch. Sci. Phys. et Nat. [Geneva], 43 (1918), pp. 66–68; abs. in Chem. Abs., 13 (1919), No. 1, p. 52*).—A study of the solubility of the iron in soils and of the changes which ferrous and ferric compounds undergo in the soil is reported.

The results indicate that the iron normally present in soils is insoluble. This explains the marked effect of adding small amounts of iron compounds to the soil. This effect is produced, however, only when the iron compound is placed near the roots. Otherwise it is rendered insoluble before it can be absorbed by the plant. Potassium ferrocyanid was found to be toxic even in very small amounts in the soil. It underwent a double decompositon, a part of the potash being absorbed by the soil and potassium ferricyanid passing into the filtrate.

Report on commercial fertilizers, 1918, E. H. Jenkins and E. M. Bailey (*Connecticut State Sta. Bul. 209 (1918), pp. 123–170*).—This reports the results of the actual and guarantied analyses of 466 official samples of commercial fertilizers and fertilizing materials collected during 1918. A number of miscellaneous materials and waste products from different sources were also analyzed as usual.

Commercial fertilizers in 1917–18, G. S. Fraps (*Texas Sta. Bul. 233 (1918), pp. 3–25*).—This reports the results of the actual and guarantied analysis of official samples of commercial fertilizers and fertilizing materials collected during the year ended September 1, 1918. A list of the brands registered for sale in the State during the season is also included.

AGRICULTURAL BOTANY.

A sketch of botanical activity in the District of Columbia and vicinity, P. L. Ricker (*Jour. Wash. Acad. Sci., 8 (1918), Nos. 14, pp. 487–498; 15, pp. 516–521*).—The first section of this contribution deals with the persons who have been active in connection with different phases of botany in the District of Columbia. The second gives a list of related publications.

The cytology of the myxomycetes with special reference to mitochondria, N. H. Cowdry (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 35 (1918), No. 2, pp. 71–94, pls. 3*).—The author reports a search for mitochondria in 10 slime molds which are named, stating that these bodies were present in all the forms examined and appeared to be identical in all respects with those in the higher plants and in the whole animal series from the protozoa to man. He calls attention, however, to their apparent absence or radical differentiation in some of the lower plants. Mitochondria are said to occur invariably in the plasmodia, as well as in all stages of spore formation and probably in all stages of the life cycle. So far as known, they take no active part in the formation of the sporangium wall, the complicated spore capsule and capillita, the hypothallus, the pigment, and the lime deposits of the myxomycetes.

Physiological predetermination: The influence of the physiological condition of the seed upon the course of subsequent growth and upon the yield.—I, The effects of soaking seeds in water, F. Kidd and C. West (*Ann. Appl. Biol., 5 (1918), No. 1, pp. 1–10, pls. 2*).—The authors have investigated the problem as to the limits of variation in growth and yield which may be determined by the influence of environmental conditions during the seed stage (both before and during germination and later), employing for this purpose seeds of various common plants. A preliminary account is given of the results of this work so far as obtained.

It is stated that soaking seed in distilled water may affect subsequent growth of the plant in ways impossible to forecast from germination tests. These effects are very specific, showing considerable differences even with closely allied plants. Beans effectively illustrate these points. Soaking seeds of *Phaseolus vulgaris* for 6 hours decreased the top dry weight 26 per cent. Soaking the seeds for 24 hours gave rapid and vigorous germination, but 12 days after sowing, the plants from seeds so treated were much smaller than the controls. Soaking *Vicia faba* seeds proved increasingly beneficial up to 3 days as regards both germination and growth.

The sulphur requirement of the red clover plant, W. E. Tottingham (*Jour. Biol. Chem., 36 (1918), No. 2, pp. 429–438, pl. 1*).—This paper deals with the response of the common red clover plant to different forms and planes of sulphur supply under conditions of better control than can be obtained in the ordinary soil culture. A Knop solution was employed with a total salt concentration of 0.2 per cent by volume. The methods were the same as those previously employed by the author (E. S. R., 31, p. 425), except that the seeds were germinated in pure sand until the seedlings were large enough for fixing in the culture vessels.

It was found that, under the experimental conditions employed, from 0.1 to 0.01 of the usual amount of magnesium sulphate of Knop's solution was as efficient as the full amount for the growth of red clover when the remainder of the magnesium sulphate was replaced by magnesium nitrate. The addition of sodium sulphate and calcium sulphate to the sulphur-free modification of Knop's solution, in amounts equivalent to the sulphur of the unmodified solution, produced a greater yield of dry tops than did the latter solution, calcium sulphate being very efficient in this respect. It appears that the sulphur of this salt functioned in the molecular combination in which it was supplied. The data obtained indicated that deficiency of sulphur supply restricts growth by limiting the synthesis of protein.

The products of the diastatic degradation of inulin in chicory root, J. Wolff and B. Geslin (*Ann. Inst. Pasteur, 32 (1918), No. 2, pp. 71–96, fig. 1*).—The authors, reporting more fully than formerly (E. S. R., 38, p. 502), state that in sap of chicory roots pure inulin was not fermented by the saccharomycetes employed, nor was it attacked by sucrase or other diastase secreted by various yeasts tested. The degradation products of inulin are fermented by these yeasts. The same products are attacked by the hydrolyzing diastases of the yeasts, which yield diastases as opposed to inulids. Yeasts attacking saccharose also attack inulids. Yeasts not attacking sucrase attack neither inulids nor saccharose.

Wound periderm in certain cacti, M. W. Coutant (*Bul. Torrey Bot. Club, 45 (1918), No. 9, pp. 353–364, pl. 1, figs. 3*).—A study is described of the results at different stages after wounding *Opuntia vesicolor* and *O. discata*, considered as typical of the cactus flora near Tucson, Ariz. It is stated that the best analogy to the natural cork-building process is obtained as the result of wounding. The essential facts here noted are the lignification of the old outer cortical cells, the production of both thin-walled and thick-walled cells by the activity of the wound phellogen, and the formation of the second interior meristematic layer forming the new vascular bundles near the wound surface.

The biological significance of false witches' brooms in ericaceous plants, J. Dufrenoy (*Jour. Wash. Acad. Sci., 8 (1918), No. 15, pp. 527–532*).—Recording biological data in the study of false witches' brooms in Arcachon, France, on leaves of *Vaccinium myrtillus* and *Arbutus unedo* infected by Glœosporium, the author concludes that false witches' brooms should not be interpreted as symbiotic organs. Their power of assimilation is low or inhibited, their life is shorter than that of healthy plants, and such morphological variations as are noticeable are neither very marked nor progressive.

Hybrid sunflowers, T. D. A. Cockerell (*Nature [London], 102 (1918), No. 2550, pp. 25, 26*).—Crosses made at Boulder, Colo., between varieties of *Helianthus annuus* give fertile plants in case of certain crosses, others showing a marked deficiency of pollen. The annual species of Helianthus are fertile among themselves, their hybrids nearly sterile. *H. annuus* has been crossed with *H. argophyllus*, *H. petiolaris*, and *H. cucumerifolius*. The rare crossings of the annual species with the perennial give offspring closely resembling one or the other of the parents.

The evolution of maize, P. Weatherwax (*Bul. Torrey Bot. Club, 45 (1918), No. 8, pp. 309–342, figs. 36*).—The results of a study of maize and some of its relatives are said to show that, considering the vestigial organs, Zea, Euchlæna, and Tripsacum are practically identical in structural plan, the present aspect of each being due to the suppression of some parts which were present in a primitive ancestor having perfect flowers borne in one type of inflorescence. The ear is the homologue of the central spike of the tassel. The view that maize is of hybrid origin is considered as having little real support and as not being in harmony with the significant facts of morphology. It is considered probable that Zea, Euchlæna, and Tripsacum have descended independently from a common ancestral form now extinct.

Chenopodium nuttalliæ, a food plant of the Aztecs, W. E. Safford (*Jour. Wash. Acad. Sci., 8 (1918), No. 15, pp. 521–527, figs. 3*).—A description is given of *C. nuttalliæ* n. sp., a plant used as a vegetable by the Aztecs.

FIELD CROPS.

[Report of field crops work in Alabama], E. F. Cauthen, M. J. Funchess, and W. A. Gardner (*Alabama Col. Sta. Rpt. 1918, pp. 16–22*).—This briefly notes results of variety testing with oats, wheat, barley, and rye; a test of fall *v.* spring planting of oats; and fertilizer experiments with corn and cotton. The development of soluble manganese in acid soils and observations on the presence and destruction of certain so-called organic toxins in the soil are also noted.

Experiments at Substation No. 3, Angleton, Tex., 1909–1916, N. E. Winters (*Texas Sta. Bul. 229 (1918), pp. 7–38, pl. 1, figs. 9*).—This bulletin comprises a progress report of work with field crops during 1913, 1914, and 1916. The substation, situated in Brazoria County at an elevation of 25 ft. above sea level, was established in 1909. It is stated that the greatest problem was to secure adequate drainage during the seasons of heavy rainfall. The growing season is said to be characterized by climatic conditions favoring high crop production. The average precipitation for the period of 1914–1916, inclusive, was 47.56 in. The average date of the last killing frost in the spring was March 27, and of the first in the fall November 24. The results of the experimental work to date may be summarized as follows:

Cotton seed produced and kept in dry parts of the State proved superior to that produced in humid sections. Cotton yielded 30 per cent more in rotation with corn, oats, and cowpeas than under continuous cropping, the fourth year of the test.

Thomas, Fentress Strawberry, Hasting Prolific, Virginia White Dent, Mexican June, Surcropper, Munson, Ferguson Yellow Dent, Chisholm, Improved Southern Snowflake, Mosby Prolific, and Yellow Creole corn averaged best in the order named. Cowpeas planted late in the life of the corn resulted in about 11 per cent more corn than where they were planted early. Where corn and cowpeas were grown together, the yields of corn decreased as the yields of cowpeas increased, and vice versa. Where corn and velvet beans were grown together, higher yields of corn were obtained with late maturing beans.

Hundred-Bushel, Fulghum, and Texas Red Rust Proof were the leading oat varieties in the order named. Abruzzi rye has never failed to mature grain, but all other small grains have been complete failures.

New Era, Brabham, and Blue Goose cowpeas have produced the most grain, and Iron, Groit, and Whippoorwill the most hay. Cowpeas grown in rotation have so far shown no particular advantage over those grown continuously. The Yokohama is said to be the earliest maturing variety of velvet bean, requiring about 150 days, and Osceola, requiring about 225 days, is the latest maturing. Biloxi soy beans produced well when protected from rabbits and blister beetles. Mung beans were found to be especially valuable as a summer poultry pasture crop, while both Kulthi and Moth beans produced good hay but did not mature seed. The Mexican Pinto or "Frijole" has been a failure.

Spanish peanuts have given the highest average yields of cured nuts per acre, while Tennessee Reds have produced the most forage without nuts. The results are held to indicate an increase in yield of nuts as the seeding rate increases.

Japan, bur, and crimson clover are said to do well under certain conditions, while alfalfa and red clover have failed up to the present time. Hairy vetch does well when protected from rabbits.

Japanese cane has yielded as high as 87,818 lbs. of green forage per acre. A temperature of 28° F. did not injure the cane standing in the field, although it was severely damaged by a drop to 25°. Deep plowing produced 16 per cent more cane than shallow plowing the first year, and 7 per cent more the second year without replowing or replanting. It is not regarded as good practice to harvest Japanese cane early, as it is said to store most of its sugar after reaching maximum growth in October. It is recommended that bur clover be grown during the winter on Japanese cane land.

Sweet sorghum showed the highest yield of forage from the thickest planting in cultivated rows, while there was little difference in yield between different seeding rates in close drills. It is stated that Sudan grass may be used successfully as a catch pasture crop after oats. Seeding in 18 in. rows has given a higher average yield of forage than seeding either in 3 ft. rows or close drills. Sudan grass is also deemed valuable as a summer pasture crop.

Rhodes grass is regarded as a good perennial pasture and hay crop, being able to endure a temperature of 18° F. without serious loss.

Work being done with garden vegetables, especially for home consumption, is briefly noted. A method and seeding rate test with dasheens resulted in yields in 3-ft. rows of 229 bu. per acre from whole tubers and corms planted 2 ft. apart, and 191, 150, and 130 bu. respectively, from cut tubers planted 1, 2, and 3 ft. apart.

[Report of work with field crops in Washington] (*Washington Sta. Bul. 153 (1919), pp. 14, 15, 17–22, 38, 39, fig. 1*).—This describes the progress of work along the same general lines as previously noted (E. S. R., 37, p. 32) for the year ended June 30, 1918.

Winter wheat varieties grown on land kept in a high state of fertility showed an average nitrogen content under cultivation of 2.86 per cent and without cultivation of 2.87 per cent and spring wheat varieties 2.77 and 2.73 per cent, respectively. The same varieties grown in the usual manner and without cultivation averaged 2.47 per cent for winter wheat and 2.56 per cent for spring wheat.

Cooperative tests with land plaster on alfalfa are said to have resulted in an increase of over 200 per cent for the treated plats.

The results of the variety testing work to date have led to the following conclusions: Hybrid 128 is deemed to be the best winter wheat under conditions prevailing at Pullman, and Bluestem is the best spring wheat variety except in arid sections of the State where Baart has given better results. Banner oats has outyielded all other sorts in eastern Washington, with Abundance a close second. White Bonanza oats have proved best for portions of western Washington. The coast barleys are deemed best, and are said to yield more in pounds per acre than any other grain crop. Winter barleys were not generally winter hardy and produced on the average 13 bu. per acre less than spring barleys. Bangalia field peas have produced the highest yield, but due to market discrimination and later maturity Bluebell is recommended for use where the seed is to be sold or for planting with late maturing varieties of oats for hay. Mexican Red beans have been found best for the Palouse country and Yakima Pinks for the warmer irrigated sections. Minnesota No. 2 rye is said to be the best winter variety and Beardless the best spring sort. Minnesota No. 25 flax outyielded the best of four other varieties tested by 45.7 per cent for a 2-year average. It is stated that chick peas, sorghums, and soy bean can not be recommended, except in restricted districts of long season and high temperature.

The best seeding rate for corn varied with the season, ranging from two to five stalks per hill, with three stalks giving the best results on the average. Late August and early September seeding of winter wheat gave the best results in 1917. As an average of two years' results, the decrease in yield was found to be in proportion to the increase in the amount of smut produced. Wheat seeded in ordinary drill rows yielded more than that seeded in rows from 12 to 18 in. apart, while cultivation materially benefited winter wheat but reduced the yield of spring wheat. Over a period of 18 years, manure applied as a top-dressing on summer fallow wheat has given better results than plowing under the same amount of manure for summer fallow. Early plowed well tilled summer fallow is deemed best.

Turnips and rutabagas produced the largest tonnage per acre of root crops, while winter wheat produced the largest amount of green forage for silage. Preliminary tests are held to indicate that red clover seed can be profitably produced when proper spacing methods and time of cutting have been determined.

Crop rotation tests covering a period of 18 years and including clover, straight wheat and summer fallow, and continuous wheat without manure and with 10 tons of manure per acre annually led to the following conclusions: Continuous wheat without manure has shown a marked and regular decline in yield. Applications of 10 tons of manure per acre annually have maintained the yield of wheat grown continuously at practically the same level as that of the well tilled summer fallow plats. In rotations including clover and eliminating summer fallow the wheat yield was maintained at nearly the same level as that secured on well tilled summer fallow.

Early Baart spring wheat with a yield of 13.8 bu. per acre was the leading variety grown on the Adams substation. The best spring sown varieties of rye, barley, and oats produced 10.5, 16.2, and 19.5 bu. per acre, respectively. In general, relatively heavy early seedings at a depth sufficient to prevent the drying out of the seed gave the best results with spring wheat.

Among the forage crops tested, corn produced 7.1 bu. of grain and 1,500 lbs. of stover per acre; and broom corn and Russian sunflower each 4,000 lbs. of stover. Field peas are said to be most promising for forage. The yields of seed for the leading varieties ranged from 6.6 bu. per acre for Canadian to 8.9 bu. for Bangalia. Alfalfa and sweet clover offered little encouragement.

On the Waterville substation the best yielding winter wheat was a strain of Turkey Red with 32.5 bu. per acre, and of spring wheat Bluestem (Washington No. 362) with 28.7 bu.

The leading varieties of field peas ranged from 13 bu. per acre for Grey Winter to 16.9 bu. for Kaiser.

[Report of work with field crops in Michigan], B. W. Householder (*Michigan Sta. Spec. Bul. 90 (1918), pp. 8–13, figs. 7*).—This notes the progress of work on the Upper Peninsula substation for the year ended June 30, 1918, including variety and cultural tests with barley, oats, and root and silage crops.

Rutabagas grown on rough, new land produced on the average 19.46 tons per acre. Corn yielded 2.21 tons of inferior silage, as compared with 10.28 tons per acre of excellent material from oats and peas.

[Report of field crops work in Minnesota, 1917] (*Minnesota Sta. Rpt. 1918, pp. 45–48, 62, 63*).—This describes variety, cultural, and breeding tests with cereals, forage crops, and miscellaneous field crops, and work with potatoes for the year ended June 30, 1918, in continuation of similar work previously noted (E. S. R., 39, p. 335).

In a comparison of primary, secondary, and double oat kernels for seed, data secured over a 4-year period are said to indicate that, "double oats are as valuable for seed purposes as primaries. No difference was found in the value of the seed crop from secondary and primary kernels. Secondary kernel oats averaged 5.9 per cent higher in value than primary kernels." Wild oats possessed a considerably lower percentage of kernels than cultivated oats. Good seed oats sown at the rate of 64 lbs. per acre gave as satisfactory yields as larger amounts up to 112 lbs. per acre.

Listed winter wheat produced 3 bu. per acre more than that sown in the usual manner. Winter wheat sown September 1 gave the best results, with that sown September 8 next in order, followed by continually decreasing yields from later seedings up to October 10 with a minimum yield of 25.6 bu. A seeding rate of 90 lbs. per acre gave better yields of winter wheat than any amount from 75 to 105 lbs.

Marquis wheat, Victory oats introduced from Canada, and Minnesota No. 184 barley, respectively, were the highest yielding sorts in variety tests.

Medium red clover alone, mixtures of medium red clover and timothy, and of timothy, and medium red and alsike clovers are said to have given the heaviest yields per acre in tests of various seedings of grasses and legumes. A large tonnage also resulted from a mixture of meadow fescue and medium red and alsike clovers.

It is stated that studies of high protein content in corn seem to show that a high protein strain can be immediately isolated by self-fertilization.

Yields of potatoes amounting to 306, 322, 350, and 266 bu. per acre, respectively, were secured from whole seed tubers weighing 2, 3, and 4 oz., and from 1-oz. cut pieces. The average number of stalks per hill was 3, 3.82, 4.73, and 1.5, respectively. One-ounce seed pieces from the stem, middle, and seed ends resulted in yields of 258, 276, and 294 bu. per acre, respectively. Planting 1-oz. seed pieces of Green Mountain in hills 18 in. apart and rows 3 ft. apart resulted in an average of 1.646 stalks per hill and 266 bu. per acre, as compared with 240 bu. from the same sized seed pieces with the stalks thinned to 1 per hill. Green Mountain seed planted two weeks later, owing to wet weather, produced about 100 bu. per acre less. In the later plantings 1-, 2-, and 3-oz. cut seed pieces produced 183, 228, and 214 bu. per acre, respectively. These results are believed to corroborate the opinion that the size of the seed piece that can be profitably used depends directly upon the fertility and condition of the soil, together with the price of the seed.

Early Ohio seed potatoes grown on various types of soil and in different parts of the State were planted at University Farm and on the Duluth, Grand Rapids, and Crookston substations. The tubers produced on University Farm are said to have averaged larger than those grown on the substation farms, and also exhibited large papillæ, small knobs, and numerous scab injuries. The Duluth tubers had indistinct papillœ and exceptionally smooth skin. The tubers grown at Crookston were the least mature, had a redder skin, and a marked tendency to be elongated and tapering toward the proximal end. The Grand Rapids tubers possessed a more flaky skin than the others and were slightly infected with Rhizoctonia. The Duluth and Grand Rapids tubers retained the shape of the parental stock much better than the others.

Potato varieties exchanged with the substations mentioned above are said to have shown a marked degree of rejuvenation in one season, although certain varieties required a longer period. Seed potatoes from plants sprayed
Potato varieties exchanged with the substations mentioned above are said
the following season.

[Report of field crops work at the Crookston substation, 1917], C. G. Selvig (*Minnesota Sta. Rpt. 1918, pp. 75–78, 79–81*).—This describes the progress of work along the same general lines as previously noted (E. S. R., 39, p. 336), embracing variety, cultural, rotation, and fertilizer tests with various farm crops for the year ended June 30, 1918. The precipitation during 1917 is said to have been the lowest recorded during the 37 years that observations have been taken at Crookston, amounting to 9.44 in., as compared with an average precipitation of more than 22 in. The crop season was also 35 days less than the average.

The highest yielding varieties of wheat, barley, and oats, respectively, were Pentad with 27.7 bu. per acre, Hannchen with 33.3 bu., and Minnesota No. 533 with 66.4 bu., as compared with average check yields of 18.3, 24.4, and 27.3 bu. per acre, respectively. Minnesota No. 2 rye produced 19.1 bu. per acre and all other varieties an average of 13.8 bu. North Dakota No. 155 wilt-resistant flax was highest with a yield of 10.8 bu. per acre. Canadian White field peas were first with 12 bu.

Among the forage crops tested the highest yields were secured from Kursk millet, Amber cane, Sudan grass, Manchu soy beans, and a so-called black yellow soy bean, amounting to 4,840, 4,500, 3,400, 2,800, and 2,480 lbs. per acre, respectively. The corn varieties did not mature seed but a large number of them are said to have produced good silage.

In nursery increase tests, Victory oats produced at the rate of 57.3 bu. per acre, No. 923 barley 38.2 bu., Disco No. 32 O alfalfa 2,625 lbs. in one cutting, and Disco No. 78, 1,925 lbs.

Single cuttings of different grasses resulted in the following yields: Tall meadow oats grass 3,940 lbs. per acre, slender wheat grass 3,760 lbs., orchard grass 3,380 lbs., timothy 3,360 lbs., and Kentucky blue grass 3,160 lbs. The highest yielding combination of grasses in 1917 comprised (1) brome grass 10 lbs., tall meadow oat grass 6 lbs., white clover 2 lbs., and alfalfa 4 lbs., with a yield of 6,160 lbs. per acre; (2) timothy 6 lbs. orchard grass 6 lbs., and alfalfa 4 lbs., with 5,200 lbs.; and (3) brome grass 10 lbs., alfalfa 8 lbs., and meadow fescue 6 lbs., with 4,160 lbs.

Winter wheat seeded on stubble and on plowed land winterkilled, while that seeded on corn land with every sixth row of corn left standing produced 12.5 bu. per acre, and with all the corn left standing, 30.7 bu. Straw failed to supply the necessary protection. Seedings made August 15 and September 1 resulted in higher yields than later seedings. Winter wheat production on the substation is deemed unprofitable.

Contradictory results were secured in a comparison of tractor with horse plowing and disking. Disking the stubble after harvesting proved beneficial. Early August plowing for corn resulted in a yield of 2,925 lbs. of fodder per acre as compared with 1,100 lbs. following spring plowing.

Under various cropping systems the wheat yields were as follows: Continuous cropping 15.9 bu. per acre; continuous cropping with clover 16.6 bu.; and 3-, 4-, 5-, and 7-year rotations 25.8, 23.7, 25.5, and 20.9 bu., respectively. Oats produced 73.8, 65.2, and 71.9 bu. per acre in 4-, 5-, and 7-year rotations, respectively. Barley produced 39.5 bu. in a 3-year rotation and 39.6 bu. in a 7-year rotation.

The results obtained to date in the fertilizer tests in the 3- and 4-year rotations may be summarized as follows:

Results with fertilizers in the 3-year rotation.

Treatment.	Yields per acre.					
	Corn.		Barley.		Clover.	
	1917	Three-year average.	1917	Three-year average.	1917	Two-year average.
	Lbs.	*Lbs.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*
Nothing	2,600	2,649	39.5	41.0	2,096	2,113
Potassium sulphate and acid phosphate	2,840	3,178	44.6	43.0	....	....
Acid phosphate	3,560	2,466	45.4	42.5	1,850	1,983

Results with fertilizers in the 4-year rotation.

Treatment.	Yields per acre.						
	Corn.		Oats.		Wheat.	Clover.	
	1917	Three-year average.	1917	Three-year average.	1917	1917	Two-year average.
	Lbs.	*Lbs.*	*Bu.*	*Bu.*	*Bu.*	*Lbs.*	*Lbs.*
Nothing	2,446	2,394	77.8	46.8	20.6	1,786	3,000
Manure	3,260	2,128	73.8	45.0	23.7	2,563	3,165
Acid phosphate	4,173	1,993	75.8	46.1	24.3	2,800	3,412
Acid phosphate and manure	3,306	2,472	79.5	40.8	26.2	2,766	3,497

Plats grown to barley in 1917, after receiving various treatments in 1916 in an effort to eradicate quack grass, produced net returns ranging from $2 per acre where buckwheat was plowed under in full bloom, reseeded, and plowed under after frost, to $84 after hemp. One plat seeded to winter rye after millet gave a net return of $38.48.

Average yields of rutabagas, stock carrots, sugar beets, and mangels amounted to 259.8 bu., 142.5 bu., 9 tons, and 13.4 tons per acre, respectively.

Early Ohio potatoes were first in yield of the early sorts, followed by Irish Cobbler and Triumph. Whole seed treated with formalin gave the highest yield, 154 bu. per acre, in a test of different treatments for the control of tuber diseases, although 65 per cent of the tubers were scab specked and 1.5 per cent were unmarketable because of scab and black scurf. Seed treated with corrosive sublimate produced 128 bu. per acre and exhibited only traces of scab and black scurf. A 5:5:50 Bordeaux mixture used twice produced 101 bu., as compared with 89 bu. for the check. Bordeaux mixture applied 3 times in comparison with self-boiled lime-sulphur and commercial lime-sulphur resulted in yields of 117.1, 110.1, and 106.6 bu. per acre, respectively, as compared with 100.3 bu. for the check. Paris green applied both as a liquid and as a dust spray proved most effective against potato beetle, while homemade arsenate of lead was the most economical spray used.

Seeding Early Ohio potatoes at the rate of 18 bu. per acre resulted in a yield of 184 bu., as compared with 203.5 bu. from a 16-bu. rate.

In fertilizer tests with potatoes the highest average yield for a 4-year period, 142.9 bu. per acre, was secured from plats receiving potassium sulphate and acid phosphate, as compared with 128.1 bu. for the check. Potassium sulphate alone resulted in an average yield of 121.8 bu. Manure used in combination with either rock or acid phosphate failed to give any appreciable effect. As an average of 3 years, different phosphate treatments used in a 4-year rotation have given the following results: Rock phosphate 91.2 bu. per acre, manure 99.5 bu., and acid phosphate 104.18 bu., as compared with 81.53 bu. from the check. It is stated that manure has given the most economical gains.

The 3-year rotation in the fertilizer series produced 144 bu. of potatoes per acre as compared with 107.4 bu. from the 4-year rotation. In the agronomy series the 7-year rotation was best with 98.6 bu. per acre, while the 3-year rotation produced only 71 bu., said to be due largely to the early summer drought and the poor physical condition of the plat.

[Report of field crops work at the Grand Rapids substation, 1917], O. I. Bergh (*Minnesota Sta. Rpt. 1918, pp. 89, 90, 91*).—This briefly describes the progress of work along lines similar to those previously noted (E. S. R., 39,

p. 337) for the year ended June 30, 1918. The weather conditions are said to have been unfavorable, and all crops except potatoes showed yields below the average.

The maximum yields per acre secured of different field crops were as follows: Oats 30.6 bu., spring wheat 11.9 bu., barley 19.12 bu., winter rye 32.1 bu., winter wheat 12.1 bu., potatoes 303.2 bu., rutabagas 15.6 tons, clover and timothy meadows 1.2 tons, alfalfa 1.14 tons, oats and peas for hay 2.12 tons, millet 1.02 tons, and *Bromus inermis* 1.2 tons.

An application of 10 tons of manure per acre resulted in an increase of 57.2 bu. of potatoes over the untreated check.

[Report of work with field crops on the Canada Experimental Farms, 1916] (*Canada Expt. Farms Rpts. 1917, pp. 15, 16, 18, 19, 26, 27, 29–31, 38, 39, 45–47, 50–53, 54–64, 67–69, 73, 74, 79, 80, 85–87, 90, 97–99, 102, 103, 109, 112–114, 116, 117, 123, 124, 127, 128, 131, 132, 133, 135, 136, 139, 142–144, 146, 147*).—This, much more briefly than heretofore, describes the progress of work conducted along the same general lines as previously noted (E. S. R., 38, p. 634), embracing variety, fertilizer, rotation, and cultural tests with wheat, oats, barley, rye, field peas, buckwheat, corn for silage, turnips, mangels, carrots, sugar beets, flax, potatoes, alfalfa, vetches, clovers, grasses and tobacco; plant breeding work with alfalfa, red clover, grasses, and root crops; and observations on the effect upon the yield of mangels of the use of seed obtained from different sources. It is stated that the results of the various lines of investigation will be dealt with in more detail as the experimental work is completed.

Spring small grains in Indiana, A. T. Wiancko and C. O. Cromer (*Indiana Sta. Bul. 225 (1919), pp. 3–20, figs. 4*).—Based on results obtained in variety tests with spring-sown oats, barley, and wheat, and on observations of spring rye and emmer it is stated that the growing of spring small grain can not be recommended under normal seasonal conditions except in the northern portion of the State, where profitable production is dependent upon early seeding, good soil and cultural conditions, cool weather, careful selection of varieties, and proper grading of seed. No important advantage was noted from the use of imported seed.

Oats are said to comprise about 99 per cent of the total area devoted to spring-sown small-grain crops in Indiana. Medium maturing varieties, including Great Dakota, Big Four, Silver Mine, White Bedford, and Schance, have given the best results, while Daubeney and Sixty Day are regarded as the best early sorts. The necessity for seed treatment for loose smut is emphasized and directions given for both the wet and the dry methods of formaldehyde treatment.

It is suggested that the production of spring barley might profitably be increased on mellow soils in northern Indiana. Silver King, Canadian No. 21, and Hannchen have proved best, with Success Beardless the best early variety.

Marquis and Regenerated Red Fife are said to be the most promising spring-wheat varieties, although the crop is not deemed comparable to oats, barley, winter wheat, or winter rye.

The average yields of spring wheat, spring barley, and oats for the 9 years, 1910–1918, of spring emmer for 5 years, and of spring rye for 3 years amounted to 13.7, 28.7, 52.6, 23, and 29.1 bu. per acre, respectively, as compared with 29.2 bu. for winter wheat and 38.7 bu. for winter rye for the 9-year period.

Farm practices in grain farming in North Dakota, C. M. Hennis and R. E. Willard (*U. S. Dept. Agr. Bul. 757 (1919), pp. 35, figs. 17*).—Based on data secured in cooperation with the North Dakota Agricultural College from more than 350 records of grain production in 34 counties in the State for 1912, 1913, and 1914, the authors present information relative to dates of operations, time available for field work, farm organization, equipment, man and horse labor, use of machinery, amount of seed required for various crops, thrashing, yields, etc., together with a comparison of the costs of various items for 5 years before the war and their cost in 1917 on a representative farm. The results of the study may be summarized as follows:

Wheat occupied 39 per cent of the crop acreage of the farms studied, oats 17 per cent, and barley 14 per cent, while flax, corn, rye, and potatoes were of less importance. The average yield of wheat was 13.2 bu. per acre, as compared with 12.7 bu. for the State as a whole. The equivalent of one disking and two harrowings, in general, appeared to give better results than either more or less working, while under certain conditions the disking was omitted and the same results secured by harrowing three times. Summer fallowing as a rule did not prove profitable except on very weedy land, and comparatively few farmers followed this practice. No significant difference in yields was observed between spring and fall plowing, but the latter is said to be more advantageous, in that it gives a better distribution of labor and makes possible earlier spring seeding. The practice known as "stubbling in," whereby the grain is sown after disking the land without plowing, was found to be almost invariably unprofitable, tending to lower yields and to encourage the spread of weeds and other pests. Approximately 6.4 hours of man labor and 19.4 hours of horse labor were required per acre in the production of wheat, while oats, barley, and flax required a little more work per acre than wheat, different parts of the State varying widely in this respect. Thrashing from the stack cost a little more than thrashing from the shock but possessed certain advantages in labor distribution and the saving of grain.

The maintenance of work stock cost $145 per head in 1917, as compared with an average cost of $105 for the five years 1911–1916, the difference being attributed to the advance in the price of feed. The initial cost of farm machinery used on these farms was 40 per cent more in 1917 than the average for the five-year period, while seed wheat cost $2.28 per bushel in 1917, as compared with $1.23 for the preceding five years.

Pea and oat hay for northern Ohio, L. E. Thatcher (*Mo. Bul. Ohio Sta., 4 (1919), No. 3, pp. 86–88*).—Growing a mixture of field peas and oats for hay as a supplementary forage crop in the spring is described. Golden Vine, Prussian Blue, or Canada Beauty field peas, and medium or late varieties of oats such as Siberian, Wideawake, Welcome, or Improved American, are said to be best suited for this purpose. For the 7 years, 1909–1915, the maximum average yield was obtained from a seeding rate of 1 bu. of peas and 2 bu. of oats per acre, amounting to 5,578 lbs. of hay. A mixture of 1.5 bu. each of peas and oats, however, is deemed more satisfactory.

Inoculation of legumes, P. Emerson (*Idaho Sta. Circ. 7 (1919), pp. 8, figs. 4*).—A popular account of the purpose and nature of inoculation.

Spacing of rows in corn and its effect upon grain yield, A. B. Conner (*Texas Sta. Bul. 230 (1918), pp. 5–20, figs. 3*).—Experimental work with corn planted in rows 36 in. apart with the stalks 36 in. apart in the row and in rows 6 ft. apart with the stalks 18 in. apart in the row, thus providing for 4,840 stalks per acre in each case, is described. The tests embraced 234 plats, located at seven different points in the State said to represent different soil and climatic conditions existing in the corn-growing regions of Texas and have extended over periods of from two to five years at each point. The results obtained at each experimental center are presented in tabular form and briefly discussed. Limited observations were also made on the effect upon yield of alternating corn planted in two rows 3 ft. apart with two fallow rows 3 ft. apart, but the results secured from this distribution are not deemed comparable to those mentioned above.

As an average for all tests corn grown in rows spaced 3 ft. apart produced 21.98 bu. per acre as compared with 20.1 bu. for that grown in rows spaced 6 ft. apart. Better stands are also said to have resulted from the closer spacing. It is concluded that the regular distribution of corn plants on the land as secured with the 3 ft. spacing favors as large or larger grain yields than the irregular distribution following the 6 ft. spacing, although the latter may prove to be more profitable in that it is better suited to the introduction of intertilled legume crops, allows cheaper cultivation where the land is weedy, and under certain conditions provides for better preparation of the land for small grains. Whether or not wide spacing is more profitable than regular spacing is said to depend upon local conditions in individual cases, the results of these experiments demonstrating that the mere widening of the rows will not increase grain yields, and that the practice should not be followed except in cases where other advantages obtain.

Grain sorghum improvement, A. B. Conner and R. E. Karper (*Texas Sta. Bul. 236* (*1918*), *pp. 5–12, figs. 4*).—This bulletin describes in a popular manner methods whereby the farmer may develop improved strains of Kafir corn, milo maize, and feterita. Directions are given for the selection of a foundation stock and the procedure outlined for further improvement through mass selection, individual plant selection, or a combination of the two methods. In the last-named system isolated plantings are made from the heaviest yielding heads in the performance test and the remainder of the seed secured in the performance test used for field planting. By continuing this process it is stated that within four years a high-producing strain of grain sorghum will have been secured, while, at the same time, selected seed superior to the common field run seed will have been available during the intervening years.

Farm practice in growing sugar beets in three California districts, T. H. Summers, L. A. Moorhouse, R. S. Washburn, and C. O. Townsend (*U. S. Dept. Agr. Bul. 760* (*1919*), *pp. 48, figs. 27*).—This bulletin deals with the farm practices involved in producing sugar beets and the requirements of the crop with respect to labor, seed, water, etc., on 81 farms south of Los Angeles in Los Angeles and Orange Counties, 45 at Oxnard in Ventura County, and 39 at Salinas in Monterey County. The Salinas records apply to the 1916 crop only, while the other records are for both the 1915 and 1916 crops. Actual costs are presented for purposes of comparison only.

The tillable area devoted to sugar beets amounted to 68 per cent in the Los Angeles district, 34 per cent at Oxnard, and 52 per cent at Salinas. No definite cropping system was followed, sugar beets being grown continuously for as long as 10 years in some instances. Beans and barley comprise the other important crops of this region. All available farm manure is applied to the beet land, but so little manure is produced that only a small portion of the beets are manured each year. The average yields for the different districts were, Los Angeles, 14.52 tons per acre; Oxnard, 9.53 tons; and Salinas, 15.59 tons. The average cost per acre was $67.11, $54.88, and $66.45. It is stated that in general as the acreage increased the cost per acre decreased, while with an increase in yield the cost per acre increased but the cost per ton decreased. Labor constituted 50 per cent of the total cost of production and the use of the land 35 per cent. The beet tops were fed on most of the farms in the Los Angeles and Oxnard areas, while in the Salinas area 56 per cent of the growers plowed them under. The value of this by-product is said to depend upon the method of utilization, being greatest when the tops were used as feed.

Sweet potato growing, F. E. Miller (*U. S. Dept. Agr., Farmers' Bul. 999* (*1919*), *pp. 30, figs. 22*).—Field practices and cultural methods employed in growing the crop are described. Information is also presented on harvesting, storing, and marketing the product, and on 10 of the principal commercial varieties of sweet potatoes.

The spring wheat situation in Ohio, C. G. Williams (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 3, pp. 67–69*).—Spring wheat production in the State is briefly described, the crop being rated as rather uncertain for the greater part of Ohio. An average yield of 17.9 bu. per acre was secured from Blue Ribbon at Wooster for the 6 years, 1912–1917, while Marquis has also given good results. Early seeding, from March 20 to April 10, at a rate of from 5 to 6 pk. per acre is recommended.

The survival of weed seeds, W. E. Brenchley (*Gard. Chron., 3. ser., 64* (*1918*), *No. 1664, p. 193*).—Experiments recently carried out at Rothamsted are said to have shown that seeds of certain weeds common on cultivated soils may survive for 60 years.

Whitetop and its control, F. J. Pipal (*Indiana Sta. Circ. 85* (*1918*), *pp. 12, figs. 8*).—White top (*Erigeron annuus*), said to be the most common and noxious weed of Indiana meadows and, in certain seasons, a serious pest of grain fields, especially oats, is briefly described, its methods of propagation and spread indicated, and preventive and control measures outlined.

Meadows and other places where the plants are allowed to mature seed form the chief source of infestation, while impure grass and clover seed may be responsible for its appearance on clean lands. Preventive measures comprise the use of clean seed on well prepared land, breaking badly infested meadows, plowing instead of disking for oats, and thorough preparation of corn land for wheat, while the most practicable methods of control are said to include clipping, grazing with sheep, early cutting of infested hay, and mowing pastures, roadsides, fence rows, and waste places at least two or three times during the season. Spraying with iron sulphate or salt solution was found to be effective, but, owing to the expense involved, is recommended only where other methods are deemed inadvisable.

The utilization of the young rosettes as pot herbs in some localities is noted.

HORTICULTURE.

[Report of the horticultural department], L. Greene (*Indiana Sta. Rpt. 1918, pp. 40–53, figs. 3*).—The long-continued orchard management investigations (E. S. R., 38, p. 641) have shown that soil moisture may be properly conserved in a young orchard either by thorough tillage with cover crop or by an adequate mulch. The mulch system is well adapted to orchards located on hilly lands which would erode badly if cultivated. The growth of the trees is benefited in proportion to the quantity of mulch applied. A light mulch where the hay crop is less than three-fourths ton per acre does little good, and the use of straw or other additional material is necessary to secure as good results as with tillage.

The amount of fruit thus far produced under the various systems of management has gone hand in hand with growth. Aside from soil moisture, the growth made by the trees has shown little or no consistent response to any of the other factors investigated. For example, the straw-mulch plat, which is showing an accumulation of organic matter, has made an excellent tree growth, but the clean culture cover crop plat, which has made an equally good tree growth, has lost in organic matter.

Variations in soil temperature under different systems of management showed no direct relation to tree growth. The influence of the bacterial population of the soil upon tree growth has been difficult to determine, but there is an indication that the field efficiency (ratio between the nitrates present in the field and the nitrifying power of the soil) does bear a relation to tree growth.

The results of pruning experiments are still inconclusive as regards tree growth when measured by circumference increase. Some new experiments have been planned with the idea of removing several trees from time to time to determine the actual plant tissue laid down in new wood under different systems of pruning. In the work at Laurel lightly pruned trees have produced more fruit, and fruit of a higher color, than heavily pruned trees, although the average size of the fruit was slightly smaller. The pruning work at Bedford continues to show that heavy cutting back of the annual growth results in smaller gains in trunk girth than are made by trees not so cut back.

The cover-crop experiments conducted at the station have shown, as a whole, that the most important consideration in choosing a cover crop is to select one which can be depended upon to produce a large annual yield of cover material in the locality in which it is expected to be grown. The trees have reacted very favorably where the ranker growing cover crops were used, and in all cases the trees of the bare check plats made the least growth. The various cover crops under investigation had marked effects on the bacterial content of the soil and on the nitrates present in the soil during the growing periods of the trees. In the fall and winter the number of bacteria in soil carrying a cover crop is greater than where no cover crop is present. Nitrification is greatest on the plats where cover crops are grown, and starts much quicker on those plats where green rye is turned under than on the others. The effects of the cover crop in general are to increase the bacterial activities of the soil rather than to increase the soil organic matter.

In order to throw more light on some of the problems of soil aeration and the relation of decomposition of organic materials to plant nutrition suggested by the orchard soil management investigations, controlled greenhouse experiments in Wagner pots were conducted with peppers, lettuce, and string beans. The results of the carbon dioxid treatment with the different plants are noted. They indicate, in brief, that the effects of carbon dioxid appeared to be to increase the available plant food in the soil, thereby increasing soil acidity; to prevent normal root development of the plants; and to allow 1 gm. of dry matter to be produced on much less moisture than is normally the case. As applied to orchard soil management it appears that the addition of organic matter, instead of increasing soil moisture, allows larger crops to be grown on less moisture than otherwise would be the case, this being due to the carbon dioxid present and the measured bacterial activities of the soil.

Incubation tests have shown that those plats having the more compact conditions of soil contain the largest percentage of carbon dioxid surviving organisms. Extensive tests were made to determine the best media for the cultivation of soil micro-organisms. The results of these tests indicate that bacteria multiply excessively in neutral or alkaline soils containing decomposable organic matter that is of a carbohydrate nature.

Work was undertaken with a number of greenhouse crops to determine the effect of variation in the quality and abundance of plant food in the soil on the composition of the plant and its fruit. The experiment is essentially a comparison of manure, with and without chemical fertilizers, and fertilizers in different proportions. The results secured with the lettuce plant have shown that the nitrogen content of the plant can be varied widely by various fertilizer treatments. When nitrogen, phosphorus, and potassium in equal parts were compared with manure containing three times the nitrogen in the fertilizer, it was found that soils will respond to applications of manure up to 25 tons of dry manure per acre applied three times per year, while one-third the nitrogen in 15 tons of dry manure applied with equal phosphorus and potash prevents the development of normal plants. The various combinations used have shown that in greenhouse forcing, manure is undoubtedly the most satisfactory fertilizer. Leaf mold containing equal quantities of organic matter is not so available and shows no results until the second year. A combination of complete fertilizers with less manure may be as satisfactory as manure alone, and a fertilizer made up of dried blood, dicalcium phosphate, and potassium chlorid will produce good crop increases.

[Investigations with fruits and vegetables] (*Minnesota Sta. Rpt. 1918, pp. 60–62, 63, 64*).—Brief statements of progress made in various lines of work are given.

In the fruit sterility studies, all the plums which have been self-pollinated have been found to be self-sterile. The investigation has shown that there are three distinct periods of dropping in the plum. The first flowers to drop have aborted pistils. The next drop occurs three or four weeks after bloom through lack of fertilization. The so-called "June drop" occurs about three weeks later as a result of embryo abortion.

Considerable attention has been given to devising a method of determining the relative hardiness of fruit seedlings. The results of these studies show that the winter injury to the tenderest tissues of the plant serves as an accurate index of hardiness. The results of the tests of trial plats at Deerwood, Grand Rapids, and Cloquet show that in the raspberry only a very few of the varieties in the nursery trade are sufficiently hardy to stand the winter in the northern section of the State uncovered, and only a few of them are hardy when covered. Tests are being made of seedlings from seed obtained from Canada. The present status of general varieties of fruit under observation is briefly noted.

In the work with vegetables, distinctive strains of beans, varying in size and shape, productiveness, color, and brittleness of pod, have been isolated from the Refugee bean "1,000 to 1" and are being propagated for stocks of seed. Improved strains of the Alaska pea have also been developed. A number of selected strains of Hubbard squash are being tested. First generation tomato crosses again proved more productive than their parental mean and often more productive than the highest yielding parent.

[Report of horticultural investigations] (*Washington Sta. Bul. 153 (1919), pp. 22–24*).—Brief statements of progress made in various lines of work are given.

In a sterility test of Jonathan and Rome Beauty apples, both varieties "set a few fruits without cross-pollination, when pollinated by the normal fall of pollen and distribution of pollen and by the work of bees." The fruits set on these trees contained very few seeds and a large proportion of seedless apples. Jonathan in the open orchard averaged 7 seeds per apple and Rome Beauty 10 seeds per apple. There was no appreciable difference in the size or appearance of the self-pollinated fruits and those produced in the open orchard.

In the breeding work with blackberries and raspberries, no plants thus far fruited are worthy of introduction as a new variety. Seedlings of Evergreen blackberry were the only ones that came true to type. A study of soil moisture in relation to the keeping quality of apples clearly indicates that so long as moisture conditions are such as to produce normal fruit, the keeping quality of the fruit is not noticeably modified by that factor.

Experiments with orchard cover crops were continued. It was concluded that in the rainfall section the late plowing under of the growing cover crop in the spring resulted in the production of humus at the expense of the fruit crop; hence only very limited value can be derived from cover crops in the orchards of eastern Washington. Nitrate of soda has given promising results in the renovation of prune orchards in Clarke County. A list is given of potato varieties for different sections of Washington. A study of frost injury to tender plants and fruit tree blossoms has shown the amount of frost injury to be in many cases inversely in proportion to the amount of new growth developed by the plant. Blossoms produced by the more vigorous plants are more easily killed than those produced by less vigorous plants.

Report from the division of horticulture for the year ended March 31, 1917, W. T. MACOUN ET AL. (*Canada Expt. Farms Rpts. 1917, pp. 15, 16, 19, 22, 35–38, 69, 70, 74, 75, 80, 81, 87, 90, 91, 103, 105, 109, 114, 117, 118, 121, 124, 128, 132, 133, 135, 136, 139, 140, 144, 147, 148*).—A brief progress report on horticultural work at the Central Farm, together with notes on tests of fruits, vegetables, and ornamentals, at the branch farms and stations.

Experiments with fertilizers on greenhouse crops, T. H. WHITE (*Maryland Sta. Bul. 222 (1918), pp. 75–91, fig. 1*).—A number of experiments designed to determine the value of various organic and inorganic materials as fertilizers for roses, carnations, and chrysanthemums are reported, together with suggestions for using fertilizers.

The author concludes from the studies as a whole that the best general fertilizer for greenhouse crops is cow manure. When cow manure is mixed with the soil so that it is sufficiently rich none of the other manures or fertilizers seem to have any other effect than to make the foliage darker green in color. Dried sheep, cattle, or hog manure induced the growth of more and longer shoots on carnations than the chemical fertilizers, but dried horse manure did not seem to have much direct manurial value.

Raw bone meal or phosphate rock with dried blood were good fertilizers for roses. A mulch of stable manure placed around rose plants induced a new growth of shoots when chemical fertilizers failed to do so. Either organic or inorganic fertilizers in solution gave good results with carnations. Nitrate of soda applied at the rate of 3 oz. to 20 sq. ft. of bench space once a month, beginning February 1, was a good fertilizer for carnations. Dried blood, raw bone meal, and nitrate of soda gave as good results with chrysanthemums as the commercial brands of chemical fertilizers or the dried animal manures. As measured by the growth of chrysanthemums, leaching proved to be a good practice on solid beds of soil that had not been changed for several years. Enough water should be applied to cover the bed at least 2 in. deep, if none of it soaked into the soil.

The pollination of greenhouse tomatoes, T. H. WHITE (*Maryland Sta. Bul. 222 (1918), pp. 93–101, figs. 2*).—Four crops of tomatoes were grown in these studies, J. W. Reichard and A. White assisting in the work. Natural pollination was compared with hand pollination, 10 varieties being used.

Generally speaking, hand pollinations made a large increase in the quantity and size of the fruit. The Chalk Jewel variety was least benefited by hand pollination and did not bear heavily under either method. The Hubert Marvel and Sterling Castle varieties set fruit nearly as well with natural as with hand pollination. Reichard suggests that this is due to the fact that these varieties have short styles with which the pollen can come readily into contact. Varieties with protruding styles, such as Coreless, Farquhar Bountiful, Early Freedom, and Comet were greatly benefited by hand pollination. One test was made of the jarring method of pollination and resulted in a very fair crop.

Early tomato growing in New Jersey, R. W. DeBaun (*New Jersey Stas. Circ. 103 (1919), pp. 3–30, figs. 25*).—Practical directions are given for starting the plants under glass and their culture in the fields. The principles discussed apply in a large degree to the growing of other vegetable crops and reference is made to such from time to time.

Spring spraying program for 1919, A. Frank (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1919), No. 12, pp. 181–184*).—A list is given of some of the common orchard diseases and insects with the methods for their control where known.

[Report of the] fruit breeding farm, Zumbra Heights, C. Haralson (*Minnesota Sta. Rpt. 1918, pp. 94–98*).—A brief statement of progress made in breeding hardy fruits, including a report of the committee (E. W. Randall and C. L. Smith) examining the fruit-breeding farm.

In addition to the further test of promising seedlings, a number of new strawberries and apples have been sent to the trial stations. The Shiro × Wyant plum, on account of its hardiness as well as its fruit characteristics, promises to be one of the best of the seedling plums yet developed. Additional crosses have been made in the plum, raspberry, strawberry, apple, blackberry, and dewberry.

Growing fruit for home use, H. P. Gould and G. M. Darrow (*U. S. Dept. Agr., Farmers' Bul. 1001 (1919), pp. 39, figs. 26*).—A practical treatise on the culture of orchard and small fruits in the home fruit garden, including lists of varieties recommended for the different parts of the country.

Some soil treatments for mature apple orchards, B. S. Pickett (*Illinois Sta. Circ. 233 (1919), pp. 3–6, fig. 1*).—Practical suggestions are given for cultivating, mulching, and fertilizing bearing apple orchards.

Disease resistance of apples (*Arkansas Sta. Bul. 158 (1918), p. 49*).—A brief statement of progress made in a study of disease resistance among apples.

Data already gathered indicate that there is a wide range of variation in the susceptibility of the different varieties to different diseases. For example, the Jonathan tree is very susceptible to fire blight and resistant to blister canker, while the Ben Davis is very susceptible to blister canker and resistant to fire blight.

Prune the cherry trees, R. H. Roberts (*Wisconsin Sta. Bul. 298 (1919), pp. 30, figs. 21*).—Observations made on Early Richmond and Montmorency trees during the last three years confirm the experiences of the most successful growers of Michigan and Wisconsin who find, contrary to the frequent advice that the cherry tree should be pruned little if any, that the sour cherry tree thrives best when regularly and often heavily pruned. Some of the results of the station's observations are here presented in tabular form and directions are given for training and pruning sour cherry trees.

The study as a whole indicates that the top of the tree should be heavily pruned at planting in order to secure a good growth the first season. A "modified-leader" tree has a stronger head, is more spreading, and is lower than an "open center" tree. Early bearing usually takes place at the expense of fruit spur formation. The growth of young trees should be encouraged by pruning and otherwise with the view of developing a large spur fruiting system. Spur blossom buds are hardier than the blossom buds along the short branches. Annual pruning should be done to avoid heavy cutting at any one time.

Training raspberries and blackberries, J. L. STAHL (*Washington Sta., West. Wash. Sta. Mo. Bul.*, *6* (*1919*), *No. 12*, *pp. 178–181*).—Several methods of training raspberries, blackberries, and loganberries are described.

FORESTRY.

Forest research and the war, E. H. CLAPP (*Jour. Forestry*, *17* (*1919*), *No. 3*, *pp. 260–272*).—A brief review of those research activities of the Forest Service of the U. S. Department of Agriculture that were conducted with special reference to meeting war-time needs.

Reconstruction and the conservation of American forests, J. W. TOUMEY (*N. Y. Forestry*, *1919*, *April*, *pp. 19–28*).—This paper draws lessons from the war relative to the need of the forest in national defense, and makes a plea for a wiser utilization and conservation of American forests.

Forestry and reconstruction in New York, H. P. BAKER (*N. Y. Forestry*, *1919*, *April*, *pp. 10–18*).—In this paper the author suggests ways in which foresters and forestry may assist in solving reconstruction problems in New York State.

Need for a unified forest research program, J. W. TOUMEY (*Jour. Forestry*, *17* (*1919*), *No. 3*, *pp. 281–289*).—The author briefly reviews methods of conducting forest research in some foreign countries, and makes an appeal for an organization much similar to the State agricultural experiment stations to cooperate with and give directions to forest research now being carried on by the Forest Service of the U. S. Department of Agriculture, State agencies, private agencies, and educational institutions.

Some remarks on State forest policy, R. S. HOSMER (*Jour. Forestry*, *17* (*1919*), *No. 2*, *pp. 168–172*).—The author discusses the importance of having a definite enunciation of forest policies in State work.

Some reflections upon Canadian forestry problems, C. D. HOWE (*Jour. Forestry*, *17* (*1919*), *No. 3*, *pp. 290–296*).—The author briefly discusses some fundamental problems which should be solved, with a view to developing silvicultural systems to insure the continuous productivity of Canadian forests.

Planting in relation to the future of National Forests, F. R. JOHNSON (*Jour. Forestry*, *17* (*1919*), *No. 2*, *pp. 173–177*).—The author points out that the greatly increased use of the grazing lands of the National Forests as a result of the war should not be continued indefinitely, inasmuch as these lands have been included in the forests as more valuable for forestry than for agriculture and grazing. A vigorous planting policy upon nontimber land within the forest is adopted.

What the National Forests mean to the water user, S. T. DANA (*U. S. Dept. Agr., Forest Service*, *1919*, *pp. 52*, *pl. 1*, *figs. 35*).—In this paper the author calls attention to the importance of forest cover in preventing the rapid run-off of water and thereby regulating stream flow and water power, and gives an account of the activities of the National Forest administration undertaken with the idea of insuring the fullest protection and utilization of the water supply of the National Forests.

The National Forests.—The last free hunting grounds of the Nation, A. LEOPOLD (*Jour. Forestry*, *17* (*1919*), *No. 2*, *pp. 150–153*).—The author presents certain conclusions bearing on the present game policy of the Forest Service of the U. S. Department of Agriculture, with special reference to a predicted much greater future demand for hunting on the National Forests.

The organization of finance in forest industry, B. P. KIRKLAND (*Jour. Forestry*, *17* (*1919*), *No. 3*, *pp. 236–244*).—The author calls attention to the necessity of improvement in organization of financial credit for the development of forest industries, and considers the proper constitution of a forest loan board and its methods of operation.

Private forestry, H. S. GRAVES (*U. S. Dept. Agr., Off. Sec. Circ. 129* (*1919*), *pp. 11; Jour. Forestry, 17* (*1919*), *No. 2, pp. 113–121.*)—A paper on this subject presented before the New England Forestry Conference at Boston, Mass., February 24, 1919.

An appeal for a constructive reforestation policy on private timberlands, which now supply 97 per cent of the timber and other wood products used in the United States and include four-fifths of the standing timber of the country. The author briefly indicates several principles which must be considered both by the public and private holder in developing an effective program of forestry on private lands.

Forestry as a rural community project, R. S. HOSMER (*N. Y. Forestry, 1919, April, pp. 5–9*).—This paper presents suggestions relative to the cooperative action of woodlot owners in regard to marketing their products and also the development of community forests.

Marketing timber from farm woodlands, F. W. BESLEY (*Jour. Forestry, 17* (*1919*), *No. 2, pp. 135–143*).—A brief review of various methods now employed in marketing timber from farm woodlands. The author presents the plan of cooperation between the Maryland Forestry Department and the farmers of the State for marketing timber and other forest products, as a working basis for those who have had difficulty in getting small woodland owners to practice forestry.

Seventh biennial report of the State forester of the State of California, 1916–1918, G. M. HOMANS (*Bien. Rpt. State Forester Cal., 7* (*1917–18*), *pp. 103, pls. 15, fig. 1*).—In addition to a review of the 1918 forest fire season and protective measures, practical suggestions are given on forest planting in the arid regions of southern California, including a list of species recommended for planting together with descriptions of the more important tree species in different sections of the State. Information is also given relative to the wood utilization service and educational work of the State Board of Forestry.

Fifteenth annual report of the State forester [of Massachusetts], F. W. RANE (*Ann. Rpt. State Forester Mass., 15* (*1918*), *pp. 54, pls. 4*).—This is the usual annual report relative to the administration and management of the State nurseries and forests in Massachusetts, including accounts of general reforestation activities in the State and moth and fire control work, together with recommendations relative to needed legislation.

Preliminary report of some forest experiments in Pennsylvania, J. S. ILLICK (*Jour. Forestry, 17* (*1919*), *No. 3, pp. 297–311, fig. 1*).—The author briefly outlines the experimental work conducted on the State forests in Pennsylvania, and presents some data on results secured with exotic tree species. Some experiments in forest conversion are also outlined and discussed with reference to their present status.

Critical observations concerning the mechanical theory of diameter growth in trees, P. JACCARD (*Bul. Soc. Vaud. Sci. Nat., 51* (*1917*), *No. 191, pp. 271–298*).—In this paper the author presents further observations on the causes of diameter growth in trees in support of his previous conclusions and in response to various objections to these conclusions (E. S. R., 34, p. 536).

Tamarack for fence posts, J. J. CRUMLEY (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 3, pp. 83–85*).—To determine the value of tamarack for fence posts, the station made a thorough examination of the individual posts of a number of fences in those sections where tamarack has been used for this purpose in the past.

In 14 representative fences, with an average age of 11 years, an average of 55 per cent of the posts were still sound as compared with an average of 65.2 per cent sound oak posts of about the same age. In fences where neatness is more desired than durability tamarack is straight and holds the staples well. Where durability is the principal requirement, posts of locust, catalpa, or cedars are recommended.

The structure and use of the Paraná pine forests of Brazil, H. N. WHITFORD (*Jour. Forestry, 17 (1919), No. 2, pp. 154–158*).—A brief descriptive account of these forests and their present use as a source of forest products.

Philippine bamboos, W. H. BROWN and A. F. FISCHER (*[Philippine] Bur. Forestry Bul. 15 (1918), pp. 32, pls. 33*).—The various species are described, and growth data are given on bamboo plantations established by the Philippine Bureau of Forestry.

Philippine forest products as sources of paper pulp, W. H. BROWN and A. F. FISCHER (*[Philippine] Bur. Forestry Bul. 16 (1918), pp. 13, pl. 1*).—This bulletin calls attention to a bamboo (*Schizostachyum lumampao*) and two grasses (*Imperata exaltata*) and talahib (*Saccharum spontaneum*), which offer immediate prospects for paper pulp. Information is given relative to experiments conducted to determine the value of these materials, together with suggestions on utilization of a number of other trees and plants for paper making.

DISEASES OF PLANTS.

The biochemistry of resistance to disease in plants (*Minnesota Sta. Rpt. 1918, pp. 40, 41*).—In the study of the biochemistry of disease resistance in plants, the physiological effect of hydrocyanic acid upon plants, the fundamental nutrition of *Sclerotinia* spp., the enzyms of *S. cinerea*, and the biochemistry of resistance to cereal rusts have been investigated.

In the investigation of the nutrition of Sclerotinia, a thorough study is being made of the source of carbon and nitrogen, the mineral requirements, etc., of the fungus, and considerable progress is reported to have been made on the study of the source of carbon and the reaction of the medium. Oxalic and citric acids have been proved to be frequent products of the growth of the fungus, the character of the medium determining the amount of the acids present.

In the study of the enzyms of *S. cinerea*, pectase has so far been found to be the most common one.

In the investigation of the biochemistry of resistance to cereal rusts, attempts to grow *Puccinia graminis* in the absence of living host cells have given negative results. The hydrogen-ion concentration and the specific electrical conductivity of the juices from both resistant and susceptible wheats under different conditions were determined. The hydrogen-ion concentration was found remarkably uniform, and the results to date are considered to show that it is extremely doubtful whether the hydrogen-ion concentration per se is involved in the phenomena of resistance. The specific electrical conductivity of the juice paralleled rather closely the ash content.

Some experiments were conducted on the germination and growth of spores of *Fusarium lini* in the sterile juices of resistant and nonresistant flax plants. The fungus spores were found to germinate less readily and to grow less vigorously in the juices of resistant plants.

[Report of] division of plant pathology (*Washington Sta. Bul. 153 (1919), pp. 25–27*).—A progress report is given on some of the investigations carried on during the year ended June 30, 1918.

In the wheat-smut investigations it was found that normal grains from partially smutted heads do not transmit the disease. Sprinkling the seed with strong copper sulphate solutions greatly reduced infection from smut in the soil. Early plantings (August) were practically free from smut and give good yields. Smut loss can not be accurately estimated by head count. Replowing, which had been suggested as a means of reducing smut, increased rather than reduced the yield. The use of exhaust fans on thrashing machines, if properly installed, was found to lessen the danger of explosions, to improve the quality of the wheat, and to prevent much of the smut dust from passing out through the stacker.

Continued studies were made of Rhizoctonia diseases, and it was found that the blight of tomato is caused by Rhizoctonia and that the disease may be transmitted from the potato to the tomato. The treatment of seed-potato tubers with mercuric chlorid, while not increasing the yield of table stock, is recommended for use in the production of extra fancy or seed stock free from sclerotia. Seed selection, it is claimed, is more valuable for the prevention of loss from Rhizoctonia than seed treatment.

In continuation of investigations of fire blight, leaf invasions of *Bacillus amylovorus* were produced by inoculation, and twig blight was caused by migration of the organisms downward through the leaf petioles.

Powdery scab of potatoes is considered comparatively harmless in Washington, and investigations have indicated that spindling sprouts of potatoes may result from poor conditions of storage.

Brief notes are given on the identification of a number of miscellaneous diseases.

Spraying for fungus diseases: How to prepare Bordeaux, D. McAlpine (*Fruit World Austral., 19 (1918), No. 9, pp. 223, 224*).—In addition to giving directions for the preparation of fungicides, the author states that no amount of poor or air-slaked lime could produce good Bordeaux mixture, failures being often attributable to the use of such a defective ingredient. A simple copper sulphate solution (2 lbs. copper sulphate to 50 gal. water) with 4 lbs. soft soap makes a cheap and valuable fungicide for dry districts, but it may scorch the leaves if applied after the buds open. Spraying should commence when the buds are just on the point of bursting. Properly prepared Bordeaux will not injure apples even when in full bloom, and the operation should be deferred until the blooms are at least partially open.

Copper stearate, A. H. Lees (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 39–42*).—Paraffin emulsion having given satisfactory results as regards the wetting of difficult surfaces (E. S. R., 37, p. 759), the author made an attempt to combine soap with Burgundy mixture (Bordeaux being considered unsuitable for that purpose) made in the ordinary way.

It was found that interaction occurred, resulting in a curdy precipitate and rendering the soap inactive. The addition of ammonia to copper sulphate gave a stable mixture, but required a considerable amount of ammonia, which gradually evaporated, leaving the copper sulphate to react with the soap. The surface was thus finally covered with a soap which is called copper stearate. Less ammonia was required if a certain amount of caustic soda was added at the same time as the carbonate and soap, but the resulting mixture caused defoliation and was otherwise somewhat unsatisfactory. Later it was found that if the mixing took place in the reverse way, copper sulphate solution being added to soap solution, a more satisfactory result could be obtained so long as the soap was in excess and the solutions sufficiently dilute. The mixture when made assumes a characteristic opaque light blue color, which proved to be due to an exceedingly fine precipitate of a copper-soap compound, the particles of which appeared to be in a state of emulsion in the soap solution. Slight differences in composition gave considerable variation in the appearance, behavior, and effects of the compound.

Since the mixture contains soap in excess, it is possible to increase the wetting powers greatly by combining with it a 2 per cent paraffin emulsion, the combined mixture adhering readily to resistant surfaces like the summer stage of the American gooseberry mildew. Without the paraffin emulsion the copper stearate mixture spreads well on the foliage, and when dry leaves an almost imperceptible film of exceedingly fine, close particles, which may be regarded for practical fungicidal purposes as continuous. Such a sprayed surface has a further advantage in that it resists wetting completely, water running off in drops instead of spreading. This may be due to a slight decomposition of the copper stearate into stearic acid or may be a property of the stearate itself.

A preliminary test appeared to show that copper stearate may be sufficiently dissolved by root hairs to cause copper poisoning, this fact leading to the conclusion that it may be employed as a fungicide.

Diseases of grains and forage crops, M. T. Cook and J. P. Helyar (*New Jersey Stas. Circ. 102 (1918), pp. 16, figs. 5*).—Popular notes are given on the more common diseases to which cereals and forage crops are subject.

Oat smut control, W. Van Pelt (*Mo. Bul. Ohio Sta., 4 (1919), No. 3, pp. 92–95*).—Directions are given for the treatment of oats for the prevention of smut, the so-called dry application, which consists of spraying the seed with a strong solution of formaldehyde, being compared with sprinkling the seed with a solution of 1 pint formaldehyde to 40 gal. water. The results obtained by the different methods indicate that formaldehyde solutions (1 pint to 40 gal.) are generally absolutely safe and effective, while the so-called dry treatment is unsafe on account of injury to germination.

Fungoid and insect pests and their control.—I, Vegetable and pulse crops, F. O. Mosley (*Reading, [Eng.]: Author, 1918, pp. 26, figs. 53*).—Brief accounts are given of the life history, injurious effects, and control measures in connection with animal pests, slime molds, and fungi attacking vegetables and legumes.

Further experiments on the Rhizoctonia disease of asparagus, B. T. P. Barker and C. T. Gimingham (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 28–32, fig. 1*).—The results of studies subsequent to those previously noted (E. S. R., 38, p. 648) and employing the same general procedure are said to confirm the conclusions previously reached, and to afford ground for the hope that an effective method for dealing with pathogenic soil fungi may at last be evolved. The time of applications of the fungicides is thought to be an important factor in this work, as the fungus appears to winter in the soil in a resting condition. The treatment was applied about the middle of April. It is thought possible that a later application might have proved more effective.

Onion diseases found in Ohio, W. Van Pelt (*Mo. Bul. Ohio Sta., 4 (1919), No. 3, pp. 70–76, figs. 6*).—Descriptions and suggestions for control are given for the principal diseases occurring in Ohio on onions.

Potato diseases in New Jersey, M. T. Cook (*New Jersey Stas. Circ. 105 (1919), pp. 38, figs. 19*).—The author describes potato diseases known to occur in New Jersey and offers suggestions for their control.

Potato spraying, S. Pickering (*Gard. Chron., 3. ser., 64 (1918), No. 1657, p. 131*).—Comparative tests with Burgundy, Bordeaux, and Bordorite mixtures at Woburn are said to have shown that of these mixtures Bordorite possessed adhesiveness superior to that of Burgundy in all cases and to that of Bordeaux in most cases. Bordeaux was somewhat superior in every case but one to Burgundy mixture. In every case the ultimate deposit was in the form of a carbonate of copper. In case of Burgundy the copper was deposited initially as carbonate and in the other two mixtures as basic sulphate, which was converted into carbonate, such conversion implying supposedly a much finer and a more adherent deposit. The superiority of Bordeaux over Burgundy in this respect is, however, reduced by the presence of particles of excess lime, which, owing to their size, are easily removed from the leaf surfaces, carrying with them some of the copper and reducing its adhesiveness nearly to the level of that of Burgundy.

Potato spraying for farmers, E. S. Salmon (*Jour. Bd. Agr.* [*London*], *24* (*1917*), *No. 3, pp. 265–274, pls. 4*).—This article, intended for practical potato growers, contains an account of spraying experiments carried out on the farm at Wye College for several seasons demonstrating the benefit to be derived from the proper preparation and timely use of Bordeaux and Burgundy mixtures for potato late blight (*Phytophthora infestans*). These sprays are considered superior to dust sprays in seasons of severe blight attack.

Diseases of tomatoes, M. T. Cook and W. H. Martin (*New Jersey Stas. Circ. 104* [*1918*], *pp. 15, figs. 6*).—Descriptions are given of some of the more common tomato diseases, and so far as definite means are known, control measures are suggested.

Damping-off and collar rot of tomatoes, G. T. Spinks (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 25–27*).—A damping-off and collar rot of tomatoes grown under glass has recently received serious attention, as a result of which it is stated that the two diseases differ only as regards the age at which the plants are infected. There is thus only one disease in question, and most of the observations apply to attacked plants of all ages.

The causal organism is evidently a Phytophthora, though no form of fructification has been found except sporangia, the organism not having been grown in pure culture. The infection is thought to persist year by year in the soil unless removed by sterilization, though the possibility of its transmission by means of water is not excluded by the results of observations noted.

Fungus diseases [of fruit trees], H. W. Davey (*Jour. Dept. Agr. Victoria, 16* (*1918*), *No. 2, pp. 104–107*).—These notes discuss apple black spot or scab, stone fruit shot-hole, peach curl, root rot (Armillaria), citrus collar rot, and chlorosis, with a discussion of fungicides appropriate to these diseases and the preparation and use of Bordeaux mixture and iron sulphate.

Silver leaf disease, P. S. Hayward (*Gard. Chron., 3. ser., 64* (*1918*), *No. 1659, p. 148*).—Cases of silver leaf of fruit trees are noted as having arisen apparently as a result of traumatism or of imperfect union between stock and graft and as having extended both upward and downward. No organism was found in this connection. The course of the disease was marked by silvering of the foliage, partial development of the fruit, deficiency of growth, and death of the branches and finally the tree. Poor drainage and acidity of the soil may be involved.

Black spot of pear, J. G. Veall (*Jour. Agr.* [*New Zeal.*], *16* (*1918*), *No. 5, pp. 288–290, fig. 1*).—Giving the results of orchard experience, the author states that after a bad attack in 1915, owing to neglect of spraying, the use in 1916 of a winter 10 : 10 : 40 Bordeaux application and of a 4 : 4 : 40 strength after the fruit had set improved the pear crop considerably. Tests in 1917 of a winter 8 : 6 : 40 Bordeaux, a pink spray at 6 : 4 : 50, and a strength of 3 : 4 : 40 with the first arsenate spray gave some good fruit in spite of the general failure of that year. The results of this season's work are regarded as very encouraging.

It is considered important to spray thoroughly, at high pressure (above 210 lbs. per square inch), and precisely at the time required for each variety.

Notes on the fruit blossom bacillus, O. GROVE (*Univ. Bristol, Ann. Rpt. Agr. and Hort. Research Sta., 1917, pp. 21-24*).—The bacillus causing a serious disease affecting particularly pear blossoms and fruit spurs of pear trees was investigated in a series of experiments carried on during 1917 at the station to ascertain whether it was sufficiently common in the soil to justify the presumption that the disease is carried by insects from the soil to the plants.

It appears that the organism is fairly common in the soil in April, but not earlier, adhering to the roots of various plants which are mentioned, although tests as to its effect upon the growth of some of these gave inconclusive results. The characters of this organism are said to correspond very closely to those of the fruit blossom bacillus.

Black spot and leaf curl, W. LAIDLAW and C. C. BRITTLEBANK (*Fruit World Austral., 19 (1918), No. 9, pp. 214-217, figs. 10*).—Tests with copper acetate against peach leaf curl (*Exoascus deformans*) showed good results so far as carried. Burgundy gave better results at 6:8:40 strength than did Bordeaux mixture. The spray should be applied when the buds are in the pink stage.

Black spot of apple due to *Venturia inæqualis* appeared to be influenced more by the time of spraying than by the fungicide employed, although lime-sulphur gave better results than did Bordeaux mixture. The application should be made when the central blooms of the cluster are fully open.

Control of brown rot, J. W. COLLARD (*Jour. Agr.* [*New Zeal.*], *16 (1918), No. 5, pp. 275-283, figs. 2*).—A provisional account of studies looking to protection against peach brown rot (*Monilia fructigena*) in the northern districts of New Zealand after the severe attack of 1916-17 states that, while valuable information has been gained, no definite course of treatment can yet be recommended as reliable under adverse conditions. Intense attacks appear to be due primarily to weather conditions, secondarily to soil and situation, and thirdly to variety, though the softer peaches are not more susceptible, as was formerly held.

Tentative conclusions offered are to the effect that Bordeaux mixture at 2:3:50 as a summer spray is too strong for peaches, and any beneficial effects are as yet undecided. Lime-sulphur and atomic sulphur caused more or less leaf marking on all varieties. Soil dressings of iron sulphate at the rate of 1 and 2 lbs. per tree were made without appreciable effect. The need for careful and judicious thinning of the fruit is indicated by the large percentage of infection at points where fruits are in contact. Destruction of all affected fruits is regarded as essential, and all prunings should also be destroyed. Further work is expected to lead to more definite conclusions.

Plum diseases, L. SOURSAC (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 8, pp. 180-185*).—Physiological diseases noted include court-noué, chlorosis, asphyxiation (due to soil conditions), gummosis, and injuries due to hail and other causes. Cryptogamic diseases include root rot (*Armillaria mellea, Agaricus melleus, Dematophora necatrix, Rosellinia necatrix*), trunk and branch rots (*Polyporus fulvus*), mosses and lichens in moist situations, rust (*Puccinia pruni spinosæ, Polystigma rubrum*), plum pockets (*Exoascus pruni*), spotting (*Fusicladium pruni*), brown rot or gray rot (*Monilia cinerea*, (*Stromatinia*) *cinerea*), and cracking (of doubtful causation).

For cryptogamic diseases of plum a treatment with Bordeaux mixture after the appearance of the foliage in spring is considered as being generally safe, practically assuring a good, clean crop of fruit and leaving the foliage and trees in good condition.

How to combat fungus diseases, F. DE CASTELLA (*Fruit World Austral.*, *19* (*1918*), *No. 9*, *p. 213*).—This note gives the substance of an address by the author to the fruit growers at Ardmona, August, 1918, dealing with grape downy mildew, gray rot, and black rot, and with the employment of the preventive sprays Bordeaux and Burgundy mixture and admixtures to increase their adhesiveness.

Calcium carbid for grape Oidium and downy mildew, J. B. LAYMOND (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *38* (*1917*), *No. 37*, *pp. 269, 270*).—The author reports the employment in connection with severe Oidium and downy mildew attack of calcium carbid, applied abundantly in the form of a fine powder to the surfaces and followed by a very fine spray of water. The effects of the acetylene gas were very striking as regards control of the diseases on both foliage and fruit.

Rational protection for grapevines against downy mildew, O. AUDEBERT (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *39* (*1918*), *No. 19*, *pp. 445–449*).—Observations are said to confirm the view that spraying should conform to age and consequent growth of vines in order to avoid the exposure of areas to infection by continued growth and by removal of the fungicide due to precipitation. Suggested sprayings to the number of six are tabulated to agree, as regards the first four, in case of black rot and of severe or moderate mildew infection, with the appearance of certain numbers of leaves, the last of these being employed about August 20.

Positive control of grape downy mildew, A. CADORET (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *38* (*1917*), *No. 35*, *pp. 229, 230.*)—An example is given showing the absolute control of grape downy mildew obtained by the employment before, during, and after rain of Bordeaux mixture at a 2.5 per cent copper strength with an equal proportion of lime.

Grape downy mildew control during 1918, A. CADORET (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *39* (*1918*), *No. 17*, *pp. 392, 393*).—Attempts at combating grape downy mildew are said to have been absolutely effective with certain hybrids when employing the blue basic copper spray, particularly during or after a very misty or rainy period. Both copper sulphate and lime should be present in a strength not less than 3 per cent, and the vines should present a distinct blue color from June 10 to July 15. This mixture is supposed to owe its efficiency not only to the copper compound but also to the lime and to the adherence of the reserve copper.

Precipitation and grape downy mildew in 1917, L. CHAPTAL (*Prog. Agr. et Vit.* (*Ed. l'Est-Centre*), *38* (*1917*), *No. 43*, *pp. 416–423*).—Data presented with discussion are considered to show a distinct relation between precipitation and other factors (particularly in 1902 and 1917) and the prevalence of grape downy mildew.

Eelworm disease (blackhead) of bananas, W. NOWELL (*Agr. News* [*Barbados*], *17* (*1918*), *No. 422*, *p. 206*).—The author notes briefly information collected regarding a serious condition affecting the coarse banana known in Grenada as bluggoe and ascribed to a nematode, possibly *Tylenchus similis*, concerning which further information is being sought. The trouble may appear in plants of any age as a drying of the outer leaves and later of the fruit bunch, the development of which is quickly arrested. Bulbs and roots of young suckers from diseased parent plants may carry the infection. The nematode appears to be widely distributed, attacking even vigorous plants.

Bud rot disease of coconuts, S. F. ASHBY (*Jour. Jamaica Agr. Soc.*, *22* (*1918*), *No. 8*, *pp. 331–333*).—Coconut bud rot, previously referred to (E. S. R., 39 p. 849), is said to exist in two forms, each of which kills the trees with (usually) a soft stinking rot in the heart of the cabbage. In one type the dropping of the young nuts is followed by the breaking down of the limbs, though the host may not be killed for some weeks or months. In the other type, now widespread in St. Thomas and Portland where it has gradually increased since the hurricane of 1817, the first disease indication is a drooping of the heart leaf, which soon dries up, the tree being in a dying condition from the first appearance of the trouble. This type is due to a fungus, the progress of which is described. Destruction of the whole tree by fire as soon as the disease is discovered is recommended, as the infection is spread by means of wind, insects, and birds, attacking trees of all ages, but more particularly those on deep, rich, alluvial soils in wet districts where rapid growth, sappy wood, and early bearing are more noticeable.

Diseases of coconuts in Jamaica, W. Nowell (*Agr. News [Barbados], 17 (1918), No. 427, pp. 286, 287*).—This contains a brief account of the coconut bud rot diseases discussed by Ashby, as above noted, also of leaf bitten phenomena said to exist in four forms. The most frequent of these is caused by the pineapple fungus (*Thielaviopsis paradoxa*), the second widely spread but less frequent form by a small yeast, the third by a downy mildew (*Phytophthora* sp.), and the fourth by the rhinoceros beetle (*Strategus* sp.). These forms are briefly described.

The minimum Bordeaux application for the control of Hemileia, E. M. Africa (*Philippine Agr. and Forester, 6 (1918), No. 9, pp. 251–271*).—The principal obstacle to coffee production in the Philippines for some years having been found to be leaf rust (*H. vastatrix*) an investigation has been made of this disease, the results of which are tabulated and discussed.

A stock solution of 3:5:50 Bordeaux was used at 25, 50, and 75 per cent of its full strength. The 75 per cent solution employed every three weeks gave fair results, as did the 50 per cent strength employed every two weeks. Weaker solutions or longer intervals gave slight protection and were employed at a loss. It was shown that for the best results spraying should begin before the infection is perceptible. Caracolillo coffee on the college farm was infected earlier than was native coffee at San Antonio. A net profit from spraying was obtained on two lots of coffee at Los Baños.

The diseases of roses, L. M. Massey (*Trans. Mass. Hort. Soc., 1918, pt. 1, pp. 81–101, pls. 2*).—This somewhat general account of rose diseases deals also with experimentation on their control.

Black spot (*Diplocarpon rosæ*) was effectively controlled by the use of lime-sulphur 1:50, Bordeaux mixture 5:5:50, or a dust mixture consisting of 90 parts finely ground sulphur and 10 parts lead arsenate, the last mentioned being preferred on account of its ease of application and of its causing less discoloration than the others. In connection with powdery mildew (*Sphærotheca pannosa*), the dust mixture proved superior in fungicidal value and less objectionable as regards the resulting appearance of the plants than Bordeaux mixture or lime-sulphur. Crown canker (*Cylindrocladium scoparium*) is said to be under experimentation as regards proper control measures. Crown gall (*Bacterium tumefaciens*) is said to live for years in soil once infected, supposedly attacking the plants as a wound parasite.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Annual report of the governor of Alaska on the Alaska game law, 1918, T. Riggs, jr. (*U. S. Dept. Agr., Bur. Biol. Survey, 1919, pp. 14*).—This is the usual annual report on the administration of the Alaska game law, in which information is given on the status of game, particularly big game, and recommendations as to a revision of the game laws are presented. Lists of hunting licenses and general game shipping licenses issued for the year ended June 30, 1918, are appended.

A convenient method of handling large numbers of individuals in life history studies of insects, R. A. CUSHMAN (*Proc. Ent. Soc. Wash., 20 (1918), No. 5, pp. 112–114, fig. 1*).

The development of a portable insectary, A. W. YOUNG (*Jour. Econ. Ent., 11 (1918), No. 6, pp. 476–479, pl. 1*).—This article gives a description, specifications, and plan of a field insectary made use of in gipsy moth investigations by the Bureau of Entomology of the U. S. Department of Agriculture.

Observations on the mode of action of contact insecticides, W. MOORE (*Jour. Econ. Ent., 11 (1918), No. 6, pp. 443–446*).—The author's experiments here reported show that a contact insecticide containing oil or soap may penetrate the tracheæ of the insect, "thus preventing normal oxidations from taking place in the insect's body with the result that the insect dies from their mechanical action alone. In order to insure death in this manner it is necessary that all the tracheæ be filled with the spray. The vapor of the insecticide such as nicotin may produce death by chemical action without materially influencing the intake of oxygen. . . . Field experiments with sprays containing free nicotin have shown that the efficacy of such sprays is sometimes increased 50 per cent by the addition of soap. . . . The clothes louse was able to close its tracheæ quickly enough to keep out soap solutions, lubricating oils, xylene, and in seven cases out of twelve even ether was prevented from entering."

A study of the effect of storage, heat, and moisture on pyrethrum, W. S. ABBOTT (*U. S. Dept. Agr. Bul. 771 (1919), pp. 6*).—The author reports upon dusting and dipping tests made of *Pyrethrum cinerariæfolium* at the testing laboratory of the Insecticide and Fungicide Board of this Department at Vienna, Va., the results of which are summarized as follows:

"Whole and ground flower heads kept in sealed fruit jars for 150 weeks were not injured. Ground flower heads kept in tightly closed glass containers for 5½ years lost practically all of their effectiveness. Whole flower heads kept in tightly closed glass containers for 5½ years were practically unhurt. Whole flower heads exposed in an open dish in a room for 150 weeks were not injured. Ground flower heads were not injured by an exposure for 34 weeks in an open dish in a room. Their value was materially reduced by an exposure of 136 weeks and they were practically worthless at the end of 150 weeks. Whole and ground flower heads were uninjured by an exposure to the weather of 12 weeks, but an exposure of 21 weeks greatly reduced their efficiency. Powdered flower heads heated at 120° C. for 18 hours were practically uninjured, but a temperature of 130 to 140° for the same length of time destroyed practically all of their effectiveness. Ground flower heads were slightly injured by soaking for 24 hours in cold water, and materially injured by soaking for the same length of time in hot water."

Report of entomologist, W. E. HINDS (*Alabama Col. Sta. Rpt. 1918, pp. 27–29*).—A brief statement of the status of the work on the Adams fund projects on the rice weevil, the use of arsenate of lead against the boll weevil, and fumigation.

[Report on] entomology, J. TROOP (*Indiana Sta. Rpt. 1918, pp. 30, 31*).—This is a brief statement of the work of the year, including miscellaneous notes on insect depredations in which mention is made of the occurrence of a plant louse (*Geoica squamosa*) which, though rarely troublesome in the State, during the year destroyed whole fields of barley as well as doing considerable damage to rye. An undetermined membracid which attacks the stems of beans below the surface of the soil by first making a cone-shaped opening in the soil around the stem was a source of damage to the bean crop.

[Report on] division of zoology and entomology (*Washington Sta. Bul. 153 (1919), pp. 34–38, fig. 1*).—This is a brief statement of the work of the year ended June 30, 1918, under the headings of cranberry insects, immunity of San José scale to sprays, taxonomy of insects, and biological survey of Washington.

It is stated that newly introduced insects have for several years been increasing to such an extent as to threaten the cranberry industry of southwestern Washington, several bogs having had their entire crop ruined. A preliminary survey made during 1917 has shown the main damage to be done by the black-head fire worm, which has acquired habits remarkably different from its behavior in the East, in that it is mainly destructive to fruit. Studies conducted in cooperation with the Bureau of Entomology of the U. S. Department of Agriculture have shown the larvæ of the first brood to be most abundant during the latter part of May, those of the second brood the middle of August, while, unlike the eastern form, a partial third brood of larvæ appears during September. Tests of sprays show it necessary to use a spreader, such as soap or glue, with the insecticide, and better results were generally obtained with nicotin spray than with arsenicals. Locally a native weevil (*Geoderces incomptus*) was found destructive, and the cranberry girdler (*Crambus hortuellus*) was widespread, though causing relatively little injury.

In immunity work with the San José scale, many thousands were transferred to potted plants at Pullman from several regions in the State, but absolute failure was repeatedly met with in attempting to get the San José scale to thrive at Pullman, either outdoors or in the insectary. More successful results were obtained in the exchange of infested trees between Clarkston and Wenatchee. Counts of many thousands of scales at definite intervals subsequent to spraying at Clarkston, Walla Walla, Yakima, and Wenatchee showed a marked degree of difference in resistance to the polysulphid sprays, the scales from Wenatchee being relatively highly susceptible, while those from Clarkston showed a striking resistance.

In tests of many insecticides in connection with the scale resistance work, the highest grade of miscible oils used at 5 per cent strength proved much quicker acting and more efficient than the customary polysulphid sprays. Samples of one widely used brand obtained in different localities, however, lacked uniformity to an astonishing degree.

Notes from Tasmania, F. M. Littler (*Jour. Econ. Ent., 11 (1918), No. 6, pp. 472–475*).—These notes relate to several insects of economic importance in Tasmania, including the currant clearwing moth (*Aegeria* [*Sesia*] *tipuliformis*), the Rutherglen fruit bug (*Nysius vinitor*), the codling moth, the common earwig (*Forficula auricularia*), and the harlequin fruit bug (*Dindymus versicolor*).

Insects attacking the potato crop in Connecticut, W. E. Britton (*Connecticut State Sta. Bul. 208 (1918), pp. 103–119, pls. 8, figs. 6*).—This is a popular summary of information on the more important insect enemies of the potato in Connecticut and means for their control.

Some new insect enemies of greenhouse and ornamental plants in New Jersey, H. B. Weiss (*New Jersey Stas. Circ. 100 (1918), pp. 3–19, figs. 32*).—Brief accounts are given of a number of insect enemies of greenhouse and ornamental plants, including the ash-leaf bug (*Neoborus amoenus*), the rhododendron lace bug (*Leptobyrsa rhododendri*), the azalea lace bug (*Stephanitis* *pyrioides*), the boxwood leaf miner (*Monarthropalpus buxi*), an imported willow beetle (*Plagiodera versicolora*), a European pine sawfly (*Diprion simile*), an orchid plant bug (*Tenthecoris bicolor*), and three orchid weevils (*Acythopeus* [*Baridius*] *orchivora*, *Cholus cattleyæ*, and *Diorymellus lævimargo*). With the exception of *L. rhododendri* and *N. amoenus*, all of the insects mentioned have been recently found in New Jersey.

Insects of the swamp rose mallow (Hibiscus moscheutos) in New Jersey, H. B. Weiss and E. L. Dickerson (*Jour. N. Y. Ent. Soc., 27 (1919), No. 1, pp. 39–68, pls. 3*).—This is a report of studies of insects of the swamp rose mallow growing in nurseries and also on marshes in their natural environment. These include the buprestid beetle (*Rhæboscelis tenuis*), the adult of which feeds on the leaves and the larva bores in the stem; *Conotrachelus fissunguis*, which develops in the seed pods; *Apion hibisci*, which forms galls at the base of the leaf petiole; *Bruches hibisci*, which develops in the seeds; *Chætocnema quadricollis*, a flea beetle which infests the leaves; *Gelechia hibiscella*, which feeds on the leaves or in the seed capsules; *Tarache* (*Acontia*) *delecta*, which feeds on the leaves; the stalk borer, which infests the stems; and *Neolasioptera hibisci*, a cecidomyiid which forms galls on the stems. A number of other insects of lesser importance are mentioned, including those which infest the stems and leaves and those found in the blossoms.

Medical entomology a vital factor in the prosecution of the war, W. D. Pierce (*Proc. Ent. Soc. Wash., 20 (1918), No. 5, pp. 91–104*).

Two new species of the blattid genus Arenivaga, A. N. Caudell (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, pp. 154–157*).

Three species of Anasa injurious in the North, H. M. Parshley (*Jour. Econ. Ent., 11 (1918), No. 6, pp. 471, 472*).—This paper includes a table for the separation of *A. armigera*, *A. tristis*, and *A. repetita*.

The "17-year locust" in 1919 (*U. S. Dept. Agr., Off. Sec. Circ. 127 (1919), pp. 10, fig. 1*).—This is a digest of information from Bureau of Entomology Bulletin 71, previously noted (E. S. R., 19, p. 452).

The life history and early stages of Calophya nigripennis, H. B. Weiss and A. S. Nicolay (*Jour. Econ. Ent., 11 (1918), No. 6, pp. 467–471, fig. 1*).—This is a brief account of a psyllid which lives exclusively on *Rhus copallinum* from Connecticut southward to Georgia and Florida. Technical descriptions are given of its life stages, including four nymphal stages.

The identity of Aphis circezandis, A. C. Baker (*Proc. Ent. Soc. Wash., 20 (1918), No. 6, pp. 130, 131*).—The author concludes that *A. circezandis* Fitch is a synonym of *A. gossypii* Glover.

Preparing for apple aphid outbreak, H. A. Gossard (*Mo. Bul. Ohio Sta., 4 (1919), No. 3, pp. 89–91, fig. 1*).—This is a brief popular account relating to the three species of aphids common on apples, namely, the European grain aphis, apple aphis, and rosy aphis, and the measures which may be taken to combat them.

Eradication of poultry lice, R. W. Wells (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1919), No. 12, pp. 170–172, figs. 4*).—This popular account calls attention to and gives directions for the use of sodium fluorid as a control measure, as described by Bishopp and Wood in Farmers' Bulletin 801, previously noted (E. S. R., 37, p. 357).

A note on the economic importance of Samia cecropia, C. N. Ainslie (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, pp. 150–152*).—The author records the occurrence of this moth in great abundance in western North Dakota, at one place visited trees having been more or less injured for several years. In the city of Dickinson, N. Dak., a campaign against the pest was waged for two or three ears prior to 1917, thousands of cocoons having been collected and destroyed rough rewards offered to children. It is estimated that 20,000 viable cocoons ere destroyed during a single year.

The bee moth or wax worm, F. B. Paddock (*Texas Sta. Bul. 231* (*1918*), *pp.* -38).—This revision of Bulletin 158 (E. S. R., 29, p. 859) contains additional nformation obtained from experiments in the practical control of this pest.

In fumigation work experiments were made with sulphur and carbon bisulhid. While sulphur dioxid is generally effective under proper conditions, it an not be recommended in preference to carbon bisulphid. Experiments with he moths show them to be very susceptible to carbon bisulphid, being overcome n from 10 to 15 minutes and killed in from 15 to 20 minutes after being conined, when an average dose is used. All fumigation should be allowed to ontinue for at least 12 hours, as those larvæ which are best protected by webs nd refuse will not be killed unless plenty of time is given for the gas to pene-

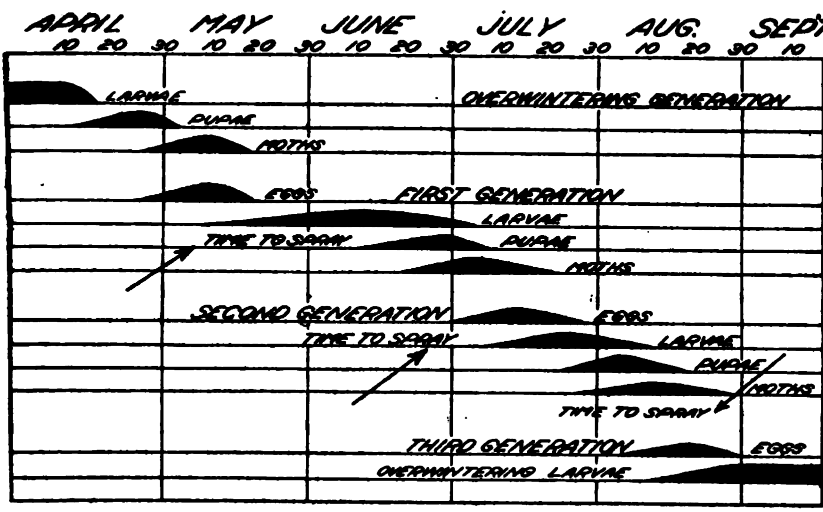

Fig. 1.—Diagram of life history of the strawberry leaf roller, showing the proper times during the season for spraying.

trate the material. The eggs of the bee moth are uninjured by fumes of carbon bisulphid, while the larvæ usually succumb to the average dose in a comparatively short time, and the pupæ are quite susceptible, but a long exposure is necessary. A table is given showing the quantity of liquid carbon bisulphid required for effective fumigation of ten frame supers and hive bodies containing infested material.

The strawberry leaf roller (Ancylis comptana), R. L. Webster (*Iowa Sta. Bul. 179* (*1918*), *pp. 233–256, figs. 8; abridged ed.* (*1918*), *pp. 4, figs. 4*).—This tortricid is said to be the most common strawberry insect in Iowa, severe losses frequently being caused by it. Reference is made to localities in Scott County, where strawberry growing was practically abandoned due to it. The species is particularly abundant and causes the most trouble in the Mississippi Valley, occurring in practically every State between the Appalachian and Rocky Mountains. In North America it is apparently restricted to a very few food plants, the blackberry and raspberry being the only others known.

There appear to be three generations in Iowa (fig. 1). The winter is passed as nearly mature larvæ. At Ames, eggs are deposited by moths of the overwintering generation as early as April 28, by moths of the second generation as early as June

24, and of the third generation as early as August 3. In May the eggs hatched in from 9 to 13 days, and in July and August in from 3 to 12 days. The larval stages averaged 19.5 days, and the pupal stage averaged 6.6 days. The longevity of the female moths, which may deposit as many as 136 eggs, varies from 3 to 28 days, with an average of 10.2 days.

Control work has led to the recommendation that lead arsenate paste be used at the rate of 3:50. This may be applied effectively three times during the season, the first when the earliest blossoms appear, or about May 1; the second after the crop is off, or about July 1; and the third late in August. The May application is the most important. Mowing over the strawberry foliage immediately after the crop is harvested is no less valuable a measure. The mowed leaves should be raked off and burned as soon as dry.

A preliminary account by the author has been previously noted (E. S. R., 38, p. 862). A list of 19 references to the literature is included.

A comparison of several species of Lepidoptera infesting peach and apple in Maryland, with additional notes on the oriental peach moth, P. Garman (*Maryland Sta. Bul. 223* (*1918*), *pp. 103–126, figs. 36*).—The author first presents a comparison of the oriental peach moth (*Laspeyresia molesta*) with several native, more widely distributed, and better known species, namely, *L. prunivora*, *Enarmonia pyricolana*, the codling moth, peach-twig moth, and eye-spotted bud moth. General notes are presented on these six species, their life history and habits are compared in tabular form, and keys to the larvæ, pupæ, and adults are given.

The second part of the bulletin (pp. 109–113) consists of notes on the life history of the oriental peach moth, additional to the information given in the bulletin previously noted (E. S. R., 39, p. 260). The notes relate to egg laying and early larval habits, pupation habits and methods of passing the winter, life history of the different stages, and number of broods. There are three full broods and a fourth, the majority of which hibernate.

The third part (pp. 114–119) deals with the amount of injury caused by the oriental peach moth to peaches, apples, pears, and cherries, and includes a table showing the effect of various insecticides on the egg of *L. molesta*. The injury caused to the apple is in no case as serious as that of the apple bud borer. The injury to pear seems to be of little importance, while the fruit and twig injury to cherry is slight.

A total of five hymenopterous parasites and three dipterous parasites have been reared from the oriental peach moth at College Park and in addition two secondary parasites from the pupa of Macrocentrus, namely: Primary hymenopterous parasites, *Trichogramma minuta*, *Macrocentrus* sp., *Ascogaster carpocapsæ*, and an undetermined species of the family Eupelminæ; secondary hymenopterous parasites, *Dibrachys boucheanus* and *Eurytoma* sp.; and dipterous parasites, *Nemorilla phycitæ*, *Leskiomima tenera*, and *Euzenillia variabilis*. Wood and Selkregg (E. S. R., 39, p. 259) have reared four additional primary parasites, making a total of 12 obtained from the oriental peach moth.

Observations made since the previous report lend some doubt both as to the advisability of using arsenates because of injury to the trees and because of their doubtful effect in controlling the pest.

Tests of the effect of various insecticides on the eggs of the oriental peach moth are reported in tabular form. The highest percentage was that of blackleaf 40, which at the strength of 1:800 destroyed 76 per cent.

The lotus borer, F. H. Chittenden (*Jour. Econ. Ent., 11* (*1918*), *No. 6, pp. 453–457, pl. 1*).—The author here brings together information on *Pyrausta penitalis*, which so closely resembles the European cornstalk borer (*P. nubilalis*) as to be mistaken for it.

This lepidopteran shows a general distribution from New Jersey westward to Illinois and Kansas and southward to Texas. In addition to the lotus (*Nelumbo lutea*), upon the receptacle of which it feeds, Polygonum, Apocynum, and Eupatorium serve as food plants. Its natural enemies include *Panzeria penitalis* and *Zemelucha* (*Porizon*) *facialis*, which were reared by the author. Other species recorded as parasites are *Exorista vulgaris*, *Hypostena variabilis*, *Phorocera comstocki*, and *Bracon xanthostigmus*. As a control measure, the author recommends the application of arsenicals in the destruction of the young larvæ before they penetrate the interior of the buds, seed capsules, or stems.

The California pistol case bearer (Coleophora sacramenta), W. M. DAVIDSON (*Jour. Econ. Ent.*, *11* (*1918*), *No. 6*, *pp. 446–452*, *pl. 1*).—Data are presented on the biology of this elachistid, the young larvæ of which skeletonize the foliage of plum, prune, cherry, apricot, and apple, particularly cherry and plum, in the San Francisco Bay region of California from June to September. They feed at first as leaf miners and from June to September skeletonize the foliage; from late February to May the old larvæ attack leaf buds, fruit buds, flowers, foliage, and occasionally the young fruit. There is one generation a year. The adults emerge in May and June, and deposit eggs on the leaves of the food plants which hatch after a period of 26 days, July 1 being the maximum date of hatching. Pupation occurs in April and May, 25 days being required for transformation to adult.

The larva is commonly parasitized by a small blackish pteromalid (*Eurydinota flavicorpus*).

On the lepidopterous genus Opostega and its larval affinities, C. HEINRICH (*Proc. Ent. Soc. Wash.*, *20* (*1918*), *No. 2*, *pp. 27–38*, *figs. 34*).

A new genus of Lepidoptera allied to Leucoptera, C. HEINRICH (*Proc. Ent. Soc. Wash.*, *20* (*1918*), *No. 1*, *pp. 21*, *22*, *figs. 2*).

Three new species of Diptera, C. T. GREENE (*Proc. Ent. Soc. Wash.*, *20* (*1918*), *No. 4*, *pp. 69–71*).—*Madiza conicola*, the larvæ of which feed within the cocoons of *Abies concolor* in Oregon and California, *Chrysotoxum coloradensis* from Colorado, and *Myxosargus nigricormis* from the District of Columbia are described as new.

District of Columbia Diptera: Tabanidæ, W. L. MCATEE and W. R. WALTON (*Proc. Ent. Soc. Wash.*, *20* (*1918*), *No. 9*, *pp. 188–206*, *figs. 40*).

Notes on gadflies in the Florida Everglades, C. A. MOSIER and T. E. SNYDER (*Proc. Ent. Soc. Wash.*, *20* (*1918*), *No. 6*, *pp. 115–126*).

Collecting the larvæ of Tabanus and Chrysops, W. MARCHAND (*Ent. News*, *30* (*1919*), *No. 5*, *pp. 131–137*).—The habits of these larvæ are described.

The dipterous family Cyrtidæ in North America, F. R. COLE (*Trans. Amer. Ent. Soc.*, *45* (*1919*), *No. 1*, *pp. 1–79*, *pls. 15*).—This is a report of studies of the family Cyrtidæ, formerly known as Acroceridæ, which extended over a period of two years. Ten species and three varieties are described as new. Notes on their life history and habits are included. The species of which the early stages are known are parasitic in the egg cases or the bodies of spiders.

A bibliography of 162 titles is appended.

Anastrepha fraterculus, a severe menace to the southern United States, E. W. RUST (*Jour. Econ. Ent.*, *11* (*1918*), *No. 6*, *pp. 457–467*).—This is a report of studies made during the past two years by the entomologist of the Tucumán Experiment Station, Tucumán, Argentina, in the northern part of which country *A. fraterculus* is the particular scourge of the fruit grower. Attention is called to the great loss that would result in the southern part of the United States should it once gain entrance. The name South American fruit fly is suggested for it, since it is indigenous to and well distributed over the warmer portions of South and Central America and the West Indies, where it is regarded as only less destructive than the Mediterranean fruit fly. Infestation of citrus fruit by it has increased during the past three or four years until in March, April, and May, 1918, the percentage of infested oranges was nearly 50, one grower reporting the dropping of at least three-fourths of his crop of grapefruit.

A number of fruits known to be infested in Argentina are added to the list of hosts recorded by Pierce in the manual previously noted (E. S. R., 38, p. 154). But little is known as yet of the parasites of this species, only a small number having thus far been encountered in rearing thousands of specimens of *A. fraterculus* from all sorts of fruit hosts.

The fruit fly of Argentina (Anastrepha fraterculus), E. W. Rust (*Rev. Indus. y Agr. Tucuman, 9 (1918), No. 3-4, pp. 33-42*).—Substantially noted above.

A note on the habit of Pegomyia affinis and other anthomyid genera, C. T. Greene (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, p. 160*).

Some muscoid synonymy, with one new genus, C. H. T. Townsend (*Proc. Ent. Soc. Wash., 20 (1918), No. 1, pp. 19-21*).

Notes on Zeugophora scutellaris, a European poplar leaf miner, in New Jersey, H. B. Weiss and A. S. Nicolay (*Ent. News, 30 (1919), No. 5, pp. 124-127, fig. 1*).—This chrysomelid was first observed in New Jersey in a nursery at Arlington, feeding on the foliage of poplar (*Populus deltoides*). The species appears to be widely distributed in the United States, having been collected in New Mexico, Illinois, and Indiana.

The tobacco beetle: An important pest in tobacco products, G. A. Runner (*U. S. Dept. Agr. Bul. 737 (1919), pp. 77, pls. 4, figs. 16*).—This is a detailed report of extended studies of the cigarette beetle, a Farmers' Bulletin relating to which has been previously noted (E. S. R., 38, p. 61), as has also a paper on the effect of Roentgen rays on this beetle and the results of experiments with a new form of Roentgen tube (E. S. R., 35, p. 554).

The life history of this insect is briefly summarized by the author as follows: "In material kept constantly warm, breeding is continuous and there may be as many as five or six generations in a year. Under usual conditions in warehouses in the latitude of Virginia there are ordinarily three or four generations a year. The beetle lives in its food substances during all stages of its existence, and the time required to complete its life cycle depends mainly upon temperature and may be as short as 45 days. Normally, in summer, the time varies from 45 to 70 days. The eggs are deposited in the food substance, and under usual conditions the incubation period is from 6 to 10 days, the larval period from 30 to 50 days, and the pupal period from 6 to 10 days. Adults live ordinarily from 3 to 6 weeks after emergence. In cold climates the species passes the winter mainly in the larva stage. It thrives best in localities where the temperature and humidity are high, and, in substances, in which the larvæ are protected from rapid evaporation."

Of its insect enemies the predatory beetle *Thaneroclerus girodi* is the most important, both larva and adult feeding upon the cigarette beetle. This beetle was first observed in unusually large numbers at Key West, Fla., in April, 1912. It has since been found to be more or less common but much less abundant at Tampa, St. Petersburg, Jacksonville, and Tallahassee, Fla. Specimens were also located at Richmond, Va., in a package of smoking tobacco infested with the cigarette beetle which had been returned to the manufacturers from Galveston, Tex. This beetle is said to be well known among Cuban cigarmakers, and an undetermined clerid beetle in the Philippines has been reported by Jones to have similar habits (E. S. R., 29, p. 458). Technical descriptions are given of the several stages of this predator and brief notes on its life history and habits.

The parasitic enemies mentioned include *Aplestomorpha pratti*, one of the more common species, which is found in various localities from Richmond, Va., southward to Key West, Fla. *A. vandinei* was found abundant in a tobacco warehouse at Clarksville, Tenn.

The technical description of the larva of the cigarette beetle and of *T. girodi* are by A. G. Böving.

The remedial measures considered at length consist of cold storage, high temperatures, ultra-violet rays, trapping, exposure to vacuum, sealed containers for manufactured tobacco, casing cigar tobacco in a decoction of tobacco stems, use of cold water in casing cigar tobacco, and boric acid. Fumigation with hydrocyanic-acid gas, carbon tetrachlorid, carbon disulphid, and formaldehyde and the effect of the Roentgen or X-rays are discussed at length.

The more important means of control of this beetle have been summarized by the author as follows: "Scrupulous cleanliness in the factory, wholesale or retail establishment, including the prompt destruction or treatment of all refuse material, damaged stock, etc., in which the beetles may breed. In factories, screening or otherwise protecting the finished product from infestation. Constructing or refitting packing or storage rooms, especially in warm localities, so that they can be quickly and easily cleaned, and with a view to the exclusion of beetles which may be present in other parts of the factory.

"Among the destructive agencies which may be employed in control of the insect are freezing (treatment by cold storage or exposure to low temperatures in cold climates); high temperatures or steam (a temperature of from 125 to 140° F. continued for several hours, or 150° for a short time, kills all stages of the beetle); trapping or destruction by mechanical means; fumigation with carbon disulphid, hydrocyanic-acid gas, or other fumigants; and sterilization of infested tobacco by means of exposure to Roentgen or X-rays.

"The modern method of storing leaf tobacco in hogsheads in specially constructed buildings or sheds, giving practically out-of-door conditions and variations of temperature, furnishes an effective means in cool climates of reducing or preventing injury from the beetle to the classes of leaf tobacco which may be stored in this manner."

An annotated bibliography of 90 titles is included.

A new species of Agrilus from Florida, W. S. Fisher (*Proc. Ent. Soc. Wash., 20 (1918), No. 4, pp. 67, 68*).—*Agrilus dozieri* from Gainesville, Fla., is described as new. It was found to be fairly abundant on the foliage of blue birch (*Ostrya* sp.) about the first of April, 1917.

The case of the genera Rhina and Magdalis, W. D. Pierce (*Proc. Ent. Soc. Wash., 20 (1918), No. 4, pp. 72–78*).

A new host plant of the boll weevil, E. A. McGregor (*Proc. Ent. Soc. Wash., 20 (1918), No. 4, pp. 78, 79*).—Investigations by the author in Sonora, Mex., have shown *Anthonomus grandis thurberiæ* to infest heavily a wild littoral species of cotton (*Gossypium davidsonii*).

An eyeless drone honeybee, J. A. Nelson (*Proc. Ent. Soc. Wash., 20 (1918), No. 5, pp. 105–108, figs. 4*).

Report of the apiarist, F. W. L. Sladen (*Canada Expt. Farms Rpts. 1917, pp. 41–44*).—It is pointed out that the noteworthy feature of 1916 was the unusually large crop of honey from alsike and white clover produced in Ontario, Quebec, and Manitoba, principally due to the wet spring followed by fine, warm weather when the plants were in flower. The highest yield of honey in 1916 was obtained at the Central Experimental Farm, Ottawa, where

8,269 lbs. were produced by 85 colonies, an average of 236 lbs., valued at $34 per colony.

Further study showed *Megachile latimanus* to be by far the most useful species in pollinating alfalfa in southern Alberta and *M. perihirta* in the dry interior of British Columbia. The honeybee visits the flowers without tripping them, and the action of bumblebees is uncertain.

Of two experimental shipments of bees without combs received from Alabama, one consisting of six 1-lb. packages was 14 days en route and only 17 oz. of bees were found to be alive on arrival. The other shipment, consisting of three 2-lb. packages, with untested queens, arrived in good condition after 4 days' journey and after having been assisted a little with combs and brood from other colonies produced 435 lbs. of honey and built up into five strong colonies fit for wintering.

Experimental work was conducted throughout the winter with 28 colonies wintered in the bee cellar in the new apicultural building at the Central Farm, the objects of which included a comparison of different kinds of food consumed by bees during the winter and the discovery of the source or sources of the hard, granulated honey, associated with a heavy mortality of bees, that has been found in some winters in several apiaries in the Ottawa valley. In four colonies wintered on stores collected between June 26 and July 18 mainly from alsike and white clover, the bees were found to cover an average of 5.1 combs per colony on April 17, the honey having granulated but little. Three colonies on stores gathered between July 24 and August 8, largely from white sweet clover (*Melilotus alba*), covered an average of only 3.2 combs, much of the honey having granulated hard. Three colonies on stores collected after August 14, principally from goldenrod (chiefly *Solidago canadensis*) and buckwheat, covered an average of 3.8 combs and the honey was not granulated.

Wintering bees outdoors, using four hives packed in shavings in a case in an inclosure sheltered from wind without attention during the winter, continues to prove successful in Ottawa, the average results of the last four years showing that the bees so wintered did better than those wintered in the cellar. An experiment with sealed covers is briefly reported upon.

A cage containing live wax moths (*Galleria mellonella*) with larvæ, pupæ, and probably eggs was placed in the honey house in the middle of March, 1917, and exposed to a temperature as low as 9° F. on March 18 and 19. All the moths were apparently killed by the cold.

A note on the muscular coat of the ventriculus of the honeybee (Apis mellifica), G. F. White (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, pp. 152–154, fig. 1*).

The correct names for some of our common ichneumonid parasites, R. A. Cushman (*Proc. Ent. Soc. Wash., 20 (1918), No. 1, pp. 9–12*).

A synopsis of the species belonging to the chalcidoid genus Rileya, A. B. Gahan (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, pp. 136–150*).

Three new chalcidoid egg parasites, A. B. Gahan (*Proc. Ent. Soc. Wash., 20 (1918), No. 2, pp. 23–26*).—*Gonatocerus ornatus*, *Polynema imitatrix*, and *Abbella* (*Ittys*) *perditrix*, reared from the eggs of *Stictocephala festina* at Tempe, Ariz., are described as new.

A note on Chalcis abiesæ, S. A. Rohwer (*Proc. Ent. Soc. Wash., 20 (1918), No. 1, p. 18*).

The genus Ephialtes first proposed by Schrank, R. A. Cushman and S. A. Rohwer (*Proc. Ent. Soc. Wash., 20 (1918), No. 9, pp. 186–188*).

Propachyneuron Girault, A. B. Gahan (*Proc. Ent. Soc. Wash., 20 (1918), No. 3, p. 66*).

Description of a new hymenopterous parasite, A. B. Gahan (*Proc. Ent. Soc. Wash., 20 (1918), No. 1, pp. 18, 19*).—*Microbracon cephi*, reared from the larva of *Cephus cinctus* infesting stems of Agropyron at Bottineau, N. Dak., and also reared from the same host in the stems of *Elymus canadensis* in Manitoba, is described as new.

Notes on the cocoon spinning habits of two species of braconids, R. A. Cushman (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, pp. 133–136*).

Notes on and descriptions of sawflies belonging to the tenthredinid tribe Hemichroini, S. A. Rohwer (*Proc. Ent. Soc. Wash., 20 (1918), No. 8, pp. 161–173*).

The North American species of the sawfly genus Laurentia, S. A. Rohwer (*Proc. Ent. Soc. Wash., 20 (1918), No. 7, pp. 157–159*).

New sawflies of the subfamily Diprioninæ, S. A. Rohwer (*Proc. Ent. Soc. Wash., 20 (1918), No. 4, pp. 79–90*).—Among the species here described are *Augomonoctenus libocedrii* n. g. and n. sp., reared from larvæ collected feeding in the cones of *Libocedrus decurrens* at Siskiyou, Oreg.; *Neodiprion dyari* n. g. and n. sp., *N. virginiana* n. sp., and *N. affinis* n. sp., from larvæ collected on *P. virginiana* at Rosslyn, Va., Kanawha Station, W. Va., and Falls Church, Va., respectively; and *N. maura* n. sp., from larvæ collected on jack pine (*P. banksiana*) at Boulder Junction, Wis.

FOODS—HUMAN NUTRITION.

The milling and baking qualities of Wisconsin-grown wheats, B. D. Leith (*Wisconsin Sta. Research Bul. 43 (1919), pp. 38, figs. 4*).—The tests reported in this bulletin were carried on to determine whether wheat of good quality can be grown in Wisconsin, and to select the best varieties for milling and baking quality and yield to the acre.

"The spring wheats were so low in yield to the acre that with the exception of the Marquis they were not continued long in the milling and baking tests. Two pure lines of hard winter wheat, Pedigree No. 2 and Pedigree No. 408, are recommended to millers and farmers for their excellent quality and high yield as shown in these tests. . . .

"In a six-year test, Wisconsin Pedigree No. 2 was fully equal to the Marquis grown at the Madison station in milling and baking quality, and considerably superior in yield. In a five-year test Wisconsin Pedigree No. 2 compared very favorably in milling and baking quality with the average of the northern spring wheats tested by the same laboratory.

"Wheat does not deteriorate when grown in Wisconsin. Kansas No. 570, Wisconsin-grown, compared very favorably in milling and baking quality with the Kansas-grown crop after having been grown continuously in Wisconsin for seven years. . . .

"As far as baking tests show, the yellow berry can not be considered very detrimental. In one test the loaf baked from the yellow berries equaled those from the average hard-winter wheat and in the other test the loaf was comparable to the semihard winters.

"Pure lines of hard-winter wheats may be almost identical in appearance but have widely different capacity for baking quality. This heritable character was very marked in No. 70 and No. 71, the former giving a baking test equal to the best hard winters while the latter ranked with the semihard winters in size of loaf."

The "strength" of wheat flour (*Minnesota Sta. Rpt. 1918, pp. 38, 39*).—A brief summary is given of the results obtained in studies of various factors which may be involved in flour strength. The effect of colloidal factors has been previously noted from another source (E. S. R., 39, p. 468). Other factors noted are the diastatic enzyms and the specific electrical conductivity of aqueous extract of flour. The latter factor is considered of importance in a consideration of the baking quality of the flour.

The baking qualities of flour (*Washington Sta. Bul. 153* (*1919*), *pp. 12-14*).—Studies are reported of the effect upon the baking quality of flour of the addition of electrolytes, the substitution of a part of the wheat flour by other cereal flours, and the physical properties of gluten.

The patented preparation Arkady Yeast Food showed beneficial effects with some flours but not with others. The wheat substitutes studied were flours made from oats, barley, rice, yellow and white corn, apples, alfalfa, and soy beans. A particular study was made of field peas and soy-bean cake, owing to their higher protein and lower starch content than most cereals. It was found that the volume of the loaf could be held to the size obtained from the use of wheat flour alone if not more than 10 per cent of the substitute flour was used. With larger amounts of the substitute, the volume of the loaf was in general inversely proportional to the amount of substitute. The flavor of the pea flour bread was said to be very good and its color an unobjectionable green. Soy bean flour bread had a less pleasant taste and a yellowish color. Apple flour imparted an acrid taste and brown color to the bread. Bread made with alfalfa flour tasted of weeds and had an objectionable color.

The physical properties of gluten were thought to be determined to a large extent by differences in chemical composition, possibly due to environmental factors.

Cereals in the diet, M. F. Henry (*Cornell Reading Course for Farm Home, 117* (*1918*), *pp. 27-52, figs. 4*).—Cereals as sources of energy, protein, inorganic elements (lime, phosphorus, and iron), and body regulating substances (cellulose and vitamins) are discussed.

The dietary properties of the pea (Vicia sativa), E. V. McCollum, N. Simmonds, and H. T. Parsons (*Jour. Biol. Chem., 37* (*1919*), *No. 2, pp. 287-301, figs. 8*).—This paper contains a report of the dietary properties of the common pea and the supplementary relationships between the proteins of the pea and casein, zein, and lactalbumin, respectively, as determined by the usual feeding experiments with young rats.

The proteins of the pea were found to be of poor quality when fed as the sole source of nitrogen. The deficiencies were supplemented by casein and zein but not by gelatin or lactalbumin. This is thought to indicate that the limiting amino acid in the pea is neither tryptophan, lysin, nor cystin. From the failure of lactalbumin as a supplement, the authors conclude that it is a poorly constituted or incomplete protein, and that the excellent results obtained with it by Osborne and Mendel (E. S. R., 37, p. 864) were due to the high proportion of nitrogen derived from protein-free milk which served to supplement the lactalbumin with respect to some as yet undetermined cleavage product.

The pea was found to be fairly rich in fat-soluble A and to have a shortage of calcium, sodium, and chlorin. With peas as a sole source of water-soluble B, the limiting values of growth were found to lie somewhere between 5 and 25 per cent of the food mixture. Contrary to results obtained with navy beans (E. S. R., 37, p. 163), no serious injury appears to result to rats from the feeding of a liberal amount of peas over a long period of time.

The antiscorbutic property of vegetables.—I, An experimental study of raw and dried tomatoes, M. H. Givens and H. B. McClugage (*Jour. Biol. Chem., 37* (*1919*), *No. 2, pp. 253-269, figs. 6*).—This is the first of a series of studies planned to determine the antiscorbutic potency of different foods, the effect of preparation and preservation on these foods, etc. In the present study, raw and dried tomatoes were used as the antiscorbutic agent. The tomatoes were dried in a special apparatus which allows of temperature control within 5° C. or less at all times by means of a series of electric coils placed between the sections of drawers in which the product is being dried. The volume of air is so controlled as to be always the same. The details of the drier are illustrated by a diagram.

The basal ration was a dried product containing soy bean flour, milk, yeast, paper pulp, sodium chlorid, and calcium lactate. This was proved to be adequate for the rat and the pigeon but to produce scurvy in the guinea pig. A small daily addition (10 gm.) of fresh tomato to this diet was sufficient to prevent and to cure the disease. Raw tomatoes dried in a blast of air at either a low temperature (35 to 40°) or a high temperature (55 to 60°) were found to retain a significant amount of their antiscorbutic potency, as a daily supplement of 1 gm. was sufficient to protect guinea pigs form scurvy. The low-dried tomatoes were still effective as antiscorbutic agents 80 days and the high-dried 90 days after drying.

The authors state that their experiments confirm the conclusions of Chick, Hume, and Skelton (E. S. R., 40, p. 272) that guinea pig scurvy is due to the deficiency in the diet of a specific accessory substance, and of Cohen and Mendal (E. S. R., 39, p. 770) that roughage is not the determining factor.

Our local foods, their production and use, W. G. FREEMAN and R. O. WILLIAMS (*Trinidad: Dept. Agr. Trinidad and Tobago, 1918, pp. 24*).—Directions for planting yams, sweet potatoes, tannias, dasheens, eddoes, cassava, artichokes, beans, pigeon peas, and other common vegetables are given. Suggestions for the use and recipes for the preparation of these vegetables and some of the local fruits are included.

Studies on the composition and nutritive value of some subtropical fruits, M. E. JAFFA and F. W. ALBRO (*Ann. Rpt. Cal. Avocado Assoc., 1917, pp. 85–91*).—The results of various chemical analyses of the avocado, sapote, guava, feijoa, and several cacti are tabulated as follows:

Composition of various subtropical fruits.

Kind of fruit.	Water.	Protein.	Fat.	Carbohydrate (by difference).	Fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Lemon guava	84.00	0.76	0.95	8.06	5.57	0.67
Strawberry guava	79.42	.88	.80	11.55	6.58	.77
Sapotes	72.64	.64	.46	24.56	1.26	.44
Do	74.74	.87	.55	21.75	1.62	.47
Feijoa	84.86	.82	.24	9.97	3.55	.56
Do	83.87	1.02	.05	11.16	3.45	.45
Cacti (6 analyses)	86.02	.76	.07	12.46	.26	.43
Avocado (28 analyses)	69.16	2.08	20.10	7.40	....	1.26

Attention is called to the high percentage of oil in the avocado, the digestibility of which has been found to be equal to that of other oils. The use of avocado pulp as a butter substitute is suggested as a conservation measure.

Investigation of fruit juices, F. HÄRTEL and J. SÖLLING (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 11, pp. 437–442*).—Tables are given showing the composition of raspberry juices prepared by different methods. According to the figures given, the freshly pressed juice contains a larger amount of nitrogen and phosphoric acid than the fermented juices. More phosphoric acid was found in the juices in which the whole fruit had been fermented than when the juice alone had been fermented. The authors suggest that this is probably due to the fact that during fermentation small amounts of phosphorus-containing compounds in the pulp pass into solution. The percentage composition of the ash of these same juices is also tabulated.

An examination of apple juice in which the first, second, and third extractions are analyzed separately is recorded. The data show that the mineral constituents and the alkalinity increase with succeeding extractions.

Twenty-four samples of raspberry juice, which had been preserved by various chemicals (for 1 liter of juice 2.5 gm. of formic acid, 1 gm. of salicylic acid, 1.5 gm. of benzoic acid, or 0.5 gm. of hydrofluoric acid), were examined.

It was found that salicylic acid was the most satisfactory, and that after one year's standing the juice retained its color as well as its natural flavor and aroma. Hydrofluoric acid ranked next in value, while formic acid was found the least satisfactory.

The bacteriology of canned foods, J. Weinzirl (*Jour. Med. Research, 39 (1919), No. 3, pp. 349–413*).—This is the report of an investigation of the organisms which may be present in canned foods. An historical survey is given of the literature relative to the bacteriology of the canning industry, in summarizing which the author points out that, although the results are conflicting, all investigators are agreed that spoilage is due to the action of microorganisms. Two types appear to be prominent, the colon group, which causes swelling and decomposition with malodors, and the *B. subtilis*, or spore-bearing group, which is difficult to kill in processing.

In the present investigation, a study was made of the organisms found in spoiled canned foods, in experimental packs subjected to different periods of processing, and in ordinary commercial packs. Proper media and conditions of growth were selected to isolate molds and yeasts, aerobic and anaerobic bacteria, and thermophiles. In connection with the bacteriological studies, an examination of the cans was conducted to determine whether apparently nonleaking cans were really tightly sealed and to determine the extent of swelling in cans in which spoilage had occurred.

Bacteriological examinations were made of 169 spoiled or suspected samples, 67 experimental or underprocessed samples, and 782 commercial or market samples. The organisms isolated comprised 17 cultures of yeasts, 29 cultures of molds representing 7 genera, and 392 cultures of bacteria representing 38 species. The most prevalent mold was *Aspergillus nidulans*. The most prevalent species of bacteria were *B. mesentericus*, *B. subtilis*, *B. thermoindifferens*, *B. vulgatus*, and *B. cereus*. Members of the paratyphoid-enteritidis group were not found, nor was *B. botulinus* ever isolated.

In spoiled and in underprocessed canned foods, both spore and nonspore-forming bacteria were present, the spore-forming usually belonging to the *B. mesentericus* group and the nonspore-forming to the lactic-acid-forming group. In spoiled sardines, the colon group was the prevailing type, the presence of which causes the swelling of the cans. The swelling of cans of fruits and vegetables is thought to be due chiefly to the presence of anaerobic bacteria such as *B. welchii*.

In commercial canned goods giving no evidence of spoilage, microorganisms, almost entirely spore-forming, were found in 23 per cent of the cases. As these may develop in the presence of air, it is pointed out that a vacuum is essential to the preservation of canned foods under present practice.

Of the 700 cans tested for leakage, 64.1 per cent were found not to leak. The presence of viable spores in 19.2 per cent of the nonleaking cans is consequently attributed to understerilization.

Food Surveys (*U. S. Dept. Agr., Food Surveys, 2 (1919), Nos. 20, pp. 8, figs. 7; 21, pp. 8, figs. 5*).—The first of these numbers consists of a special report of commercial stocks on hand January 1, 1919, of fats and oils, cured meats, and salt fish, and the second of corresponding data for dairy and related products, sugar, sirup, honey, and candy.

Reference handbook of food statistics in relation to the war, R. Pearl and E. P. Matchett (*Washington: U. S. Food Admin., 1918, pp. 124*).—This handbook is published by the United States Food Administration. The statistics of production, export, and import of the principal food crops in all the countries of the world are given for the years 1914–1917, and as far as possible for 1918, with the average of the three years preceding the war.

Rise in prices during the war.—Food and other commodities (*Nat. Food Jour.* [*London*], *2 (1918), No. 30, p. 164*).—Tables showing the broad movement of prices of different articles, the effect of control in the prices of the principal foods, and the contrast between the rise in food prices in England and other countries are given.

A method of expressing numerically the growth-promoting value of proteins, T. B. Osborne, L. B. Mendel, and E. L. Ferry (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 223–229*).—To show with some degree of accuracy the maximum efficiency of individual proteins or mixtures of proteins for growth, the authors suggest the calculation of the gains in body weight per gram of protein eaten. In this way differences in food intake and rate of growth are largely eliminated, and the efficiency of combinations of proteins can be expressed numerically and compared with that of single proteins. The method previously described (E. S. R., 37, p. 864) is considered, however, to be better adapted to the use of the dietitian or the agriculturist in determining the relative value of proteins for growth.

Tables are given showing the relative efficiency of lactalbumin and casein as calculated by the new method and the effect of restricted food intake on gains made per unit of food eaten. Recalculations have also been made of data obtained in the earlier study.

It is pointed out that economy of food can be effected only by supplying the young animal with as much as it will eat, and economy of protein only by reducing the nutritive ratio below that at which the normal rate of growth can be maintained. "Economy in nutrition during growth depends upon a correct adjustment between the proportion of protein and the total energy supplied. Furthermore, the optimum of protein is determined not only by the absolute amount furnished but also by its quality."

The occurrence of creatin and creatinin in the blood in normal and pathological conditions.—III, Further observations of normal cases, especially in old age, J. Feigl (*Biochem. Ztschr., 87 (1918), No. 1–2, pp. 1–22*).—In continuation of the investigations previously noted (E. S. R., 40, p. 274), determinations are reported of the creatin and creatinin content of the blood of adults from 40 to 50, 50 to 60, 60 to 70, and 70 to 80 years of age. The results are compared with those of children and of adults under 40 years.

Creatinuria and acidosis, W. Denis and A. S. Minot (*Jour. Biol. Chem., 37 (1919), No. 2, pp. 245–252*).—Experiments on human subjects along the same general lines as those used by Underhill and Baumann on rabbits (E. S. R., 36, p. 161) were conducted to determine the relation between acidosis and creatin excretion. The experimental subjects received a highly acid diet until creatin excretion was established, after which sodium bicarbonate was administered in amounts sufficient to keep the urine alkaline to litmus. Creatin and creatinin determinations were made by Folin's micro methods, using purified picric acid.

The results obtained appear to demonstrate no definite connection between changes in acid-base equilibrium and creatin excretion. The authors point out that the rations used in the above experiments and those reported earlier (E. S. R., 37, p. 469) contain a much larger amount of protein than the so-called high protein diets employed by Rose, Dimmitt, and Bartlett (E. S. R., 39, p. 571), with which creatin excretion was not obtained.

Normal mechanism for the control of oxidation in the body, W. E. Burge and A. J. Neill (*Amer. Jour. Physiol., 46 (1918), No. 2, pp. 117–127, figs. 3*).—Continuing previous work (E. S. R., 40, p. 364), an investigation was undertaken with laboratory animals (dogs, cats, and rabbits), from which the author concludes that "ingestion of the foodstuffs increases the catalase of the blood and hence of the tissues parallel with the increase in heat production. The increase in catalase is due mainly to the stimulating effect of the absorbed foodstuffs on the liver. The ingestion of protein, in keeping with its greater stimulating effect on heat production, produces a greater increase in catalase than fat or carbohydrate. After the removal of the liver from the body of an animal, the liver cells continue to liberate catalase for about two hours, due presumably to the stimulating effect of the dextrose formed from the glycogen."

The effect of acetone and of β-hydroxylbutyric and acetoacetic acids on the blood catalase, W. E. Burge (*Jour. Biol. Chem., 37 (1919), No. 3, pp. 343–347, figs. 2*).—In continuation of the investigations on catalase noted above, the author reports experiments indicating that the introduction into animals of acetone and of β-hydroxylbutyric and acetoacetic acids results in an increase in the catalase in the blood, and that this increase is due to a stimulation of the liver by these substances. This is thought to offer an explanation of the increased oxidation in diabetes.

Contributions to the physiology of the stomach.—XLVII, Gastric secretion and urine ammonia, A. C. Ivy (*Amer. Jour. Physiol., 46 (1918), No. 4, pp. 340–361, figs. 6*).—The author concludes that "gastric secretion and urine ammonia are related in that the urine ammonia is increased by the absorption in the intestine of the acid product of gastric secretion, provided that this acid secretion is absorbed before neutralization occurs, i. e., at a relatively fast rate." For earlier work see a previous note (E. S. R., 40, p. 270).

Contributions to the physiology of the stomach.—XLVIII, Studies in water drinking, A. C. Ivy (*Amer. Jour. Physiol., 46 (1918), No. 4, pp. 420–442, figs. 11*).—From observations upon laboratory animals (dogs) and man the author draws the following conclusions:

"The ingestion of water with the meals (400 to 800 cc.) increases the amount and the free and total acidity of the gastric juice. The ingestion of water with the meals decreases the emptying time of the stomach, due to the dilution of the stomach contents. Food in the stomach retards the evacuation of water. The emptying time of water from the normal human stomach varies, conservatively, from 400 cc. to 100 cc. in 15 minutes.

"The manner of the discharge of water from the dog's stomach is, according to the observations upon 4 dogs, rhythmic and could very possibly correspond to peristaltic waves. All stomachs do not respond to stimulation by water, there being a marked variation in different individuals. Those stomachs that empty water slowly (150 cc. or less in 15 minutes when 400 cc. are drunk) respond much more than those that empty water fast. From the observations in this study water can not be substituted for the Ewald meal.

"The latent period of the gastric glands of man when stimulated by water is from 5 to 7 minutes. It was impossible to demonstrate a fatigue of the gastric glands when stimulated by water or by gastrin for a period of 10 to 26 hours."

The physiological basis of thirst, W. B. CANNON (*Proc. Roy. Soc.* [*London*], *Ser. B, 90* (*1918*), *No. B 629, pp. 283–301, fig. 1*).—The author explains that thirst is due to a relative drying of the mucosa of the mouth and pharynx. In the cases of "true thirst" it results from deficient salivary secretion. The salivary glands require water for their action, and in the presence of a general need for water in the body they fail to maintain the normal amount and quality of secretion. The importance of this failure to the mechanism of the water supply of the body, he believes, lies in the strategic position of these glands in relation to a surface which tends to become dry by the passage of air over it. Because of the discomfort which thus arises, the salivary glands become a delicate indicator of the bodily demand for fluid.

Importance of calcium for the nourishment of plants, animals, and man, O. LOEW (*Naturw. Ztschr. Forst u. Landw., 16* (*1918*), *No. 9–10, pp. 309–336*).—This is a general discussion of the subject, with numerous references to related literature.

Studies on cholesterol.—IV, Experiments concerning the relation of the diet, the blood cholesterol, and the "lymphoid defense," G. LUDEN (*Jour. Lab. and Clin. Med., 3* (*1917*), *No. 3, pp. 141–174, figs. 8*).—The author has found that both radium and Roentgen rays appear to increase the lymphocyte count and decrease the cholesterol content of the blood. The following investigations were undertaken with a view to determining the possibility of activating the "lymphoid defense" by dietetic measures. The author was her own subject. As preliminary steps she determined her individual cholesterol standard and the effect of the digestive process on her cholesterol standard during the usual mixed diet. The cholesterol percentage of the common articles of food used during the experiments was also determined. The effects of Gruner's diet (milk, water, lettuce, toast, and jam), of an exclusive meat diet, and of a vegetable diet on her blood cholesterol and cytology were studied. The influence of an excess of carbohydrate was also observed by means of a diet composed as exclusively as possible of oats. Since no cholesterol appeared to be contained in oats it was thought that this diet might at the same time furnish data concerning the synthesis of cholesterol in the body. No conclusive evidence of the latter was found.

According to the author's data, it was definitely shown that the chemical composition of the blood could be changed by dietetic measures. The vegetable diet decreased the blood cholesterol. It was reduced by one-third in 2 days on Gruner's diet and increased as much in 3 or 4 days by the meat and oatmeal experiments.

A diet which increases the blood cholesterol weakens the lymphoid defense, whereas a diet which decreases the blood cholesterol increases the lymphoid defense. In persons predisposed to carcinoma the use of food which increases the blood cholesterol may possibly result in the development of carcinoma, whereas dietetic measures calculated to reduce the blood cholesterol by increasing the lymphoid defense may be of value in treating carcinoma.

ANIMAL PRODUCTION.

Milk as the sole diet of ruminants, A. C. MCCANDLISH (*Iowa Sta. Research Bul. 48* (*1918*), *pp. 3–11*).—Two bull calves, one a grade Jersey castrated at the age of 22 days and the other a grade Holstein not castrated, were fed on nothing but milk and common salt from the date of their birth until their death, which occurred apparently at the age of about 30 and 25 weeks, respectively. The digestible crude protein and total digestible nutrients consumed were in excess of those called for by the modified Wolff-Lehmann standard. Body weight, height at withers, depth of chest, and width at hips were determined every 30 days and these data, together with the amount of feed consumed in successive 10-day intervals, are published in tables. The average of weights and measurements of 66 normally fed heifers are presented for comparison.

At the end of 6 months the Jersey calf had increased his body weight 111 per cent. At the end of 5 months the Holstein had increased his 91 per cent, while the heifers in 6 months averaged a 345 per cent increase. During the same periods the percentage increase in height was 14 for the Jersey, 27 for the Holstein, and 85 for the heifer calves. Increase in depth was 19, 11, and 57 per cent, respectively, and in width 17, 21, and 75. Neither of the experimental animals throve after reaching the age of 3 months. They suffered from fits and large patches of skin became devoid of hair.

Autopsies were made of both calves. The bones of the Jersey steer "were very flexible as if insufficient ash were present; the leg bones could be bent comparativèly easily, while the ribs had a very thin coating of hard material with a soft core. None of the bones was as rigid as would be expected in an animal of similar age. There was one atrophied kidney (perhaps congenital) with hypertrophy of the other. The mesenteric lymph glands were much enlarged and there was an apparent leukemia. The rumen was of normal size, but the walls were evidently atonic, due apparently to a development of lymphoid tissue. The omasum was smaller than would be expected, though the two remaining compartments of the stomach appeared to be normal. The contents of the rumen resembled thin cottage cheese mixed with hair." In the case of the 6-months Holstein bull, the bones "appeared to be in fairly good condition, though one or two of the ribs might previously have been broken and healed. The mesenteric lypmh glands were enlarged and both kidneys were in bad condition with cysts. All the stomach compartments were of about normal size, but there were streaks of dark brown or black pigment on the inner wall of the abomasum. The contents of the rumen were similar to those" of the Jersey calf.

Effect of rust on [the feeding value of] wheat straw, F. T. Shutt (*Canada Expt. Farms Rpts. 1917, p. 25*).—Analyses in the laboratory of the Dominion chemist show, it is stated, that straw from rusted wheat has a higher protein and a lower crude fiber content than straw from rust-free wheat. This suggestion as to the superior feeding quality of the former is confirmed by the observations of several farmers that it is eaten by cattle with avidity. If not too seriously affected with rust, it is counsumed in preference to fully mature rust-free straw. The analytical data are not published.

[Chemical analyses of] brans and shorts, F. T. Shutt (*Canada Expt. Farms Rpts. 1917, p. 25*).—Brief note is made of the protein, fat, and fiber content of Canadian samples of bran and shorts.

Cull beans for fattening steers, G. A. Brown (*Michigan Sta. Quart. Bul., 1 (1918), No. 2, p. 47*).—Culls resulting from damage to the Michigan bean crop were tested out as feed for steers. There were three lots of six steers each. The roughage consisted of corn silage and clover hay.

The lot receiving a grain ration of corn meal and cull bean meal in the ratio of about 8:1 did not relish the bean meal and made only 1.94 lbs. daily gain per steer. Another lot given corn meal and cooked bean meal in a ratio of about 2:1 found the mixture appetizing and made an average daily gain of 2.12 lbs. The check lot fed corn meal and cottonseed meal gained 2.33 lbs. daily.

Cattle [feeding experiment in Nova Scotia], W. S. Blair (*Canada Expt. Farms Rpts. 1917, p. 72*).—A lot of 12 steers fed swede turnips and hay during a period of 136 days gained on an average 2.1 lbs. per head per day, while a comparable lot receiving corn silage and hay gained 2.24 lbs. The silage ration of the second lot was 10 lbs. less per day than the swede ration of the first. The second lot made most of its greater gain during the early part of the feeding period. The grain ration was the same in both cases, crushed oats, bran, cottonseed meal, and corn meal (2:2:2:1).

Mineral requirements of sheep, G. S. FRAPS (*Texas Sta. Bul. 232 (1918), pp. 5–20, fig. 1*).—For each component of the ash of rations fed sheep in 48 digestion experiments, this bulletin furnishes data as to the amount fed per day, the amount not recovered in the feces, and for 10 of the experiments the amount found in the urine. Eighteen of the digestion trials were made in triplicate, and 29 in duplicate, while 1 ration was fed to a single animal only. The digestibility of the organic nutrients and total ash of the rations of 43 of the experiments (numbered 1–37, 24 a, 76, 78, 79, 81, and 82) have been given in three previous bulletins (E. S. R., 37, p. 865), while the details of 5 (numbered 88–92) are unpublished. In most of the experiments, the ration consisted of a single roughage; in the others, of alfalfa plus a supplement. The roughages fed were accuff sorgo fodder, alfalfa hay, Bermuda hay, bur clover hay, buffalo grass hay, corn fodder, cowpea hay, Guam grass hay, Johnson grass hay, Kafir corn fodder, millet, oat hay, peanut hay, Para grass hay, prairie hay, Rhodes grass hay, rice hay, rice straw, sorghum and cowpea silage, sorghum hay, Tabosa grass hay, and vetch hay. The supplements to alfalfa were corn bran, cold-pressed cottonseed cake, cottonseed meal, a mixture of cottonseed meal and hulls, Kafir corn chop, Kafir corn head chop, peanut hulls, rice bran, rice hulls, and rice polish. A table gives the percentages of silica (insoluble ash), lime, magnesia, phosphoric acid, and potash found in the samples used of all these feeding stuffs except Guam grass hay.

The author points out that the rectum is a recognized path of excretion from the body of some mineral elements, but finds it convenient to speak of difference between the intake and the fecal content as the amount digested and also to call the percentage of the intake that is "digested" the coefficient of digestibility. He publishes a table showing the digestibility of the several constituents of the ash for each of the rations except that no mention is made of Guam grass. This omission and the combination of certain of the alfalfa experiments reduces the number of items in the table to 44. In 14 of the silica entries, 10 of the lime, and 12 of the phosphoric acid, the digestibility was zero, that is the amount in the feces exceeded the amount in the feed. There were no cases of "negative digestion" of magnesia and potash. The averages of such of the 44 determinations of the coefficient of digestibility as were not zero are given by the author as: Silica 22.2, lime 32.3, magnesia 32.3, phosphoric acid 22.5, and potash 83.2. Grouping the determinations by the amounts ingested shows, in the case of lime and phosphoric acid at least, that the coefficient of digestibility increases with an increase in the amount consumed, negative digestion figures occurring as a rule only when this amount was small. This condition indicates that fairly constant amounts of each are eliminated daily in the solid excrement. For lime the daily elimination is held to be about 0.6 gm. and the corrected digestibility to be about 25 per cent. For phosphoric acid the elimination is 0.8 gm. and the approximate true digestibility is 50 per cent. The data also indicate that an increased digestion of 1 gm. of lime is accompanied by an increased retention of 0.74 gm. of phosphoric acid. This ratio suggests to the author the formation of tricalcium phosphate.

Analyses of the urine collected in the balance experiments (those numbered from 76 to 92) show that the mineral constituents appear in the urine in fairly constant amounts which are little, if at all, influenced by the amounts eaten or the amounts digested. From these data it appears that about 1.7 gm. of phosphoric acid, 2.8 gm. of lime, and 1 gm. of magnesia are required per day by sheep weighing about 100 lbs. in order to maintain a mineral balance. About 0.2 gm. of potash and 0.54 gm. of magnesia per day were stored by these sheep.

In experiments 1–18 data are furnished as to the sulphur trioxid content of feed and feces. The coefficients of digestibility averaged 47.9. Since most of the sulphur was probably in combination with the protein of the rations, the coefficients of digestibility of the latter are given for comparison. Their average is stated as 48.4.

Relation of breed and age of service to prolificacy (*Washington Sta. Bul. 158 (1919), pp. 9, 10*).—Statistics collected from the records of the college herd of swine from 1908 to 1916 are published. The average litter size by breed was for Tamworth 7.94, Poland China 7.15, Duroc Jersey 7.14, and Berkshire 6.25. The number of litters upon which the averages are based is apparently 16, 67, 56, and 58, respectively. The average litter size by age of sow at service was found to be: Yearlings 6.12, 2-year olds 7.7, 3-year olds 7.8, and 4-year olds 7.9. The number of records were 16, 17, 10, and 4, respectively.

Self-balanced rations by individual pigs, R. C. Ashby (*Amer. Soc. Anim. Prod. Proc. 1916, pp. 197–209, figs. 6*).—This paper reports the first year's results of an investigation at the Minnesota Experiment Station to determine the individual differences of young pigs in the choice of feeds and the influence of the rations selected on the economy of gain, the type of hog produced, and the quality of the product. Two groups of 5 pigs each were fed for 128 days, ended November 15, 1915. The pigs in the first group were selected from a litter of Berkshire-Durocs and were started on individual feeding at the age of 109 days. The second comprised a litter of Poland-Durocs and were started when 98 days old. Each animal was kept in an individual pen with access to a self-feeder in which shelled corn, shorts, and tankage (60 per cent protein) were supplied separately. The following table in which the pigs of each group are arranged in the order of increasing economy of gain summarizes some of the results:

Results of individual selection of feeds by young pigs.

Number of pig.	Sex.	Initial weight.	Final weight.	Gain per day.	Proportion of feeds selected.			Feeds per pound of gain.		
					Corn.	Shorts.	Tankage.	Corn.	Shorts.	Tankage.
		Lbs.	*Lbs.*	*Lbs.*	*Per ct.*	*Per ct.*	*Per ct.*	*Lbs.*	*Lb.*	*Lb.*
6	Barrow	60.0	251.0	1.49	88.6	4.1	7.3	3.75	0.17	0.31
7	Gilt	54.0	267.6	1.67	86.2	3.0	10.8	3.49	.12	.44
1	Barrow	65.9	309.3	1.91	90.7	3.1	6.2	3.64	.13	.25
2	Gilt	46.0	288.0	1.89	87.4	1.5	11.1	3.32	.06	.42
4	Barrow	55.3	319.6	2.06	88.2	2.1	9.7	3.33	.08	.27
	Av. group 1	56.1	287.1	1.80	88.3	2.7	9.0	3.49	.11	.36
10	Barrow	35.3	240.6	1.60	88.0	1.7	10.3	3.79	.07	.44
12	Gilt	38.0	213.3	1.37	85.2	2.7	2.1	3.39	.11	.48
13	do	35.0	244.3	1.64	85.8	2.9	11.3	3.39	.11	.45
11	Barrow	27.5	166.6	1.09	86.8	2.1	11.1	3.43	.08	.44
14	Gilt	37.3	272.3	1.84	88.7	1.7	9.6	3.15	.06	.34
	Av. group 2	34.6	227.4	1.51	87.0	2.2	10.8	3.42	.09	.43

Other data given include the proportion of each feed selected by 3-week periods, the total daily consumption expressed as a percentage of body weight by weekly periods, and the average nutritive ratio and the maximum and minimum deviations by weeks. The ration was gradually widened as the feeding period progressed, thus confirming a statement of Lawes and Gilbert made in 1854.

At the close of the test Nos. 13 and 14 were excessively fat and appeared soft. No. 4 finished in showyard bloom. The carcasses showed the pigs to be very fat, but the fat was well distributed throughout the lean. The hams and shoulders when cured proved to be of excellent flavor. The sides were too heavy for prime commercial bacon.

Studies with individual pigs (*Minnesota Sta. Rpt. 1918, pp. 51–53*).—A continuation of the work outlined in the above paper during 1917 is noted. Sixteen pure-bred pigs were fed. A tabulation is made for each individual of this and the preceding experiment of the grain consumption per 100 lbs. gain and his deviation from the average of the lot to which he belonged.

Pasture and forage crops for pork production (*Minnesota Sta. Rpt. 1918, pp. 49–51*).—Results with 4 lots of pigs on alfalfa and rape pastures are summarized as follows:

Growth of shotes on pastures supplemented with corn, and corn and tankage.

Pasture.	Supplement.	Area actually pastured.	Pigs per acre.	Daily gain per pig.	Weights per pig. Initial.	Weights per pig. Final.	Total gain per acre.	Time on pasture.	Grain required per pound of gain.
		Acres.		*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Days.*	*Pounds.*
Alfalfa.....	3 per cent corn..........	0.31	25.4	0.53	34.5	107.1	1,470	137	3.31
Do....	4 per cent corn..........	.30	33.3	.66	32.1	123.6	2,438	137	3.43
Rape......	.....do..................	.50	30.0	.74	31.1	93.4	1,869	84	3.20
Do....	Corn+tankage, self-fed.	.50	30.0	1.10	30.6	123.2	2,778	84	3.29

In contrast unsatisfactory results are cited with 10 pigs on oats, peas, and rape. The animals became severely rape blistered at the start, and gained only 821 lbs. per acre in 98 days, or 0.35 lb. daily per pig.

Results from 4 cooperative tests of pastures for swine are given. The pastures are described as (1) rye and rape (poor), (2) clover (good), (3) mixed, and (4) alfalfa (good). The grain fed per pound of gain was 5.46, 4.03, 5.58, and 4.52 lbs., respectively, and the margin of value of gain (at 16 cts. per pound, over total feed cost was $0.22, $4.26, $2.26, and $1.25, respectively.

In 2 experiments in hogging-off corn the number of hogs per acre was, respectively, 25 and 24, the gains per acre 315 and 582.6 lbs., the estimated consumption of corn per pound of gain 10.52 and 5.83 lbs., and the tankage fed per acre 114 and 76 lbs. It is stated that the first lot remained on the cornfield at least 2 days too long.

Feeding tests with fall pigs, 10 to a lot, 4 lots fed 105 days and 3, 155 days from weaning to market are also noted. One was hand fed by the Dietrich standard, the others self fed on corn mill feed, shorts, and tankage, either with or without additional feed. For the lots fed the shorter period the additional feeds, in the order of their apparent feeding value as measured by daily gain, were (1) shelled corn and gluten feed, (2) condemned raisins, (3) none, and (4) corn gluten feed. For the longer period, the order was (1) alfalfa, and (2) none, with the hand-fed lot intermediate.

Feeding value of field peas v. barley (*Washington Sta. Bul. 153 (1919), pp. 8, 9*).—In this experiment 4 lots of shotes of Duroc-Jersey, Poland China, and Berkshire breeding were fed 49 days in January and February, 1918, under weather conditions not favorable to feeding operations. Comparison was made between field peas (split or cracked) and shorts (2:1) and barley and shorts (2:1), supplemented either with tankage (guarantied 60 per cent protein) or with linseed meal in amounts to make the supplement 10 per cent of the ration. Summary of the results follows, the lots being arranged in the order of economy of gain:

Peas v. barley for finishing pork.

Feeds compared.	Number of pigs.	Average initial weight.	Average total gain.	Grain per pound of gain.	Shrinkage (Pullman to Spokane).	Dressing percentage.
		Pounds.	*Pounds.*	*Pounds.*	*Per cent.*	
Peas+tankage	12	107.3	77.4	4.10	16.8	82.7
Barley+tankage	13	100.7	68.9	4.26	16.6	83.0
Peas+linseed meal	13	107.8	54.9	4.34	18.5	80.1
Barley+linseed meal	13	99.8	60.6	4.77	11.7	82.0

It is concluded that peas had a better feeding value than barley with the supplements used.

The nature and assimilability of the organic phosphorus compounds in cottonseed meal and other feeds for hogs (*Arkansas Sta. Bul. 158* (*1918*), *pp. 23, 24*).—As a practical result of the discovery that the phytin phosphorus of feeding stuffs is almost entirely converted into inorganic forms by the animal body (pigs) before utilization (E. S. R., 39, p. 675), it is suggested that the feeding of ground bone or phosphate rock instead of expensive organic products of plant origin is sufficient to correct phosphorus deficiencies in an otherwise satisfactory ration.

[Influence of feed on melting point of lard], G. S. TEMPLETON (*Alabama Col. Sta. Rpt. 1918, p. 30, 31*).—The melting points are reported of the lard obtained in a hog-feeding project involving a study of the effect of some southern feeds on the lard. Six lots of 8 hogs were started on the experiment, but one lot was discarded because the ration used consisting of corn, velvet bean and pod meal, and tankage (4:4:1) proved unpalatable. The lot fed corn and tankage (8:1) dressed out in a satisfactory manner, and the lard had a melting point of 44.15° C. A lot fed corn, velvet bean and pod meal, and peanut meal (3:3:2), which was not a very palatable ration, produced lard melting at 42.5°. The carcasses of the three lots fed varying proportions of corn and peanut meal were graded medium soft. The melting points of the lard were, respectively, 40.35, 40.2, and 40.57° C. when the proportions of corn and peanut meal were 1:1, 2:1, and 3:1.

The home butchering and curing of pork, J. M. HUNTER (*New Jersey Stas. Circ. 101* (*1918*), *pp. 16, figs. 9*).—General directions are given for the home butchering and curing of pork, with special attention to the best utilization of all parts of the carcass. Formulas are included for the curing agents used in the most common methods of preserving pork for home consumption—dry salt cure, pickled pork, and brine cure. Special directions are also included for the preparation of sausage, head cheese, and scrapple.

Effect of date of hatching upon egg production, W. J. BUSS (*Mo. Bul. Ohio Sta., 4* (*1919*), *No. 3, pp. 79–82, figs. 3*).—Two years' egg production records are presented of three lots of Single Comb White Leghorns, the first hatched February 22, 1916, and the others 8 and 16 weeks later, respectively. At the beginning each lot consisted of 30 pullets. While laying they had constant access to a dry mash of ground corn, bran, and meat scrap (2:1:2) and were fed shelled corn and wheat (3:1) twice daily to the extent of double the mash consumption. The records may be summarized as follows:

Egg record of three lots of White Leghorns hatched at different periods in the spring.

Date hatched.	Laying record began.	Pullet year.				Second year.			
		Laying period.	Average size of flock.	Number of eggs per pullet.	Feed per dozen eggs.	Laying period.	Average size of flock.	Number of eggs per hen.	Feed per dozen eggs.
1916.	1916	*Days.*			*Lbs.*	*Days.*			*Lbs.*
Feb. 22	Aug. 10	448	29.0	166.9	6.01	364	26.7	109.9	6.88
Apr. 20	Nov. 2	392	28.4	156.4	5.81	364	24.8	119.5	6.60
June 13	Dec. 28	336	29.5	144.0	5.05	364	26.5	118.6	5.86

A table is published expressing the egg production of each lot by 4-week periods during the first year as percentages of the maximum, an egg a day per bird. During August, September, and October, this percentage in the case of the early hatched lot varied from 26 to 47, but from November 1 to January 24 it was throughout between 6 and 7. During the latter period the pullets went through a molt resembling that of year-old hens. The production of the April-hatched lot varied from 18 to 40 per cent during November, December, and January, and showed no pronounced slump until the following November. In all three lots the highest production of any period occurred at the same time, between March 22 and April 18.

The author concludes that there is practically nothing to be gained by hatching Leghorn eggs as early as February 22 in the latitude of Wooster, Ohio, considering the high price which the same eggs would bring on the market, the low fertility, the long period the chicks must be kept in the brooder, and the drop in production of the resulting pullets during the winter months.

[Feeding values of skim milk and meat scraps for egg production], A. G. Philips (*Indiana Sta. Rpt. 1918, pp. 54–56*).—A progress report shows that pens of White Plymouth Rocks and Single Comb White Leghorns receiving animal feed in addition to a basal ration of corn, wheat, oats, bran, and shorts produced in the pullet year over twice as many eggs as pens receiving the basal rations alone. One of the experiments was continued a second year. A pen of White Leghorns receiving skim milk throughout laid 135.9 eggs per bird the first year and 119.6 eggs the second. The check lot receiving no animal feed the pullet year laid 61.4 eggs per bird, but in the second year, when given skim milk, it produced an average of 150 eggs.

DAIRY FARMING—DAIRYING.

A study of the relative reliability of official tests of dairy cows, W. W. Yapp (*Illinois Sta. Bul. 215 (1919), pp. 323–339, figs. 7*).—The purpose of this bulletin is mainly to compare the 7-day or "official" advanced registry test of Holstein cows with the year or "semiofficial" test. In confirmation of the common impression that the latter gives a reliable measure of a year's actual production, the author cites data from the University of Illinois herd showing that the average yearly butter fat production of 30 cows as determined by the semiofficial method—monthly butter fat percentage estimated from 2 days' milk—was 408.8±8.1 lbs., whereas the amount as determined by weekly composite samples was 415.5±8.1. The difference, considering the probable errors, is not regarded as significant.

In the Holstein-Friesian Advanced Register prior to May 1, 1915, the author finds records of 1,295 cows that completed a year's test during the same lactation in which they satisfied advanced registry requirements for a 7-day test. The records of this group of cows are submitted to statistical study. Tables and graphs are given showing the relation between pounds of fat and percentage of fat. In the semiofficial records there is a steady uniform increase in fat percentage with increased fat production. In the 7-day records there is a similar increase in percentage between the 8 and the 24-lb. records, but a sharp and abnormal rise in percentage occurs for the higher records. The mean fat percentage of the 7-day tests was 3.679±0.01 and that of the year tests 3.434±0.006. Considering the small probable errors, this difference is of undoubted significance. The 7-day percentage records were also distinctly more variable than the year records, the standard deviations being, respectively, 0.526±0.007 and 0.317±0.004. The correlation between amounts of milk produced during the 7-day test and during the 365 days was found to be 0.702±0.01, while the correlation between the official and semiofficial amounts of butter fat was 0.703±0.01. Although these correlations are high, it is pointed out that they are not high enough for correlations between two measurements of the same thing. Taking all the data into account, the author concludes that the 7-day test is not a satisfactory index of a cow's annual production of butter fat.

Short discussions are given of the 30-day test and of the 8-months-after-calving 7-day test. In 1,390 records where official 7-day and 30-day tests were completed, the fat percentage was higher in the former than in the latter throughout the range of production, the divergence being somewhat greater in the case of the higher records. Only 209 records were available for the purpose of comparing the 7-day test at the beginning of lactation and after the lapse of 8 months. In the case of the lower records the late test had a higher percentage of fat than the early test, but the condition is reversed in the higher records.

Ten vital questions regarding test work (*Holstein-Friesian World*, *16* (*1919*), *No. 7*, *pp. 519–521, 552, figs. 2*).—The editors of the *Holstein-Friesian World* propounded 10 questions concerning the value of the 7-day tests for Holstein cattle as a measure of productive capacity as a basis for breeding operations and as a factor in the advancement of the breed. Answers are here summarized from H. H. Wing, H. H. Dean, O. Erf, C. Larsen, G. H. True, and K. B. Musser. Considerable skepticism is shown as to the value of the test. All seem to think that the test will eventually be abandoned, but only G. H. True advocates its immediate discard.

The Wisconsin Register of Production, C. W. Turner (*Hoard's Dairyman*, *57* (*1919*), *No. 13*, *pp. 646, 647, fig. 1*).—Report is made of the first year's operation of the Wisconsin Register of Production, a scheme for giving official recognition to high producing cows in Wisconsin cow test associatons devised and carried out by the Wisconsin Dairymen's Association in cooperation with the University of Wisconsin. The sole requirement for entry is a record of 365 lbs. of butter fat in a year, there being no sliding scale for age or breeding. During the year the cows satisfying the requirement numbered 271, of which 81 were registered as pure-bred Holsteins, Guernseys, or Jerseys, and 15 are described as natives. The average milk production was 9,181.6 lbs., and the average butter fat record 407.48 lbs.

Water requirements for milk production, A. C. McCandlish and W. G. Gaessler (*Jour. Dairy Sci.*, *2* (*1919*), *No. 1*, *pp. 4–8*).—This paper reports experiments at the Iowa Experiment Station to determine, if possible, the amount of water in addition to that in the feed required by cows for milk production during hot, dry summer weather when soiling crops are being fed. Water was offered twice daily, the amount drunk being determined by the difference in the animal's weight before and afterwards. Feed was weighed and the moisture in it determined. The general results are given in the following table:

Milk production and water consumption of five dairy cows.

Breed.	Length of trial.	Average live weight.	Milk produced.	Fat produced.	Drinking water per 100 lbs. milk.	Total water per 100 lbs. milk.	Total water per 100 lbs. dry matter consumed.
	Days.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Jersey	50	834	972	44	320	512	506
Ayrshire	25	918	705	26	361	431	661
Do	15	1,030	462	19	286	453	681
Guernsey	50	1,024	991	42	338	536	521
Holstein	50	1,224	875	34	424	678	518
Average	....	1,014	....	....	350	533	545

Comparable data from the South Dakota Station (E. S. R., 38, p. 374), it is stated, show that the requirement for each 100 lbs. of milk is 432 lbs. of drinking water, or a total of 570 lbs. from feed and drink.

Importance of salt in rations, J. Joffe (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 487–497*).—A discussion of some of the literature dealing with the need of dairy cows for sodium chlorid, together with speculations as to the state of domestic animals in prehistoric times and the rôle of electrolytes in animal physiology.

Cost of raising [French Canadian] heifers, G. A. Langelier (*Canada Expt. Farms Rpts. 1917, p. 93*).—Three heifers of the French Canadian breed raised at the experiment station, Cap Rouge, Quebec, averaged 775 lbs. in weight at the end of 26 months. During this period the individual feed consumption totaled 1,028 lbs. whole milk, 7,921 lbs. skim milk, 774 lbs. meal, 3,774 lbs. hay, 6,133 lbs. roots, 5,933 lbs. silage, and 278 lbs. green feed, with 69 days on pasture.

Lactose, fat, and protein in milk of various animals, O. Folin, W. Denis, and A. S. Minot (*Jour. Biol. Chem., 37 (1919), No. 3, pp. 349–352*).—Tables are given of the lactose, fat, and protein content of the milk of rabbits, cats, guinea pigs, pigs, goats, sheep, dogs, cows, and women. The lactose was determined by the methods of Folin and Denis, previously noted (E. S. R., 38, p. 615), and fat by the Babcock method for the larger animals and Bloor's nephelometric method (E. S. R., 32, p. 312) for the smaller animals. Protein was calculated from the nitrogen figures obtained by the Kjeldahl method. The lactose figures varied from 1.8 per cent in rabbits to 8.5 in mare's milk, fat from 0.9 in a sample of mare's to 12.1 per cent in rabbit's milk, and the protein from 1.39 in human milk to 11.4 per cent in rabbit's milk.

Studies on the clarification of milk, II, B. W. Hammer and A. J. Hauser (*Iowa Sta. Research Bul. 47 (1918), pp. 79–97, figs. 2*).—In the earlier studies on clarification (E. S. R., 35, p. 778) a De Laval clarifier was used. Since the Sharples clarifier is very differently constructed, the authors thought it desirable to carry out a series of analogous experiments with the latter machine. These are reported on here.

The same apparent increase in bacterial count was noted, due presumably to breaking up of clumps. The clarifier, being sterile, was not a source of contamination. Fifty-two samples of milk with initial bacterial count under 100,000 were run through the clarifier. One showed no change in count, and 8 showed a decrease of from 2 to 43 per cent. The remaining 43 showed increases, 25 between 1 and 50 per cent, 7 between 51 and 100 per cent, 6 between 101 and 150 per cent, 3 between 151 and 200 per cent, while 2 increased 480 and 767 per cent, respectively. The average change was an increase of 68 per cent.

In 9 samples containing originally from 100,000 to 500,000 bacteria there was a decrease up to 55 per cent in 7 cases and 2 increases, 1 of 27 per cent and one of 44 per cent. The average change was a decrease of 7 per cent. In 32 samples with a count of over 500,000 bacteria there was a decrease up to 31 per cent in 17 cases and an increase up to 50 per cent in 15 cases. The average change was a decrease of 1 per cent.

In 63 comparisons of the tissue-cell content of clarified and unclarified milk, clarification caused a decrease of from 11 to 78 per cent, the average being 41. The average cell content of the unclarified milk was 308,778 and that of the clarified 177,635 per cubic centimeter. No relationship was noticed between the percentage of cells thrown out and the original cell content, the percentage of fat, or the temperature of the milk.

Fourteen samples of clarifier slime were studied as to the numbers of bacteria and cells contained. The bacterial content varied from 7,800,000 to 5,210,000,000 per gram and the cell content from 57,000,000 to 658,000,000 per gram. Slime with a high bacterial content generally came from milk with a high bacterial content.

Clarified pasteurized milk gave a higher bacterial content than unclarified pasteurized milk in 14 of 20 comparisons. In four it gave a lower bacterial content, while in two cases there was no difference.

Clarified and unclarified milk showed the same acidity after holding in three of 26 comparisons. In 13 the clarified milk showed the higher acidity, while in 10 the clarified milk showed the lower acidity.

Clarification slightly reduced the creaming ability, as determined in tubes held in ice water, of both raw and pasteurized milk. The influence was too small to be of practical importance in milk allowed to cream in bottles.

Differences in the results of clarification by the Sharples and by the De Laval methods are attributed to differences in milk samples used.

Clarification is held to be a legitimate practice. "While clarification can not be expected to improve the keeping quality of milk or to make it safe as far as possible pathogens are concerned, it can give it a much more pleasing appearance and thus result in an increased consumption. The elimination of body cells also is desirable from an esthetic viewpoint, although within certain limits they are normal constituents of milk, and it would be extremely difficult to prove them harmful."

Studies on the uniformity of heating in the final package method of pasteurization, B. W. Hammer and A. J. Hauser (*Jour. Dairy Sci., 1 (1918), No. 6, pp. 462–474*).—This paper reports experiments at the Iowa Experiment Station involving a comparison between a type of final package pasteurizer in which the bottles are immersed in a vat of water and a type in which they are not immersed. In the latter very great variations in bacterial count and depth of cream line of different bottles of the same run were found. In the immersion type only slight variations were found, too small to be of practical significance.

All the experiments showed fairly close agreement between the effect of heat on the bacterial count of a bottle and on its cream line. It is suggested that by determining the amount of cream thrown up by a number of bottles pasteurized in a given run a good index of the degree of uniformity in heating could be secured.

Data on bacteria and cream line are published for 63 bottles from 7 runs with the nonimmersion type and 144 bottles from 29 runs with the immersion apparatus.

Cold storage of cottage [and other soft] cheese, H. B. Ellenberger (*Milk Dealer*, *7 (1918)*, *No. 12*, *pp. 58*, *59*).—Uncompleted experiments conducted by the author at the Vermont Experiment Station indicate the feasibility of keeping cottage, Neufchâtel, and cream cheese in cold storage for periods of at least four months. The cheese was mostly stored in butter tubs and held at a temperature of 14 to 16° F. Some of the stored cheese after thawing was repacked in small retail packages and submitted to competent judges of dairy products, who pronounced it "fine," and did not suspect its history. A study is being made of the influence of moisture content, salt, acidity, and similar factors on the keeping qualities. It is hoped that the adoption of cold storage will result in a uniform supply of soft cheese throughout the year.

The manufacture and composition of Bulgarian cheese, M. Nicolow (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *36 (1918)*, *No. 5–6*, *pp. 87–101*).—A description of the process of manufacture and the results of analysis of 134 samples of cheese made in Bulgaria are given. The composition is very variable, fat ranging from 20 to 40 per cent, protein from 7.74 to 32.65 per cent, salt from 1.08 to 9.97 per cent, and water from 20 to 60 per cent.

A study of bacteria in ice cream during storage, H. B. Ellenberger (*New York Cornell Sta. Mem. 18 (1919)*, *pp. 331–362*, *figs. 2*).—On the basis of his investigations the author states that agar plates give higher counts than gelatin plates, the use of litmus in both cases increasing the counts somewhat, and that an incubation temperature of 20° C. for seven days proved the best of any tried for growing bacteria from the ice cream on agar plates. The greatest error in making counts of bacteria by the plate method seems to be caused by uneven distribution in the final dilution water.

As a result of the investigations reported, the following conclusions were drawn:

"Of the ingredients used in ice cream, milk, cream, and condensed milk are by far the most prolific sources of bacteria. By effective pasteurization of these products before they enter the mix, ice cream can be made having a low bacteria content.

"Aside from utensil contamination, there is usually an increase in the number of bacteria, as shown by the plate count in ice cream, resulting from the freezing process. This is probably due to the breaking up of clumps of organisms.

"There is no radical change in the total number of bacteria in ice cream during storage. There seems, however, to be a tendency toward a slight decrease during the first two to four days, with a more noticeable increase and a corresponding decrease again between the fourth and the twenty-first day, after which time there is a very gradual falling off in numbers.

"The groups of bacteria in ice cream as determined by litmus gelatin plates and litmus milk tubes do not change noticeably during storage. The acid formers predominate all through the storage period, and many of them appear to be typical of the *Bacterium lactis acidi* group."

Sugar-saving substitutes in ice cream, J. H. Frandsen, J. W. Rovner, and J. Luithly (*Jour. Dairy Sci.*, *2 (1919)*, *No. 1*, *pp. 32–40*).—Previously noted from another source (E. S. R., 39, p. 872).

VETERINARY MEDICINE.

Outlines of comparative anatomy of vertebrates, J. S. Kingsley (*Philadelphia: P. Blakiston's Son & Co.*, *[1917]*, *2. ed.*, *rev.*, *pp. X+449*, *figs. 406*).—A revised edition of the work previously noted (E. S. R., 28, p. 668).

Common diseases of farm animals, R. A. Craig (*Philadelphia and London: J. B. Lippincott Co., 1919, 3. ed., rev., pp. XII+334, pl. 1, figs. 123*).—A revised edition of the work previously noted (E. S. R., 34, p. 383).

The control of animal diseases, J. R. Mohler (*Amer. Jour. Vet. Med., 14 (1919), No. 4, pp. 155–161*).

Erroneous impressions of certain Federal activities, J. R. Mohler (*Amer. Jour. Vet. Med., 14 (1919), No. 5, pp. 207–214*).

Regulations governing entrance to the veterinary-inspector examination (*U. S. Dept. Agr., Off. Sec. Circ. 128 (1919), pp. 11*).—This presents regulations, which became effective September 5, 1918, promulgated by the Secretary of Agriculture and approved by the U. S. Civil Service Commission relative to the matriculation examination and course of instruction in veterinary science at veterinary schools and colleges required to educate and qualify persons for the civil service examination for the position of veterinary inspector.

A list of the schools and colleges at present accredited and qualified to supply the graduates eligible to enter such examinations is included.

Report of veterinarian, C. A. Cary (*Alabama Col. Sta. Rpt. 1918, pp. 33–34*).—This is a brief statement of the results of work carried on during the year to determine (1) the toxic effect of red buckeye (*Æsculus pavia*) when ingested by pigs, (2) the toxic action of *Helenium tenuifolium* on horses and dogs, and (3) the efficacy of anthelmintics on chickens.

Ninth biennial report of the State veterinarian of California for the two years ended June 30, 1918, C. Keane (*Bien. Rpt. State Vet. Cal., 9 (1917–18), pp. 27*).—This reports particularly on the tuberculin testing of dairy herds under the provisions of the State dairy law, tuberculosis control, occurrence of hog cholera, anthrax, sheep scabies, blackleg, glanders, and forage poisoning.

Seventh biennial report of the Kansas Live Stock Sanitary Commissioner, 1917–18, J. H. Mercer (*Bien. Rpt. Kans. Live Stock Sanit. Comr., 7 (1917–18), pp. 86, figs. 5*).—This report includes discussions of hog cholera and its control, bovine tuberculosis, the accredited herd plan, hemorrhagic septicemia, scabies eradication, contagious abortion, etc.

Report of the New York State Veterinary College for the year 1916–17 (*Rpt. N. Y. State Vet. Col., 1916–17, pp. 364, pls. 33*).—The papers here presented are as follows: Researches in the Diseases of Breeding Cattle, by W. L. Williams and W. A. Hagan (pp. 62–139); The Etiology and Mode of Infection in White Scours of Calves, by W. A. Hagan (pp. 140–161); Formalin in the Treatment of Mastitis, by J. N. Frost (pp. 162–165) (E. S. R., 37, p. 277); Anaesthesia and Narcosis, by W. E. Muldoon (pp. 166–198); A Survey of the Intestinal Parasites of the Dog, by F. V. Dederick (pp. 199, 200); Garbage Feeding and the Care of Garbage Fed Swine, by R. R. Birch (pp. 201–213); Orokinase and Ptyalin in the Saliva of the Horse, by C. C. Hayden (pp. 214–234); Tuberculosis in Equines, by E. M. Pickens (pp. 235–254); The Pathology of Spavin, by S. A. Goldberg (pp. 255–340) (E. S. R., 39, p. 686); and Parasites Affecting Sheep, by C. P. Fitch (pp. 341–359) (E. S. R., 38, p. 183).

The importance of sodium chlorid in agglutination, K. Tagawa (*Jour. Col. Agr. Imp. Univ. Tokyo, 3 (1918), No. 5, pp. 259–336; abs. in Vet. Rev., 3 (1919), No. 1, pp. 66, 67*).—Three papers are presented.

I. *The influence of sodium chlorid on agglutination* (pp. 259–289).—Various agglutination experiments are reported from which the following conclusions are drawn: A certain amount of salt is necessary for the complete action of immune agglutinins, but there is no fixed relation between the amount of salt and the appearance of agglutination. A small amount of salt is sufficient to start the agglutination.

The action of the so-called normal agglutinins does not depend, as formerly thought, on specific receptors, but globulins and albumins appear to play an important rôle. An agglutination similar to normal agglutination occurs with other proteins as well as with serum. From absorption experiments it appears that normal agglutinin has no essential specificity, and that salt may be present or not.

Agglutinin can bind itself to the bacillus, but only feebly. Immune agglutinin causes agglutination, especially if the immune serum is diluted with sodium chlorid solution or with distilled water. Immune agglutinin appears to have a greater affinity than normal agglutinin for agglutinogen. The presence of a definite amount of salt is necessary for the complete combination of agglutinogen and immune agglutinin.

II. *The proagglutinoid-like reaction of a solution of hemoglobin* (pp. 291–297).—The author has found that if anthrax bacilli are agglutinated with hemoglobin solution from normal animals, particularly goats, a reaction takes place similar to the proagglutinoid reaction with immune sera. As this reaction is influenced by the amount of salt present, the theory is advanced that for the complete production of the phenomenon the quantity of molecules present as emulsoids and the concentration of the liquid should be in a certain proportion. This balance is acquired by the addition of salt, which alters the number of molecules present as emulsoid.

III. *Further studies on the influence of salt on agglutination and the application to the serodiagnosis of glanders* (pp. 299–336).—The results are summarized of the influence of salt on the agglutination tests for glanders in horses. It is recommended that two series of agglutination tests be made—one with serum diluted with an 0.85 per cent solution of common salt and the other with a 0.03 per cent solution. It is said that if the horse is healthy the agglutination figure with the 0.03 per cent solution is the higher, but if the horse has glanders the results obtained are the same as, or lower than, those obtained with serum diluted with the 0.85 per cent salt solution.

Antiseptics (*Compt. Rend. Soc. Biol.* [*Paris*], *81* (*1918*), *No. 23, pp. 1165–1238, figs. 3*).—This number contains the following papers on antiseptics given at the third session of the Society of Biology (France), devoted to the biology of war: A Report of the Actual State of the Question of Antiseptics, by P. Carnot (pp. 1166–1192); Iodin Chlorid, by E. Fourneau and Donard (pp. 1192–1196); Antiseptic Properties and Method of Employment of Iodin Monochlorid, by W. Mestrezat and T. Casalis (pp. 1196–1199); Technique of the Study of the Penetration of Antiseptics in Solid Media, by P. Carnot and J. Dumont (pp. 1199, 1200); Antiseptic Dressing on the Battle Field, H. Vincent (pp. 1200–1208), with criticism by P. Duval (pp. 1208–1211); Chlorinated Alum Solution, Its Use and Application, and General Considerations on Antiseptics, W. Mestrezat (pp. 1211–1214); The Use of Antiseptics in the Treatment of Infected Wounds, M. Cazin and S. Krongold-Vinaver (pp. 1214–1217); The Problem of Surgical Antisepsis in the Different Kinds of War Wounds, by L. Bazy and Fauré-Fremiet (pp. 1217–1220); Action of Paraffined Dressings on the Infection of Surface Wounds, by Pfulb and Fauré-Fremiet (pp. 1221–1223); Procedure of Mechanical Cleansing of Recent Wounds by Artificial Serum under Strong Pressure, by C. Regaud (pp. 1223–1227); The Use of Solutions of Sodium Fluorid and Cadmium Sulphate for the Disinfection of War Wounds, by P. Philardeau (pp. 1228–1230); The Antiseptic Action of Ionization in War Wounds, by A. Latarjet and G. Promsy (pp. 1230–1235); A Case of Tetanus Treated and Cured by Intraspinal and Intravenous Injections of Antitetanic Serum, by Monziols (pp. 1236–1238); and The Sulphur in the Water of Barèges, by J. Dufrénoy (p. 1238).

The bacteriological testing of disinfectants (*Jour. State Med.*, 27 (1919), No. 2, pp. 53–62).—This is a report of an investigation, conducted at the research laboratories of the Royal Institute of Public Health (England), of the difficulties attending the testing of disinfectants by the Rideal-Walker method.

As the result of a study of the possible sources of error, it is concluded that the varying character of the peptone used in preparing the medium for the growth of the test organism has been the chief cause of the difficulties in obtaining concordant results as compared with prewar times. It is suggested that the test would be much simplified if a definite time of contact, the same for all the dilutions, were used. The coefficient would then indicate that disinfection had been obtained after a known interval of action.

The disinfecting power of Sagrotan as determined by the use of optimal culture media, A. DENGLER (*Hyg. Rundschau*, 28 (1918), Nos. 1, pp. 1–8; 2, pp. 37–42).—A discussion is given of the precautions to be taken in a study of the strength of disinfectants by the growth of pathogenic organisms in media containing varying amounts of the disinfectant under question. The necessity is pointed out of producing highly resistant strains of the organisms, of the use of uniform suspensions of the organisms or spores, and particularly of employing for the "after-culture" optimal media for growth, as pointed out by Süpfle and Dengler (E. S. R., 35, p. 279).

An examination of Sagrotan by the methods outlined is reported. Contrary to the conclusions of Schottelius (E. S. R., 32, p. 80), it was found to have a somewhat lower disinfecting value than lysol. It is recommended that as a surgical disinfectant Sagrotan be used in concentrations of not less than from 3 to 4 per cent.

Treatment of burns by paraffin, A. J. HEILL (*Abs. in Rev. Hig. y Sanidad Pecuarias* [*Spain*], 7 (1917), No. 5–6, p. 324; *Vet. Rec.*, 30 (1918), No. 1560, p. 484).—In seeking a substitute for ambrine, a commercial product which has given excellent results in the treatment of burns, after many experiments the author has arrived at the following formula which has given even better results than the commercial product: Resorcin 1 part, essence of eucalyptus 2, olive oil 5, vaseline 25, and hard paraffin 67 parts.

The treatment of ulcerous lymphangitis, R. VAN SACEGHEM (*Bul. Soc. Path. Exot.*, 11 (1918), No. 8, pp. 683–685; abs. in *Vet. Rev.*, 3 (1919), No. 1, pp. 38, 39).—In the treatment of ulcerous lymphangitis the author has substituted for the subcutaneous injection of pus treated with ether intravenous injections of pus emulsified with oil. The pus, obtained from a natural abscess of ulcerative lymphangitis or from an artificially produced abscess, is mixed with equal volumes of oil and ether and shaken at intervals for 48 hours. The supernatant fluid is then decanted, and the pus drawn into a syringe and injected directly into the jugular vein in increasing doses of from 3 to 7 cc. or more. It is said that no local reaction is produced, and that the thermal reaction rarely exceeds 1° or lasts more than three days. Reinjection is performed after the temperature has become normal, and after each series of five injections the treatment is suspended for several days.

The author points out that pyotherapy and leucocytotherapy produce cures but not immunity, and states that experiments are being conducted with the view of establishing immunity by vaccination with living bacteria obtained from horses affected with ulcerative lymphangitis.

Studies on the paratyphoid-enteritidis group.—VI, The separation of a distinct paratyphoid group among strains of rodent origin, C. KRUMWIEDE, JR., E. VALENTINE, and L. A. KOHN (*Jour. Med. Research*, 39 (1919), No. 4, pp. 449–460).—The authors report the results of further investigations (E. S. R., 39, p. 587).

"Of 15 guinea pig strains studied, 13 were alike in their agglutination reactions. This apparent identity was further verified by agglutinin absorptions. Two strains from mice and one each from a rabbit and from a cat as shown by agglutinin absorption were identical with this group of 13 guinea pig strains. A distinct paratyphoid type or group of bacilli is encountered, therefore, in spontaneous infections in laboratory animals, especially rodents. Some of the strains from mice and guinea pigs do not fall into the above group. Others belong agglutinatively to the *Bacillus enteritidis* group. Evidently the host origin of a culture is not necessarily an index to its biological position, and the classification of strains according to origin, as *B. typhi murium* or *B. pestis caviæ*, is not justified.

"None of the rodent strains studied belongs to either the *B. choleræ suis* or *B. paratyphosus* 'B' groups. The evidence that has been advanced that some rodent strains fall into these groups is insufficient. The prevalence of the same type of bacillus in spontaneous infections of guinea pigs in widely separated areas of the country is probably due to the transfer of infected breeding stock."

The rat-bite fever spirochete, with comparative study of human, wild rat, and field vole strains, S. KUSAMA, R. KOBAYASHI, and K. KASAI (*Jour. Infect. Diseases, 24 (1919), No. 4, pp. 366–375*).—The authors' experiments prove that the human, wild rat, and field vole strains of the spirochete of rat-bite fever all represent the same species. They consider that *Spirochæta morsus-muris* Futaki is, in all probability, similar to *Spirillum minor* Carter, *Spirochæta laverani* Breinl, *Spirochæta muris* Wenyon, etc.

Rocky Mountain spotted fever in the domestic rabbit, N. C. FOOT (*Jour. Med. Research, 39 (1919), No. 4, pp. 495–507, pl. 1*).—"The domestic rabbit is susceptible to infection with Rocky Mountain spotted fever, (a) by the bites of infected ticks (*Dermacentor venustus*); (b) by intraperitoneal injection of infectious blood from guinea pigs or other rabbits. This susceptibility is less marked and more variable than in the case of the guinea pig. The lesions produced are essentially the same as those found in the case of the guinea pig, monkey, or man. The presence of the small diplococcoid organism described by Wolbach [E. S. R., 38, p. 577], in connection with this disease, can be demonstrated in infected rabbits. Immunity is not transmitted from parents to offspring in this species."

Some notes on the use of tartar emetic in the treatment of domestic animals affected with African trypanosomiasis, H. E. HORNBY (*Vet. Jour., 75 (1919), No. 525, pp. 89–103*).—"On account of its solubility, low toxicity, and high trypanocidal action, tartar emetic is probably the most valuable drug available for use on a large scale in the treatment of domestic animals affected with trypanosomiasis. Its cheapness is also a point in its favor.

"It can be administered intramuscularly or intravenously, but the latter method is the better. One gm. every third day is the maximum that can be administered over a long period to even the largest domestic animals, but the same amount every fifth day is well tolerated by adult bovines and equines. Administered secundum artem it is capable of effecting cures in domestic animals infected with certain strains of *Trypanosoma vivax* and *T. congolense*. On the other hand, one frequently encounters resistant strains of the same parasites. Nevertheless, were it possible to give the patient a course of injections extending over a long period, I believe that most cases of disease due to these two species of trypanosomes could be cured. Sometimes a single injection will bring about this result.

"Tartar emetic shares with all other known drugs the property of being useless in the curative treatment of *T. brucei* infection of equines. Its sole value in connection with that form of trypanosomiasis is palliative, when given regularly to animals working in 'fly'."

A bibliography of 15 titles is included.

Experimental reproduction of tuberculosis (human and bovine) in dogs, C. SARTI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., [41] (1918), No. 22, pp. 579–597*).—The conclusion is drawn as the result of reported experiments that tubercular lesions can be produced in the dog by introducing the organism through the digestive tract, peritoneum, or blood stream. In consequence it is considered advisable as a prophylactic measure to destroy all dogs that have come in contact with persons infected with the disease.

Methods of detecting tuberculosis in cattle, J. J. LINTNER (*Ann. Rpt. Internat. Assoc. Dairy and Milk Insp., 7 (1918), pp. 61–70*).

Contagious abortion of cattle and the uterine douche treatment, W. H. RIDGE (*Penn. Dept. Agr. Bul. 323 (1919), pp. 18*).—A brief account in which the beneficial result of the douche is pointed out.

The hemoglobinuria of bovines in the cisalpine districts of Italy is a piroplasmosis, L. COMINOTTI and G. DI DOMIZIO (*Clin. Vet. [Milan], Rass. Pol. in Vet. Rev., 3 (1919), No. 1, pp. 37, 38*).—A report is given of observations on *6 (1918), No. 4, p. 227*).—The authors present evidence to show that the acute form of redwater in cattle which has occurred for many years throughout probably the whole of the cisalpine regions of northern Italy is due to a piroplasm of a type other than *Piroplasma bigeminum.*

Strongylus of cattle, sheep, goats, etc. (*Bul. Dept. Agr. Trinidad and Tobago, 17 (1918), No. 4, pp. 199–212*).—Notes on Stomach Worms, Etc., by B. H. Ransom (pp. 199–203) is followed by Notes on Strongylus in Trinidad, by J. McInroy (pp. 204–207), and Notes on Strongylus Nematodes, by H. Meaden (pp. 208–212). The two latter papers summarize the knowledge of the history of Strongylus and the control measures found of service in Trinidad and Tobago, respectively.

An outbreak of hemorrhagic septicemia among sheep, H. P. HOSKINS (*Amer. Jour. Vet. Med., 14 (1919), No. 5, pp. 218–221*).—"Hemorrhagic septicemia is a serious disease of sheep. It has been encountered in widely separated localities, both in Europe and the United States. Either the disease is on the increase or we have had it with us for some time and its exact nature not previously determined.

"In the outbreak of the disease here reported, wherein the disease made its appearance among a band of 9,000 sheep shipped from Montana to Michigan via Chicago and distributed to some 30 farms on arrival, every one of the 30 flocks suffered losses, although the mortality varied widely on the different farms.

"The similarity is pointed out existing between this disease and that reported form of hemorrhagic septicemia in cattle more generally known as 'stockyards' pneumonia."

Contribution to the study of contagious agalaxy in goats and sheep, PÉRUSSET (*Schweiz. Arch. Tierheilk., 60 (1918), No. 9, pp. 403–412, figs. 12; abs. in Vet. Rev., 3 (1919), No. 1, pp. 37, 38*).—A report is given of observations on contagious agalaxy introduced experimentally into a herd of goats and sheep. Three cases are described, two produced in goats by cohabitation or contact and one in a sheep by inoculation. In goats which had recovered from the disease the atrophied mammary glands became absolutely normal after the next parturition. In barren animals and in those animals which aborted during the first period of gestation the mammary gland remained atrophied, but in goats which aborted during the second period of gestation a satisfactory amount of milk was produced. Induration of lymph glands and fibrous nodules in the mammary gland were found to disappear gradually.

Seroimmunization (Marra) of sheep and goats infected with contagious agalaxy, B. Bianchini (*Gior. Med. Vet., 67 (1918), Nos. 41, pp. 617–622; 44, pp. 665–671*).—The symptoms of contagious agalaxy are described and case reports are given of the successful use of the antiagalactic serum of Marra and Cocciante (E. S. R., 31, p. 884) as a prophylactic and therapeutic agent.

From the results obtained, the author concludes that the seroimmunization of sheep and goats can be effected at any period, even in advanced pregnancy or during milk production, and that the passive immunity conferred by the serum is gradually transformed into active immunity. It is recommended that seroimmunization be practiced methodically every spring on all the animals in the flock.

Report of the Departmental Committee appointed to inquire as to precautions for preventing danger of infection by anthrax in the manipulation of wool, goat hair, and camel hair, W. Middlebrook et al. (*Rpt. Dept. Committee Anthrax* [*Gt. Brit.*], *1918, vols. 1, pp. III+3+93, pls. 5, figs. 2; 2, pp. 45; 3, pp. 171, pls. 2*).—Part 1 of this report contains the report of the disinfection subcommittee on the experimental investigation of disinfection of wool and hair; part 2, a report on investigations of the dangers to persons manipulating wool, goat hair, and camel hair of anthrax infection; and part 3 contains a summary of evidence heard by the committee, together with 33 appendixes.

Common diseases of pigs and their diagnosis, including swine fever and its treatment with serum, E. Peacey (*London: Baillière, Tindall & Cox, 1918, pp. VIII+114*).—A small handbook

Swine diseases, R. A. Craig (*Indiana Sta. Rpt. 1918, pp. 72, 73*).—In continuation of work on hog cholera, previously noted (E. S. R., 38, p. 688), further investigations are reported on the value of a mixture of desiccated hog cholera blood and antihog cholera serum as an immunizing agent which indicate that the desiccated cholera blood present in the mixture played no part in immunizing the animals which withstood the inoculation with virulent blood. Other studies are reported indicating that a hog which has recovered completely from cholera is not a carrier of the disease, that the disease is evidently not transmitted by internal parasites, such as lungworms and roundworms, and that filtration has no effect upon the virulence of hog cholera blood.

Experimental results obtained in a study of hemorrhagic septicemia and necrobacillosis of hogs are summarized as follows: "Pigs that were fed diseased tissues from hogs showing marked lesions of hemorrhagic septicemia developed abnormal temperatures. Sick pigs taken from outbreaks of hemorrhagic septicemia did not communicate the disease to healthy pigs when placed in a pen with them. Pigs inoculated with blood from hogs that had been immunized against hog cholera and afterward came down with hemorrhagic septicemia remained well. When exposed to hog cholera later, they sickened and died.

"Pigs fed diseased tissues from hogs showing marked lesions of necrobacillosis showed such symptoms as loss of appetite, elevation in temperature, and diarrhea. All quickly recovered, but when exposed to hog cholera later contracted the acute form of the disease."

Bacterial infections in swine and their relation to hog cholera, C. M. McFarland and F. Proescher (*Amer. Jour. Vet. Med., 14 (1919), No. 4, pp. 168–171*).—"It has been demonstrated that *Bacillus suisepticus* causes hemorrhagic septicemia or swine plague without the presence of the filterable virus. Our experiments indicate that the paratyphoid group, including *B. suipestifer* [and]

B. paratyphosus 'B,' in conjunction with *B. pyocyaneus* and *B. coli communis*, cause enteritis in swine. So-called 'necrotic enteritis' is not caused by *B. necrophorus*, because it is seldom found and if present is considered only as a secondary invader with little pathological significance. Hog cholera is nearly always accompanied by secondary bacterial infections, which have a tendency to increase the death rate by producing pneumonia and enteritis.

"Proescher has isolated, stained, and rendered visible a micrococcus obtained from the blood of pigs infected with acute hog cholera; has obtained this micro-organism in pure culture and transferred same to the forty-second subculture. Inoculation of susceptible pigs with the sixth subculture of this micro-organism has produced hog cholera. This microccocus has repeatedly been recovered in pure culture following filtration and subsequently inoculated into susceptible pigs, producing hog cholera with typical lesions, and recovered again in pure culture. The evidence at hand at the present time indicates that this micrococcus causes hog cholera."

[Hog cholera studies] (*Minnesota Sta. Rpt. 1918, pp. 73, 74*).—The progress report for 1917–18 includes notes on the following topics:

I. *To determine the possibility of producing an active immunity following a passive immunity.*—The results obtained are thought to indicate that an active immunity can be produced in a passively immunized pig at least 15 days after being injected with serum.

II. *To determine the effect of freezing on antihog cholera serum.*—A report of this has been previously noted (E. S. R., 38, p. 487).

III. *To attempt the isolation and cultivation of the etiological organism of hog cholera.*—Smears made from the blood of cholera-infected pigs did not reveal the diplococci, which, according to Proescher, are the etiological factor of hog cholera.

A study of the endocardial lesions developing during pneumococcus infection in horses, A. B. Wadsworth (*Jour. Med. Research, 39 (1919), No. 3, pp. 279–292, pls. 6*).—The author discusses the development of the lesions of vegetative endocarditis during the process of immunizing horses for the production of therapeutic antipneumococcus serum. A study of the lesions in six horses dying through pneumococcus immunization is reported which indicates that practically all of the lesions were attributable to the action of the bacteria and their poisons, carried through the circulation of the tissues affected. The heart lesions corresponded to those of acute and chronic endocarditis in man. The importance of predisposing injury in determining the localization of the bacteria is demonstrated, but it is pointed out that the bacterial poisons produce this injury, so that the bacterial localization may be practically coincident with it or may follow it immediately.

"In order to clarify our conceptions of pneumococcus infection, and doubtless also streptococcus infection, it is necessary to recognize the parasitic and the toxic activities of the inciting agents as distinct phases of the infectious processes, and yet not as entirely separate or independent activities because they are in point of fact closely linked and largely if not wholly dependent one upon the other."

A trypanosomiasis of the horse in Morocco.—A clinical and experimental study, Velu (*Rev. Gén. Méd. Vét., 27 (1918), No. 322, pp. 489–513*).—Trypanosomiasis in the horse in Morocco is a very grave disease which fortunately is localized in certain small zones. Control work consists in the complete withdrawal by the cavalry from posts situated within such contaminated areas and the treatment or slaughter of the affected animals.

RURAL ENGINEERING.

Rural water supplies and their purification, A. C. HOUSTON (*London: John Bale, Sons & Danielsson, Ltd., 1918, pp. XV+136, pls. 4, figs. 13*).—This book supplements a previous one on studies in water supply (E. S. R., 33, p. 287). It deals with the subject largely from the standpoint of the waterworks engineer, proceeding on the assumption that "there is no question that many rural districts might make far more use of rain water for domestic purposes than is now the case." A large amount of space (the first three chapters) is devoted to rain water as a source of domestic supply, but wells, springs, rivers, brooks, and lakes, as sources of water, are also discussed. The chief methods of sterilizing and purifying waters are dealt with in detail, and miscellaneous information which may be useful to the nontechnical reader is given.

Bibliography and index of the publications of the United States Geological Survey relating to ground water, O. E. MEINZER (*U. S. Geol. Survey, Water-Supply Paper 427 (1918), pp. 169, map 1*).—This bibliography includes all publications prepared in whole or in part by the U. S. Geological Survey that treat any phase of the subject of ground water and methods of measuring the flow of water. Brief abstracts and a locality index map are included.

Ground water in the Animas, Playas, Hachita, and San Luis Basins, N. Mex., A. T. SCHWENNESEN (*U. S. Geol. Survey, Water-Supply Paper 422 (1918), pp. 152, pls. 7, figs. 17, maps 2*).—This report, prepared in cooperation with the New Mexico Experiment Station, deals with the ground water of an arid area of about 3,600 square miles in southwestern New Mexico, about one-third of which is mountains and the remainder smooth and nearly level plains. The soils are residual, wind deposited, and alluvial types.

"The region contains no permanent streams, and practically its only certain source of water is underground. The rock formations yield little or no water except at a few small mountain springs, which are valuable as watering places. Water occurs, however, in the gravelly beds of valley fill—generally in the main body of the fill, but in Upper Animas Valley in gravel recently deposited in the trough excavated by Animas Creek out of the main body of fill. . . . In about 10 per cent of the area investigated, or approximately 370 square miles, water may be found at a depth of 100 ft. or less. This area includes approximately 194 square miles in which the depth to water is 50 ft. or less. . . . The largest areas in which the ground water stands less than 50 ft. from the surface are in Animas and Playas Valleys. In Animas Valley there are two shallow-water tracts—one in the depressed central part of the lower valley and another smaller one in the Animas Creek trough of the upper valley. In Playas Valley a large tract in which the depth to water is less than 50 ft. occupies the central parts of the upper and lower valleys and a small tract of shallow perched water is found in the Pot Hook Basin. Small shallow-water tracts are also found in the Hachita, Lordsburg, and San Lius Valleys."

Analyses of the water and soils, by R. F. Hare, are also included.

Surface water supply of Pacific slope basins in California, 1915 (*U. S. Geol. Survey, Water-Supply Paper 411 (1918), pp. 345+XXXVI, pls. 8*).—This report, prepared in cooperation with the State of California, presents the results of measurements of flow made on streams in Pacific slope basins in California during the year ended September 30, 1915, and includes the usual lists of gauging stations and publications relating to water resources.

Practical information on the measurement of irrigation water, O. W. ISRAELSEN (*Utah Sta. Circ. 36 (1919), pp. 3–29, figs. 11*).—This is a compilation from State and Government publications on water measurement for the use of practical irrigators and water company officers. Descriptions of, and discharge tables for, rectangular, trapezoidal, and triangular weirs, rectangular weirs without end contractions, and submerged orifices are given.

Irrigation under the provisions of the Carey Act, G. Ervin (*U. S. Dept. Agr., Off. Sec. Circ. 124* (*1919*), *pp. 14*).—This circular gives statistical data showing the number, size, and location of irrigation projects operating under the Carey Act.

"The following States have accepted the terms of the Carey Act in the order of the date of acceptance: Wyoming, Montana, Idaho, Colorado, Oregon, Nevada, Washington, Utah, Arizona, and New Mexico. In only the first five of these has any actual reclamation taken place under the act." About three-fourths of the total area reclaimed is located in Idaho.

Failures of irrigation projects under the Carey Act are attributed to the following causes: (1) Lack of thoroughness in making preliminary surveys, (2) underestimation of cost, (3) lack of proper State and Federal supervision, (4) slow rate of settlement, (5) allowing settlers to make their homes on the land before completion of the project, (6) ignorance on the part of settlers of difficulties to be overcome, and (7) requirement that water rights be paid for in 10 years or less.

Freezing and thawing effect on concrete, A. B. McDaniel (*Concrete* [*Detroit, Mich.*], *13* (*1918*), *No. 3*, *p. 84*).—Tests at the Illinois Engineering Experiment Station of 345 specimens of concrete made in 6-in. by 12-in. cylinders of 1:1:2, 1:2:4, and 1:4:8 mixtures led to the conclusions that "in general, for any of the three mixtures, and under a uniform temperature of about 70° F., there was an increase of strength with age within the limits of the tests. For this normal temperature, the rate of increase in strength decreases with the age of the specimen. The rate of increase varies with the richness of the mixture. For the specimens tested, under normal hardening conditions of from 60 to 70°, the compressive strength of the concrete subjected to a uniform temperature at the ages of 7, 14, and 21 days may be taken as approximately 60, 80, and 95 per cent for the 1:1:2 mixtures, as 50, 75, and 90 per cent for the 1:2:4 mixture, and as 40, 65, and 85 per cent for the 1:4:8 mixture, of the strength at 28 days, respectively.

"The loss in strength due to the alternate freezing and thawing conditions (1) decreases with the increase in the length of the initial setting period at a normal temperature, (2) increases with the number of reversals, and (3) decreases with the richness of the mixture. In Group 2, in which the specimens received an initial storage of 4, 8, 12, and 24 hours, the loss of strength is much greater than that of Group 1, in which the initial storage periods were 2, 6, 10, and 14 days. In Group 2 those specimens having had two reversals, show greater loss of strength than those having had only one reversal for the same initial storage periods. Under similar conditions, the richer mixture shows less loss in strength.

"When concrete of a 1:1:2 mixture is stored at a normal temperature of about 70° for initial storage periods of 4, 8, 12, and 24 hours, the percentage loss of strength after one reversal of one day at 20° and one day at 70° may be taken as about 50, 40, 25, and 10 per cent after one reversal, and 70, 55, 50, and 35 per cent after two reversals. The percentage values are based on the strength of the concrete for the same ages stored at a normal temperature of about 70°."

How lime affects strength of cement mortar, M. O. Fuller (*Concrete* [*Detroit, Mich.*], *13* (*1918*), *No. 3*, *p. 83*, *figs. 3*).—A series of tests on Portland cement mortars are reported, in which it was found that "from 5 to 12.5

per cent of hydrated lime may be added to cement mortars without seriously impairing the strength. A large number of contractors use 10 per cent lime. Averages of the value of tensile strength for the various ages give 10 per cent as the best value for air and water storage, 7.5 per cent for soil storage, and 5 per cent as the best value for all three kinds of storage. The real value of the addition of lime to cement mortars is the increase in plasticity or workability, which is very desirable from the contractors' point of view."

Effect of salt in warm climate on reinforced concrete, J. C. Foss, Jr. (*Concrete [Detroit, Mich.], 13 (1918), No. 5, pp. 149, 150, figs. 4*).—From observations made on concrete structures built in the Hawaiian Islands under his supervision, the author concludes "that salt water should never be used in reinforced concrete; that all possibility that salt might be present must be eliminated; that reinforced concrete, where used in places having warm salt atmospheric conditions, requires exceptionally careful construction. Some engineers contend that the action is no greater in a warm climate than in a cold one. It is, in the writer's opinion, many times greater, for in observing structures which show failures we find on the Islands that every one of them was exposed to salt influence, though in many cases a very small amount, and that disintegration has been abnormally fast."

Reinforced draintile tested, W. J. Schlick (*Concrete [Detroit, Mich.], 12 (1918), No. 4, pp. 139, 140, fig. 1*).—A summary of the results of tests at the Iowa Engineering Experiment Station of 278 concrete (1:3) draintile from 22 to 30 in. in diameter is reported. The tile were reinforced with two concentric hoops, using the 6-tie and bridge type tie bracing between hoops.

"The manner of failure was the same, in general, for all the reinforced tile. The first cracks developed were those at the four quarter points, as in unreinforced tile. These were followed by a varying number of circumferential cracks along the reinforcing hoops. At failure the reinforcing hoops usually pulled out on the inside at the top and bottom of the tile, or the circumferential cracks opened along one or more hoops. In many cases the section of the tile beyond the end hoops broke loose at least a part of the way around the tile. In a few cases the behavior of the tile under test indicated that one or more of the main hoop wires in the reinforcing had broken. In other, and more numerous cases, the weld between the tie wires and the hoop wires was broken at some points. The circumferential cracks and breaks were much more noticeable in the tile in which the 'bridge' type reinforcing was used. . . .

"Careful consideration of all facts seems to warrant the selection of the cracking strength of a reinforced concrete draintile as its safe supporting strength, in the ditch, and even then a factor of safety of 1½ should be applied to the predetermined probable loads, as for other draintile. . . .

"In these tests the increases in maximum supporting strengths as larger hoops of bridge type reinforcing were used were much more uniform than were the increases in cracking strengths. Also, the increases in both cracking and maximum strengths were more uniform in those tile which had wall thickness nearer normal. This latter fact indicates that if standard reinforcing is to be used considerable care should be taken to keep the forms true to the normal dimensions.

Mixtures and mixing for draintile (*Concrete [Detroit, Mich.], 12 (1918), No. 3, pp. 85, 86, 107*).—This is an abstract of a paper on proportioning of cement concrete in draintile, by R. W. Crum, in which it is pointed out that draintile manufacture with relatively dry mixtures necessitates special study as involving conditions that do not apply in the use of plastic mixtures. It is also pointed out that thorough mixing is necessary, that within certain limits the longer the mixing continues the better the results will be, but that in recent tests mixing relatively dry mixtures longer than three minutes did not prove beneficial. In addition, the theory of proportioning concrete mixtures is summarized in general and with special reference to draintile and pipe manufacture.

Hydrated lime in road concrete (*Concrete [Detroit, Mich.], 13 (1918), No. 4, p. 133, fig. 1*).—The results of first tests of the effect of hydrated lime in road concrete indicate that the compressive strength increased directly as the lime content increased from 0 to 7.5 per cent.

Public Roads (*U. S. Dept. Agr., Public Roads, 1 (1919), No. 9, pp. 64, figs. 4*).—This issue of this periodical contains 20 short articles bearing directly on highway engineering.

Land clearing, B. W. HOUSHOLDER (*Michigan Sta. Spec. Bul. 90 (1918), pp. 28–31, fig. 1*).—Data are briefly reported to show that under peninsular conditions in Michigan it will cost approximately $25 per acre to clear cut-over land of hardwood stumps, brush, and slashings, using the blasting method.

The farm tractor, W. AITKENHEAD (*Indiana Sta. Circ. 89 (1919), pp. 24, figs. 12*).—This circular reports the results of experiences of from 95 to 100 representative tractor users in the State of Indiana, working farms of from 100 to more than 500 acres.

"The fuel cost per acre is variable, depending on the type of soil and the general efficiency of the tractor and plow. With gasoline as fuel, the highest cost given was $1 per acre for plowing stiff clay 8 to 9 in. deep. The lowest was 50 cts. per acre for sandy clay plowed to a depth between 7 and 8 in.; 60 cts. per acre may be taken as the average cost of plowing 7 in. deep under Indiana conditions. The cost per acre, using kerosene as fuel, is considerably lower. The highest cost given is 50 cts. per acre for plowing clay land with a two-bottom plow, 7 in. deep, and the lowest is 25 cts. per acre for loose bottom land plowed 7 in. deep. The average tractor is using 3 gal. of kerosene per acre, costing about 12.5 cts. per gallon to plow between 7 and 8 in. deep."

Out of 94 tractor owners, 84 reported a saving of two to four horses, and 10 no saving in horses due to the use of the tractor. "The farmers reported, with very few exceptions, that their two or three-plow tractors dispensed with the services of one man and two or three horses. . . .

"The almost unanimous preference was for a three-plow size; in fact, with two exceptions, every owner of a two-plow tractor purchased before 1918 intimated that if he bought another tractor, it would be a larger one. Purchasers of the newer 1918 models of two-plow tractors generally expressed themselves as satisfied."

Out of 95 tractor owners 77 expressed themselves as being satisfied with the tractor, 11 were uncertain, and 7 were dissatisfied. Out of 95 owners 48 reported an increase in acreage due to tractor use. Twenty-seven were plowing 6 to 7 in. deep; 46, 7 to 8 in. deep; 17, 8 to 9 in. deep; and 5 over 9 in.

General information is given on the construction and operation of a tractor, and a trouble chart is appended.

Hay stackers, H. B. McCLURE (*U. S. Dept. Agr., Farmers' Bul. 1009 (1919), pp. 22, figs. 13*).—This describes different types of hay stackers and gives practical information regarding their cost and use.

"Stackers are comparatively inexpensive. The most costly types, the overshot and the swing-around, may be bought for from $45 to $75, and homemade types may be made for a few dollars. If the poles are cut on the farm, the homemade tripod or derrick stacker need not cost any more than an ordinary barn-hay fork without the track. The fork and rope from the barn may be used in rigging up such a stacker. The cost of repairs, interest on investment, and replacement charges on stackers depend upon the amount of hay handled per year; the more hay handled per year the less the amount of these charges per ton. A stacker will last from 10 to 12 years under ordinary conditions. The charges for stackers on 27 farms in central Kansas, which stacked an average of only 144 tons of hay per year, amounted to less than 7 cts. per ton when the yield was 1 ton per acre. The charges on 32 farms in central Nebraska, when twice this amount or 300 tons of hay were stacked per year, amounted to 8 cts. per ton with a yield of 1 ton per acre."

Simple water systems, O. E. Robey (*Michigan Sta. Quart. Bul., 1 (1918), No. 2, pp. 69, 70, figs. 2*).—A hot and cold water system for farm kitchens supplied by a hand-force pump is described and illustrated.

RURAL ECONOMICS.

Address of D. F. Houston, Secretary of Agriculture, before the Trans-Mississippi Readjustment Congress, Omaha, Nebr., February 20, 1919 (*U. S. Dept. Agr., Off. Sec. Circ. 130 (1919), pp. 19*).—This address deals with the necessity of certain economic and social reforms, including rural school, rural health, and better roads programs; proper Federal control of stockyards and packing establishments; the assisting of tenants to become farm owners; a Federal budget system; and others to which the recent organization for winning the war has given an impetus.

Summary of the annual reports of the farm advisors of California for December 1, 1917, to December 1, 1918, B. H. Crocheron (*California Sta. Circ. 208 (1919), pp. 59, pl. 1*).—This circular reports the success of campaigns for increased pork production, for the growing of silo sorghum, fire protection for grain fields and grass ranges, better seed, and increase of wheat, also the handling of farm labor needs, development of boys' agricultural clubs and of the farm home departments of the farm bureaus, and miscellaneous results of farm advisors' activities. Detailed reports from 35 counties having county farm bureau organizations are included.

Farming plans for 1919, C. Ousley (*College Station, Tex. Ext. Serv., Agr. and Mech. Col., 1919, pp. 8*).—This analysis predicts high prices for meats and fats, cheaper bread owing to a large prospective wheat crop, and a lower corn acreage and yield than in 1918. The author advocates restraining the cotton acreage by the production of food and feed supplies.

A method of testing farms in the South for efficiency in management, C. L. Goodrich (*U. S. Dept. Agr., Off. Sec., 1919, pp. 40*).—"This circular is intended to present a method of testing farms for efficiency in management." Some of the more important tests noted are "the production of family and farm supplies, the yield per acre of crops, the production per head of productive live stock, the organization of the crop acreages, the adjustment between labor requirements and labor supply, and secondary tests directly influencing the main factors." The author illustrates the measurement of farms by these tests, using data furnished by several farm management studies conducted in the South, which have been previously noted (E. S. R., 39, pp. 293, 294; 40, p. 292).

American Association for Agricultural Legislation: A description of the association and a statement of its aims (*Amer. Assoc. Agr. Leg. [Pamphlet], [1918], pp. [7]*).—"The purpose of this association [E. S. R., 39, p. 198] is to investigate conditions that seem to call for new or improved legislation affecting agricultural interests and to promote by publicity and education such legislation as the results of the investigations indicate."

Wanted: A national policy in agriculture, E. DAVENPORT (*Urbana, Ill.: Author, 1919, pp. 28*).—This address has already been noted (E. S. R., 39, p. 703).

National policy in agriculture, EARL OF SELBORNE (*Trans. Highland and Agr. Soc. Scot., 5. ser., 30 (1918), pp. 187–197*).—The chairman of the Agricultural Policy Subcommittee of the Reconstruction Committee here addresses the society on the subject of the report discussed editorially (E. S. R., 39, p. 402).

The report of the Agricultural Policy Subcommittee of the Reconstruction Committee, W. A. HAVILAND (*Jour. Farmers' Club [London], 1918, Dec., pp. 145–165*).—This paper was read at the meeting of the Farmers' Club December 5, 1918, and includes the comments of members upon recommendations contained in the report and the means of carrying them out.

Our daily bread, G. RADFORD (*London: Constable & Co., Ltd., 1918, pp. 127*).—State ownership and control of the land to assure maximum production, management by the State of its mineral wealth and natural resources, the training of its citizens for more efficient service, sweeping reforms in methods of finance, and the institution of free trade are here advocated.

War-time farming, T. WIBBERLEY (*London: C. Arthur Pearson, Ltd., 1918, pp. 47, figs. 2*).—The author discusses cropping systems and methods of managing farm labor for economy and efficiency on English farms.

Report upon openings in agriculture suitable for disabled sailors and soldiers (*London: Min. of Pensions, 1918, pp. 6*).—This suggests lines of farming in which disabled English sailors and soldiers may find openings, and describes opportunities for training, provisions for maintenance during training, and wages and hours of work. These matters are in the hands of local war pensions committees, consulting with the agricultural organizer of the county council.

Urban and rural development in Canada (*Ottawa: Com. Conserv. Canada, 1917, pp. [4]+98*).—In the report of this conference, held at Winnipeg May 28–30, 1917, are published addresses on rural production and development, planning and development of the land, the problem of returned soldiers, and others on phases of municipal problems, all of which, however, emphasizes the interdependence of city and country.

[Land settlement schemes] (*Proc. Spec. Committee, House of Commons, Returned Soldiers, Canad. Exped. Forces, 1917, pp. 605–610, 707–712, 874–886, 912, 913, 926, 943, 1206–1208*).—These pages embody the opinions with regard to land settlement projects in Canada, suggestions, resolutions adopted, and reports on plans inaugurated heard from February 7 to July 17, 1917, by the special committee of the Parliament of the Dominion of Canada appointed to consider, among other questions, that of the provision of employment for discharged men of the Canadian Expeditionary Forces, and the training and reeducation of the disabled.

New measures for the development of agricultural production, KÄPPELI (*Ann. Agr. Suisse, 19 (1918), No. 2, pp. 171–184*).—The text of a lecture delivered January 12, 1918, before the Swiss Society of Agriculture by the chief of the Division of Agriculture of the Swiss Department of Public Economy, reviewing the various orders in effect for increasing food production in Switzerland and arguing for increased efforts in the future from Swiss agriculturists.

Organization of the agricultural laborer in northern Italy (*Italy To-day, 1 (1918), No. 8, pp. 30–33*).—This article describes the activities of the peasant women in the agricultural societies of Italy, especially in the district of Emilia.

The economic conditions in Serbia, 1914–1918 (*La Serbia Économique, 1914–1918. Geneva, Switzerland: Comité Cent. Serbe, 1918, pp. VI+99*).—This is an abridged edition of a fuller report on economic conditions in Serbia submitted in January, 1918, by the central Serbian committee under the title "Srbija u imovnom pogledu pre, za vreme i posle svetskog rata 1914–1918." It gives notes on the natural resources and the industrial wealth of the country, with the available figures relating to real estate and personal property, and estimates the losses suffered during the war. It further outlines needs for the restoration of Serbia and an after-the-war economic program.

Moroccan economics and agriculture, F. BERNARD (*Le Moroc Économique et Agricole. Paris: G. Masson, 1917, pp. 212, pl. 1*).—This report deals with systems of landholding in operation in Morocco, public improvements, commerce, finances, social reforms which have been instituted, agriculture, and natural resources of the colony, the author's inquiry having been conducted in the administrative offices and among the colonists.

Main problems in the economy of agricultural production in South Africa, H. WOLFE (*So. African Jour. Indus., 1 (1918), Nos. 11, pp. 997–1005; 12, pp. 1113–1120; 13, pp. 1217–1222; 14, pp. 1330–1341; 15, pp. 1433–1435*).—The factors discussed here, from the point of view of their importance in agricultural production in the Union of South Africa, are land, capital, and labor. Of the three, capital is the most expensive. The author points out that private credit institutions are handicapped for offering capital to farmers at low cost, and reviews the various European credit institutions, including the Raffeisen banks, the French cooperative personal rural credit banks, the Credit Foncier, Landschaften, and the State agricultural banks of Australasia, Egypt, South Africa, and other countries, in connection with land mortgage credit. He recommends the principles of the French personal credit systems and of the Landschaften as a cooperative rural land credit organization. He advocates Government support of credit institutions in South Africa, in the form of a State guaranty upon the bonds issued, which might, however, be withdrawn when a stabilized agriculture advanced beyond the pioneer stages no longer needs extraneous support.

The third factor in agricultural production, labor, which is at present cheap but very inefficient, must be improved. "For the young Africander a system of apprenticeship . . . and for the young native a system of indenture are advocated."

Economic developments in the Anglo-Egyptian Sudan, H. P. HEWINS (*Trans. 3. Internat. Cong. Trop. Agr. 1914, vol. 2, pp. 473–487*).—The attention of the author is devoted to reviewing the inception, development, and economic effects of the Gezira irrigation scheme and the quantity and quality of the labor supply available for the agricultural regions affected by it, also to a general discussion of extension of transport facilities, provision of water for cultivation, and labor supply in the Sudan as a whole. He looks forward to a concentration of European interests on this region as a source of meat supply, and predicts the development of a market for grain and oil seeds, as well.

The distribution of agricultural products and the function of produce exchanges, C. J. BRAND (In *American Problems of Reconstruction. New York: E. P. Dutton & Co., 1918, pp. 217–231*).—The problem of reconstruction which is presented by the distribution of agricultural products is reviewed in this chapter.

The author considers that organization of producers and standardization of products and of containers are movements which have been encouraged by the war and will increase in importance; that Government collection and dissemination of market information, inspection of food products, and licensing have proved valuable and will persist; and that improvement in retail distribution will come about with education of the large numbers of merchants. He endeavors to set forth simply and clearly the principles of future trading, regulations of it under the Federal Food Control Act, and the efficiency of the system in the distribution of farm products.

The farm market (*Philadelphia: The Curtis Pub. Co., 1918, pp. 68, figs. 24*).—This is a brief summary of a study made "to visualize the market opportunity in the farm field." It takes up the numerous determining factors in the new interrelationships between city and farm, hinging upon increased production of farms and rise of new standards of earning and spending acquired by farm families. The text is graphically illustrated.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 5 (1919), No. 3, pp. 25–36*).—This report, which gives the usual data relating to estimated farm value of important products, February 15 and March 1, 1919, average of prices received by producers of the United States, and range of prices of agricultural products at important markets, is concerned mainly with farm stocks March 1, 1919, of the principal grains, by States, and the proportion of each shipped out of the county where grown. It contains, also, the United States crop summary for March; statistics of the total corn crop and the portion merchantable, yearly, 1901 to 1918, inclusive; prices of articles bought by farmers; aggregate crop acreages, by States, in 1909, 1916, 1917, and 1918; the principal crops of France, 1815 to 1918; and the principal crops harvested in Argentina in the years 1891 to 1919, inclusive.

Trends in agricultural statistical data; estimates of wheat held by interior mills and elevators on March 1 of five years, 1915 to 1919; and figures for the meat production, imports, exports, and consumption, 1900 to 1918, are shown. Special articles are included on meat production in the United States during 19 years, beginning with 1900; errors in crop reports; live-stock changes during January, 1900; the farm firewood crop, with estimates of consumption of cordwood, by States, in 1918; and farm land value. Other miscellaneous data are recorded.

[Field crop and live stock report of Canada for 1916], J. H. GRISDALE (*Canada Expt. Farms Rpts. 1917, pp. 9–11*).—These pages indicate that the only crops for which the yields equaled or exceeded those of 1915 were hay and clover, potatoes, and turnips. "The total value of all field crops grown in Canada in 1916 is estimated at $808,054,000 as compared with $841,297,500, the revised total for 1915. The total for 1916, although lower than that for 1915, is greater than that for any other previous year."

Tables are given to show a comparison of yields and prices obtained for the years 1915 and 1916, a comparison of eastern Canada, Prairie Provinces, and British Columbia as to yields and prices obtained in 1915 and 1916, and the number of various classes of live stock for the period 1912–1916.

Sugar industry [in Cuba] (*Sec. Agr. Com. y Trab. [Cuba], Ofic. Estad., Indus. Azucarera, Mem. Zafra Realizada, 1916–17, pp. 257, figs. 16*).—This gives statistical information, by provinces, as to the condition of the sugar industry in Cuba during certain periods of the years 1916 and 1917.

Agricultural statistics of Argentina, 1916–17, E. LAHITTE (*Estadis. Agr. [Argentina], 1916–17, pp. 230*).—This statistical report continues, for the agricultural year 1916–17, the one previous noted (E. S. R., 35, p. 893).

Three centuries of prices of wheat, flour, and bread. War prices and their causes, J. KIRKLAND (*London: Author, 1917, pp. 63*).—The author has compiled tables of the prices of wheat, flour, and bread through 317 years, from 1600 to July, 1917, which he offers with notes explanatory of the sources of data and possibilities of error and variation. There are included articles analyzing the main factors in the rise of prices of these commodities and of freights between August, 1914, and the fall of 1917.

Annual agricultural statistics of France, 1916 (*Statis. Agr. Ann.* [*Paris*], *1916, pp. 420*).—This report gives for the year 1916 information similar to that previously noted for 1913 (E. S. R., 34, p. 691).

Crop statistics for Switzerland in 1917 (*Schweiz. Anbaustatis, No. 208* (*1917*), *pp. XXVIII+463*).—This publishes in German, French, and Italian the findings of an official inquiry made between July 7 and 14, 1917.

Statistics on the production of cereals and legumes, 1918 (*Estadística de la Produccion de Cereales y Leguminosas en el Año 1918. Madrid: Govt., 1918, pp. 41*).—Estimated yields of the principal cereals and legumes in the dry and irrigated regions, by provinces, in Spain are given, with notes on the meterological conditions for the agricultural year 1917–18.

Area, classification of area, area under crops, live stock, land revenue assessment, and transfers of land in certain native States, G. F. Shirras (*Agr. Statis. India, 32* (*1915–16*), *II, pp. VII+107, pl. 1*).—This report continues information previously noted (E. S. R., 38, p. 596), adding data for another season.

AGRICULTURAL EDUCATION.

Second annual report of the Federal Board for Vocational Education (*Ann. Rpt. Fed. Bd. Vocat. Ed., 2* (*1918*), *pp. 172*).—This is a report of progress on the administration of the Federal Vocational Education Act of February 23, 1917, dealing with the meaning of the act; cooperation; war problems; the vocational rehabilitation of disabled soldiers and sailors; war training; agricultural, trade and industrial, home economics, and commercial education; allotments; and general statistics on schools, teachers, pupils, and expenditures.

It is estimated that between 20 and 30 per cent of the high schools in the United States are giving truly vocational instruction in agriculture. State boards for vocational education reported for the fiscal year 1917–18 609 special schools of agriculture or agricultural departments in high schools which had qualified for Federal aid under the act.

With reference to special secondary agricultural schools, the statement is made that their "instruction in all cases is strictly vocational in aim, and has undoubtedly had a good influence in showing to high schools the importance of the vocational aim in agricultural instruction. However, in many cases students at these special secondary schools get little actual farming experience. . . . It is granted that there is need for both special and secondary schools of agriculture and for courses in agriculture in our public high schools. However, for the majority of pupils the advantage is conceded to be in agricultural courses in the established high schools.

It is concluded that the first year during which the Vocational Education Act has been in operation promises well for the future. Agricultural education thought has been stimulated throughout the country. The quality of much of the work previously initiated has been improved, and new work has been started along approved lines. Investigations as to agricultural education have been instituted, of which some are already completed. Every State has set up plans for the training of teachers of vocational agriculture and has designated institutions where the work is to be carried on. Practically every State has formulated plans for the supervision of the teaching of vocational agriculture in secondary schools. The outstanding advance of the year is found to be not in the introduction of agriculture in a large number of schools but in standards having been set up for the work and the trend of the instruction having been definitely and permanently turned toward practicality and vocational efficiency.

In discussing home economics education in 1917, it is pointed out that up to the time of the passage of this act there were comparatively few schools in this country giving courses in vocational home economics. State supervision of home economics was not very well developed, and the teacher-training institutions varied in the quality of work done and the length of courses offered. An interpretation is given of the principles of home economics education as provided in the act.

The chief effort in 1917–18 was to develop the work in home economics in the all-day school. It is found that "the home-making subjects have been fairly well taught, although the connection between the school work and the home work of the pupil needed to be stressed. The development of the home project idea was encouraged. The important piece of work done was to convince the school men that a half day was none too much to require for the training of a home maker, and that the home-making subjects should be strengthened and supported by the fundamental science and art courses."

The development of courses in science and art related to the home was encouraged everywhere. "The curriculum as given in many of the secondary schools was modified so that the so-called domestic science and domestic art work was developed into one course of home economics, and the scope of the work was extended so as to include more of the home-making activities, home management, home nursing, child care, house planning and furnishing, as well as work in food preparation, garment making, and millinery." The laboratory facilities and equipment were increased, and part-time and evening work was forwarded to some extent.

At the end of the year there was a supervisor of vocational home economics in 31 States. States were encouraged to establish a well-rounded four-year course designed for the training of home economics teachers. An effort was made to strengthen the special-methods work in the teaching of home economics, the practice teaching, and the provision for vocational experience. At the end of the year a large number of institutions had increased the time spent in their methods courses, had increased their provision for practice teaching to a minimum of eight weeks of three hours each, and had provided supervised home management in a home of some sort provided for this purpose. Many of the two-year institutions had added a third year to their teacher-training courses, and in only one State where there was a two-year course was there no provision made for extending this to a four-year course by 1920.

An annotated list of the publications of the Federal board is included. Statistics of allotments of Federal money for 1917–18 and 1918–19 and the source and amount of salary of State directors and supervisors by States for the fiscal year ended June 30, 1918, are also given. Appendixes deal with the regulations governing the administration of the act, rulings and decisions of the Federal board, the response of States to the act, State legislation, and executive officers, membership, directors, and supervisors of State boards for vocational education.

Suggestions for courses in agriculture in the recognized high schools of Illinois, A. W. Nolan and J. C. Hanna (*[Dept. Pub. Instr. Ill.], Circ. 129 (1918), pp. 48*).—This bulletin contains syllabi for one- and two-year high school courses in agriculture, and for additional one-semester or half-unit courses of 18 weeks each, making up a total of three or four years in agriculture.

The topics proposed for the one-year course are agronomy, animal husbandry, farm business and life, and horticulture. For the two-year course it is suggested that plant industry, including agronomy for the first semester and horticulture for the second, be given in the first year of the course, and that animal husbandry make up the work of both semesters of the second year. The additional one-semester course outlined includes the farm physical plant, farm management, the soil, plant and animal improvement, poultry husbandry, vegetable gardening, and dairy husbandry. Suggestions for laboratory and home project work, lists of references, a list of minimum laboratory apparatus for agriculture in a recognized school, and a suggested four-year curriculum for a department of vocational agriculture in a Smith-Hughes Act school are included.

Six months' directed or supervised practice in agriculture, A. W. NOLAN (*Bd. Vocat. Ed. Ill. Bul. 8 (1918), pp. 23, figs. 3*).—This bulletin has been prepared to assist teachers of agriculture in the work of directing the six months' farm practice required under the Smith-Hughes Act. Suggestions are offered with reference to publications relating to projects, an outline for a preliminary survey of the agricultural resources of the school district, the accrediting of regular farm work as an integral part of the course in vocational agriculture, and supervised farm practice in systems of grain farming, live-stock farming, and farm mechanics. Information is also included on agricultural clubs and other organizations of farm boys offering opportunities for supplementing the six months' supervised practice in agriculture.

Elementary agriculture and horticulture (*Toronto, Ont.: William Briggs, 1918, pp. IX+200, pl. 1, figs. 90*).—This manual is intended for the use of teachers, particularly those who may not have had much training in the fundamental sciences underlying agriculture. It contains a discussion of nature study and agriculture, suggestions for the teacher on methods of instruction, equipment, and the school library, and lessons on the farm, the garden, the orchard, beautifying the school grounds and the roadside in front, and the organization and maintenance of school progress clubs, outlined according to the laboratory method and according to seasonal sequence. The course of work extends through two years.

Knowing insects through stories, F. BRALLIAR (*New York and London: Funk & Wagnalls Co., 1918, pp. XXI+291, pls. 12, figs. 19*).—This nature book, which is written in story form, is intended to awaken an interest in insects. It comprises six parts dealing, respectively, with butterflies and moths; beetles and weevils; grasshoppers, crickets, and silver fish; bees, wasps, and ants; divers little people; and bugs and flies. The material has been arranged in such a way as to enable readers to lay a foundation for future study.

Projects in farm mechanics, E. A. FUNKHOUSER (*Bul. John Tarleton Agr. Col., 1 (1918), No. 3, pp. 31, figs. 21*).—This bulletin consists of 20 plates on farm mechanics, representing handy devices for the farm, accompanied by brief explanatory notes on each article illustrated.

Food and the war (*Boston: Houghton, Mifflin Co., 1918, pp. [10]+379, figs. 2*).—This is a textbook for college classes, prepared under the direction of the collegiate section of the U. S. Food Administration with the cooperation of the U. S. Department of Agriculture and the U. S. Bureau of Education. It is a revision of the outlines for three courses prepared for college classes and sent out in weekly installments during the spring semester of 1918.

Part 1, written by Katharine Blunt and Florence Powdermaker, includes an introduction to the world food situation, followed by a study of the composition and functions of food, the fuel value of food, the body's fuel requirements, protein, the meat situation, protein-rich foods used in place of meat, fats and oils, the importance of wheat, flour and bread—the wheat substitutes, sugar, the value of milk, vegetables and fruits, suggestions for an adequate diet—the diet of infants and children, food and the community, and the work for food conservation. Part 2, by Elizabeth C. Sprague, deals with food consumption and food values; principles of cooking; the preparation and use of protein foods, vegetables and fruits, and cereal products; an adequate diet; preservation of food by canning; and demonstrations. References to literature are appended to each chapter.

Economy in food, M. T. Wellman (*Boston: Little, Brown & Co., 1918, pp. [2]+36*).—The author discusses economy in buying, storing, and serving food and in planning meals, the uses of left-overs, recipes, and fuel. A table showing the cost of 100-calorie portions of foods and factors for calculating them are included.

The business of the household, C. W. Taber et al. (*Philadelphia and London: J. B. Lippincott Co., 1918, pp. XII+438, pl. 1, figs. 41*).—This book presents a detailed study of the business of the household finance, based on practical experience of nearly a quarter of a century in the management of a household. It may be used as a text by upper-high school and college students, or as a reference book for the teacher of home economics in schools of all grades and the home maker and housekeeper. Its four parts deal, respectively, with the fundamental principles of household finance, factors in the family budget—necessities and higher life—and the legal and business status of the family. Suggestions in regard to the use of the text by the teacher and student are included. Questions, problems, and demonstrations, and references to literature follow the various chapters.

Mathematics for collegiate students of agriculture and general science, A. M. Kenyon and W. V. Lovitt (*New York: The Macmillan Co., 1918, rev. ed., pp. VII+337+1, figs. 129*).—This book is designed as a text in freshman mathematics for students specializing in agriculture, biology, chemistry, and physics in colleges and technical schools. The exercises constitute about one-fifth of the text, and include much data taken from agricultural and other experiments to show the application of general principles to problems which actually arise in real life.

MISCELLANEOUS.

Thirty-first Annual Report of Alabama College Station, 1918 (*Alabama Col. Sta. Rpt. 1918, pp. 36*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1918, and reports of the director and heads of departments on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Nature and progress of the work of the agricultural experiment station, M. Nelson (*Arkansas Sta. Bul. 158 (1918), pp. 63, figs. 4*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1918, a list of publications issued during the year and brief summaries of their contents, and brief summaries of the chief lines of work in progress at the station. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-first Annual Report of Indiana Station, 1918 (*Indiana Sta. Rpt. 1918, pp. 99, figs. 10*).—This contains the organization list, reports of the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, lists of the organized lines of work, publications of the year, changes in staff, etc., and a financial statement for the Federal funds for the fiscal year ended June 30, 1918, and for the remaining funds for the period ended September 30, 1918.

Special report of the Upper Peninsula Experiment Station, B. W. Householder (*Michigan Sta. Spec. Bul. 90 (1918), pp. 31, figs. 23*).—This includes general information as to this substation by R. S. Shaw, and a report on its work for the year ended June 30, 1918. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-sixth Annual Report of Minnesota Station, 1918 (*Minnesota Sta. Rpt. 1918, pp. 98*).—This contains the organization list, a financial statement for the Federal funds for the fiscal year ended June 30, 1918, and for the State funds for the fiscal year ended July 31, 1918, and reports of the director, heads of divisions, and the various substations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the director for 1918, J. G. Lipman (*New Jersey Stas. Bul. 330 (1918), pp. 5–25*).—This contains the organization list and a report of the director on the work and publications of the stations during the year.

Twenty-eighth Annual Report of Washington Station, 1918 (*Washington Sta. Bul. 153 (1919), pp. 45, figs. 8*).—This contains the organization list, a report on the work and publications of the station during the year, and a financial statement for the Federal funds for the fiscal year ended June 30, 1918, and for the remaining funds for the fiscal year ended March 31, 1918. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Canada Experiment Farms, 1917 (*Canada Expt. Farms Rpts. 1917, pp. 148*).—This report contains the reports of the director, the Dominion specialists, and the superintendents of the various substations. In addition to experimental work abstracted elsewhere in this issue, meteorological data and several minor feeding trials with steers, horses, sheep, and poultry are included.

Quarterly bulletin of the Michigan Experiment Station (*Michigan Sta. Quart. Bul., 1 (1918), No. 2, pp. 41–85, figs. 10*).—This contains several articles abstracted elsewhere in this issue, together with the following: Silage for Horses; Curing Meat on the Farm, and Notes on Winter Care of Breeding Ewes, both by G. A. Brown; Cull Beans for Hogs, Winter Care of Brood Sows, by W. E. J. Edwards; Directions for Preparing Samples of Water for Bacteriological Examination, by W. Giltner; Care of Milking Machines, by G. L. A. Ruehle; Plant Disease Notes for Fall and Winter, Bean Seed for 1919, and The Results of the Barberry Eradication Campaign, all by G. H. Coons; National Dairy Show Exhibit; Status of Spring Wheat in Michigan, by J. W. Nicolson; Wild Oats in Michigan, by E. A. Bessey and F. A. Spragg; Rosen Rye Breeding by F. A. Spragg; Get Ready to Top Graft Apple Trees, and Protect Young Apple Trees, both by C. P. Halligan; Demonstration Poultry Flocks, by C. H. Burgess; The Care of Manure, by C. E. Millar; The Control of Infectious Abortion in Cattle, and The Tuberculin Test of Cattle, both by E. T. Hallman; and a list of available bulletins.

Monthly Bulletin of the Ohio Experiment Station (*Mo. Bul. Ohio Sta., 4 (1919), No. 3, pp. 67–96, figs. 14*).—This number contains an article entitled Spring Seeding of Clover and Grass, by C. G. Williams, several other articles abstracted elsewhere in this issue, and miscellaneous notes.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 6 (1919), No. 12, pp. 170–184, figs. 4*).—This number contains brief articles on the following subjects: Eradication of Poultry Lice, by R. W. Wells (see p. 754); The Best Type of Sheep for Western Washington, by W. A. Linklater; Alfalfa in Western Washington, and Concerning the Purchase of Commercial Fertilizers, both by E. B. Stookey; Training Raspberries and Blackberries, by J. L. Stahl (see p. 743); and Spring Spraying Program for 1919, by A. Frank (see p. 742).

NOTES.

California University and Station.—Several additional members of the staff have now returned from war service, including Donald Bruce, appointed associate professor of forestry; S. B. Freeborn, assistant professor of entomology; H. A. Mattill, assistant professor of nutrition; and H. A. Wadsworth, assistant in irrigation investigations. Recent appointments include J. F. Wilson as assistant professor of animal husbandry; E. L. Oberholser as assistant professor of pomology; D. W. Tubbs as assistant in agricultural engineering; Ralph Benton as instructor in agricultural education; W. E. Wank as assistant in soil technology; and R. N. Davis and W. O. Johnson as assistants in agricultural extension. Leaves of absence have been granted, because of war or other Government service, to E. B. Babcock, professor of genetics, and to A. F. Swain, E. O. Essig, and W. H. Stabler, assistants in entomology, forestry, and veterinary science, respectively.

Delaware College and Station.—The resignations, effective June 30, are noted of E. A. Hodson, assistant professor of agronomy, to accept a position with the Arkansas Station, and Dr. C. C. Wiggans, research horticulturist, to become associate horticulturist in the Nebraska Station.

Florida University and Station.—J. W. Sutton of Tampa has been appointed to the board of control, vice T. B. King.

At the recent commencement the degree of LL. D. was conferred on Dr. E. R. Flint of the Office of Experiment Stations, U. S. Department of Agriculture, who was for many years professor of chemistry in the institution.

Steps are being taken to establish a substation, with the special purpose of conducting experiments relating to citrus work.

Kansas College and Station.—H. J. Penney of Hays has been appointed to succeed C. W. Greene as a member of the State board of administration.

According to the budget approved by the State board of administration, the funds available for the station and its four substations aggregate $201,300 for the ensuing fiscal year. Of this amount, $131,300 is from Federal and State appropriations, and the remainder represents estimated receipts from fees and the sale of farm products which are available for use in station work.

R. L. Hensel of the Forest Service of the U. S. Department of Agriculture has been appointed associate professor of pasture management, and will have charge of the pasture investigations which are being developed in the agronomy department for the purpose of promoting better utilization of the 20,000,000 acres of grass land within the State. Dr. H. L. Ibsen has been appointed assistant professor of animal husbandry.

Dr. Leonard W. Goss, professor of pathology in the department of veterinary medicine, resigned July 1 to engage in commercial work. Karl J. T. Ekblaw, professor of farm engineering, has resigned to become farm engineering editor of *New England Homestead*.

Kentucky University and Station.—Philip Blumenthal, chemist; Mark Havenhill, professor of farm mechanics; Jean MacKinnon, acting head of the department of home economics; Madge Lamareaux, instructor in that department; and Mabel Roe, assistant plant pathologist, have resigned. N. M. Cregor, assistant in bacteriology laboratory, has been transferred to the department of agronomy, and O. G. Hankins, assistant in boys' and girls' club work, has been transferred to the department of animal husbandry as extension specialist in swine husbandry.

Director Thomas P. Cooper of the station has been appointed director of the extension division, effective July 1, with T. R. Bryant and Goeffrey Morgan as assistant directors of extension. Mary E. Sweeny has been appointed head of the department of home economics, beginning August 15. Other appointments include John O. Barkman, instructor in dairy manufactures and extension specialist in dairy manufactures, beginning June 1; M. B. Kroft, extension specialist in farm management, beginning July 1; and J. C. Grimes, assistant in animal husbandry.

Oregon College and Station.—Appropriations by the legislature to the station for the ensuing biennium include $50,000 for agricultural investigations, $30,000 for crop pests and horticultural investigations, $15,000 for soil, drainage, and irrigation investigations, and $10,000 for dairy investigations. The appropriation of $25,000 per annum for the seven substations was continued, and in addition the Hood River substation was granted an annual continuing allotment of $4,000, the southern Oregon substation a corresponding allotment of $2,000, and the Astoria substation a special appropriation of $2,000 for completing the drainage system and clearing land. The college also received a special appropriation of $60,000 for an engineering laboratory, $15,000 for completing the barracks building salvaged from the Students' Army Training Corps, and an appropriation of $157,566 for maintenance during the biennium in addition to the proceeds of the millage tax already provided.

T. B. Beckwith, professor of bacteriology; F. W. Miller, assistant professor of veterinary medicine; D. E. Richards, assistant professor of animal husbandry; H. M. Wight, assistant professor of zoology; and L. W. Wing, assistant professor of dairy husbandry, have recently returned from war service. Other additions to the staff include B. B. Fulton, assistant entomologist of the New York State Station, as assistant professor of entomology; A. W. Oliver as instructor in animal husbandry; W. A. Smart as crop pest assistant; E. H. Wiegand as assistant professor of horticulture; L. P. Wilcox as research assistant in horticulture; and Dr. S. M. Zeller as assistant professor of plant pathology and assistant plant pathologist.

Pennsylvania College.—W. W. Wood, instructor in agricultural extension, resigned May 12. R. R. Welch has been appointed assistant professor of dairy husbandry extension, beginning July 1, and John R. Eyer, instructor in economic entomology, beginning May 26.

Utah College and Station.—A department of human nutrition has been established in the station. R. L. Hill, Ph. D., formerly of the Maryland Station and first lieutenant in the Sanitary Corps of the U. S. Army, has been appointed head of the department, with Blanche Cooper, formerly nutrition expert in the extension division, as associate.

E. B. Brossard, Ph. D., instructor in farm management at the University of Minnesota, has been appointed head of the department of farm management which was recently established in the college and station. B. L. Richards, Ph. D., has been appointed associate professor of botany. Capt. W. E. Carroll of the Sanitary Corps has resumed his duties as head of the department of animal husbandry.

Virginia College.—President J. D. Eggleston has resigned to accept the presidency of Hampden-Sidney College, effective July 1, and has been succeeded by

Julian A. Burruss, president of the State Normal School at Harrisonburg. Jesse M. Jones, director of the extension division, has resigned to take charge of the department of agricultural and industrial development of the Seaboard Air Line Railway, beginning July 1, and has been succeeded by John R. Hutcheson, formerly assistant director of the extension division.

Roosevelt Wild-Life Forest Experiment Station.—A forest biological station has recently been authorized by the New York Legislature, with headquarters at the College of Forestry at Syracuse University. This will be known as the Roosevelt Wild-Life Forest Experimental Station. The principal object will be to study the habits, life histories, methods of propagation, and management of fish, birds, game, and food and fur-bearing animals and forest wild life. No State appropriation has been made for the station, but a beginning is to be made at once with college funds. Charles C. Adams has been appointed director.

Necrology.—Jean Jacques Théophile Schlœsing, dean of the Institute of France, member of the French Academy of Sciences, professor in the National Agronomic Institute of France and the Conservatoire des Arts et Métiers, and one of the most eminent men of science of the last half of the nineteenth century, died at Paris February 8, 1919, at the age of 94 years, having been born at Marseille July 9, 1824.

His was a long life of intense and fruitful scientific activity of great value in advancing agriculture. In some of his most important work his name is inseparably connected with that of Müntz, whose death at the age of 72 years occurred February 20, 1917. One of his earliest and most important contributions to scientific agriculture was a study of nicotin and its determination in tobacco, which later led to a study of the composition and burning quality of different kinds of tobacco. Among his early scientific achievements was a study of chemical equilibrium, which furnished an explanation of the constancy of the proportion of carbon dioxid in air.

Schlœsing's name is connected with a long series of most important investigations relating to soils. In association with Müntz he established the true nature of nitrification in 1877, defined the conditions favoring this process, and isolated the specific organism concerned. He also cleared up many of the problems related to denitrification and made important contributions to the knowledge of the organic matter of the soil, the nature and function of clay, and the nature of the soil solution and its function in supplying plants with food. In connection with a broader study of sea water and other salines he investigated the subject of the water of salt marshes.

He personally devised many analytical methods of great accuracy, involving entirely new technic, which are widely used, and did much to promote not only agricultural chemistry but organic and mineral chemistry in general. He had the reputation of being an inspiring teacher, clear, precise, authoritative; personally extremely modest, benevolent, careful in reaching conclusions, firm in maintaining his convictions, but considerate of the opinions of others.

The more important of his scientific contributions appeared in *Annales de Chimie et de Physique* and *Comptes Rendus de l'Académie des Sciences.* His work on soils and air, with methods of analysis, is summarized under the title Contribution à l'Étude de la Chimie Agricole in Fremy's Encyclopédie Chimique.

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EXPERIMENT STATION RECORD.

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[1] On leave of absence for military service.

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AGRICULTURAL BOTANY.

FIELD CROPS.

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EXPERIMENT STATION RECORD.

VOL. 40. ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Recent advances in physical and inorganic chemistry, A. W. STEWART (*London and New York: Longmans, Green & Co., 1919, 3. ed., rev., pp. XV+284, figs. 23*).—In the third edition of this book, which consists of a series of essays upon recent advances in special branches of inorganic chemistry, the subject matter has been greatly enlarged and almost entirely rewritten. The book contains eight chapters dealing with subjects from pure and applied inorganic chemistry, six on physico-chemical subjects, four on radioactivity, a chapter on some new views on the elements, and a concluding chapter indicating fields of research in which much still remains to be investigated. The chapter on the fixation of nitrogen should be of particular interest to the agricultural chemist.

Osmotic pressure, A. FINDLAY (*London and New York: Longmans, Green & Co., 1919, 2. ed., pp. XI+116, figs. 10*).—The first edition of this book has been noted previously (E. S. R., 30, p. 310). In the present edition, the work on osmotic pressure has been brought up to date and a fuller description has been given of the apparatus employed by Morse and his collaborators.

The preparation of substances important in agriculture, C. A. PETERS (*New York: John Wiley & Sons, Inc., 1919, 3. ed., pp. VII+81*).—In this manual the chemistry and practical significance of certain substances of agricultural interest are explained and laboratory directions are given for their preparation. The following substances are treated: Superphosphate, sulphate of ammonia, potassium nitrate, sulphate of potash-magnesia, sulphate of potash (high grade), muriate of potash, lead nitrate, lead arsenate, lime-sulphur, copper sulphate, Paris green, Bordeaux mixture, and emulsions.

The stabilization of bleaching powder, A. N. MELDRUM (*Jour. Soc. Chem. Indus., 38 (1919), No. 6, p. 80T*).—Preliminary experiments on the stabilization of bleaching powder by removal of water are reported.

It was found that bleaching powder was more rapidly dried by alkaline agents (sodium hydroxid and basic calcium chlorid) than by acid agents (phosphorus pentoxid and sulphuric acid). Phosphorus pentoxid, however, proved to be a more effective drying agent than sodium hydroxid if an absorbent for chlorin was present. The absorbent used was a mixture of mercurous chlorid and mercury.

The tendency of bleaching powder to lose available chlorin was found to be much decreased by desiccation, as shown by the fact that samples thus dried contained over 25 per cent of available chlorin after a year.

Some studies of casein, L. A. Maynard (*Jour. Phys. Chem., 23 (1919), No. 3, pp. 145-153*).—Casein prepared from skim milk according to the method described by Osborne and Guest (E. S. R., 25, p. 504) was digested with 1 per cent sodium hydroxid solution for 24 hours at room temperature. During the digestion the phosphorus of the casein molecule was split off and changed to a soluble inorganic form, and the loosely combined sulphur was also split off. On addition of acids to the caustic soda digest, a white precipitate was obtained which exhibited colloidal properties similar to casein as regards its behavior with acids and alkalis, its response to protein tests, and its precipitation by salt solutions. A limewater solution of the substance showed none of the characteristic properties of a similar solution of casein, but when phosphoric acid was introduced into the former in such a way as not to destroy the colloidal solution a milky solution was obtained which on heating behaved like a limewater solution of casein. This is thought to furnish evidence that the white color of milk is due to the peptization of tricalcium phosphate by the colloids in the milk.

Action of neutral salts on the inversion of sugar by acids, H. Colin and M. Lebert (*Bul. Assoc. Chim. Sucr. et Distill., 35 (1918), No. 7-9, pp. 14-17*).—The inversion of sugar with small amounts of acid in the presence of neutral salts was found to depend upon the following conditions:

(1) If the hydrolysis is brought about by a strong acid in the presence of the corresponding salt of an alkali metal (i. e., HCl in the presence of NaCl), an amount of the salt equivalent to the acid produces a slight increase in the speed of hydrolysis. (2) With a weak acid the presence of its sodium or potassium salt lowers the speed of hydrolysis in proportion to the weakness of the acid, the action of acetic acid being almost completely paralyzed by an equivalent amount of sodium acetate. (3) If the salt present in the solution is not a salt of the acid causing the hydrolysis (i. e., sodium acetate with HCl), the effect produced depends upon the relations established between acid and salt.

The results seem to indicate that any cause which tends to lower the H-ion concentration of the solution diminishes the velocity of hydrolysis by acids, for which reason invertin is recommended in preference to acids for the hydrolysis of weak solutions of sucrose.

The manufacture of invert sugar and use of sugar substitutes in ice cream, H. A. Ruehe (*Cream. and Milk Plant Co., 8 (1919), No. 2, pp. 45-48*).—The author states that a solution of invert sugar of such strength that it can be used to replace sugar pound for pound in ice cream formulas can be made by boiling gently for 30 or 35 minutes a mixture of 100 lbs. of sugar, 45 lbs. of water, and 50 gm. of tartaric acid. This solution contains about 71.4 per cent of sugar and 28.6 per cent of water. The formula has been tried out by several ice cream manufacturers who claim an actual saving of from 20 to 25 per cent of sugar.

From laboratory tests of the viscosity of the mix, percentage swell on freezing, and sweetness of the product, the use of invert sugar thus prepared did not appear to alter the quality of the ice cream. The substitution of corn sugar for from 20 to 50 per cent of the invert sugar was found to be practicable, but glucose proved to be less satisfactory on account of the lessened sweetness and coarser grain of the product.

Remade milk and cream, H. W. Redfield (*Washington: Internat. Assoc. Dairy and Milk Insp., 1919, p. 32, pl. 1*).—This is a lecture given by the author, from the Bureau of Chemistry, U. S. Department of Agriculture, before a special conference of the International Association of Dairy and Milk Inspectors in New York City, April 26, 1919. The terms "remade milk and cream" are defined as the "products resulting when skim milk powder or unsweetened condensed milk, sterilized or superheated, are mixed with unsalted butter or with heavy cream, fresh or frozen, and with water, either by means of some crude device such as a bakers' whip or by means of the emulsifier, viscolizer, or homogenizer; or when whole milk powder, preferably made from homogenized milk, is mixed with water by means of such a device as a baker's whip or in a mixing tank equipped with a revolving propeller or paddle."

The advantages claimed by the manufacturers for the use of these products are stated, the report of Coutts and others, on dried milk powder (E. S. R., 40, p. 379) is summarized and discussed, and four methods developed at the Bureau of Chemistry which are said to differentiate quantitatively the natural and remade products are outlined. One of these methods depends upon the migration or transference of the protein molecules under the influence of the electric current; the second, upon the relation of the viscosity to the total solids and solids-not-fat; the third, upon the amount of fat left in the skim milk after centrifuging; and the fourth, upon nephelometric readings on the sterilized remade product after inoculation with peptonizing bacteria and incubation.

In conclusion the author indicates methods which should be adopted for controlling these products.

Chemical constants of avocado oil, F. W. Albro (*Ann. Rpt. Cal. Avocado Assoc., 1917, pp. 92, 93*).—Avocado oil was obtained from fresh pulp by extraction with petroleum ether and from dried pulp by extraction with low-boiling gasoline, filtration through animal charcoal, removal of the solvent by means of carbon dioxid, and decantation after cooling to 5° C. The chemical constants of the latter oil were as follows:

Iodin number 85 to 88, Hehner number 92.5, acid value (free oleic acid) 4 to 6, Maumené number 65, specific temperature number 156 to 157, average molecular weight of fatty acids 282.2, saponification number 177 to 178, Reichert-Meissl number 3.8 to 4, Polenske number 0, acetyl value (real) 11.3, refractive index of oil at 15.6° 1.47, refractive index of fatty acids at 40° 1.454, and oleic acid 80.85 per cent. Similar results were obtained in the determination of some of the constants of the oil from fresh pulp, the most marked difference being a higher acid value as free oleic acid (8 to 12).

Oil from Mgongo nuts (*So. African Jour. Indus., 1 (1918), No. 14, pp. 1285, 1286*).—Mgongo nuts grow principally in the Livingstone District of northern Rhodesia, and are said to be identical with the Manketti nuts of southwest Africa. From analyses of two samples of these nuts at the Imperial Institute, it was found that the true kernels with the seed removed yielded 58.1 per cent of oil. The possibility of utilizng the nuts as a commercial source of oil depends primarily on the practicability of extracting the seeds from the tough and extremely hard outer shell. Whether this could be successfully done on a commercial scale seems, in the opinion of the Institute, doubtful.

Contribution to the study of the oils and press cake obtained from the seeds of raisins, currants, and tomatoes, Rothéa (*Bul. Sci. Pharmacol., 26 (1919), No. 3, pp. 105–110*).—This article contains data on the moisture and fat content of the seeds of raisins, currants, tomatoes, oranges, and melons; analytical constants of the pressed oils; and proximate analyses of the resulting press cakes.

The oils are said to be of an agreeable odor and flavor with the exception of currant seed oil which, on account of the presence in the seeds of a lipodiastase, has too high an acid content to be edible. The press cakes from raisins, currants, and tomatoes are said to constitute an excellent feeding stuff for live stock.

Technical handbook of oils, fats, and waxes, P. J. FRYER and F. E. WESTON (*Cambridge, Eng.: Univ. Press, 1918, vol. 1, 2. ed., pp. X+280, pls. 42, figs. 33*).—This is the second edition of the volume previously noted (E. S. R., 39, p. 8).

Technical handbook of oils, fats, and waxes, P. J. FRYER and F. E. WESTON (*Cambridge, Eng.: Univ. Press, 1918, vol. 2, pp. XVI+314, pl. 1, figs. 69*).—This companion volume to the one noted above deals with the practical examination and analysis of the natural and hydrocarbon oils, fats, and waxes. After preliminary sections on an introduction to practical work for technical students and directions for sampling and preliminary tests, the subject matter is presented in the following sections: Practical methods for the standard analytical determinations; specific tests for oils, fats, and waxes; identification and determination of fatty acids and alcohols (including glycerin); testing and analysis of hydrocarbon oils and waxes; testing and analysis of rosin and turpentine; interpretation of results; and a scheme for the identification of an oil, fat, or wax. A supplementary section contains the necessary tables for use in the determinations described, and appendixes in which are described the turbidity test for oils and fats, previously noted from another source (E. S. R., 39, p. 110), and two methods for the determination of the small amounts of glycerin in hard soaps and in soft soaps made from fatty acids.

The more important operations are illustrated by means of photographs showing the methods of working and details of the apparatus.

Pectin studies, I–II, S. ODÉN (*Internat. Ztschr. Phys. Chem. Biol., 3 (1917), No. 2, pp. 71–93, fig. 1; abs. in Chem. Abs., 11 (1917), No. 21, p. 2923*).—Two papers are presented:

I. *Pectin substances as acids* (pp. 71–82).—By means of a method depending upon slight changes in electrical conductivity which occur on the addition of a small amount of ammonium hydroxid to an aqueous suspension of plant tissues previously freed from electrolytes by centrifugalization, the author has demonstrated the presence in plants of nearly insoluble acid substances which on treatment of these ammonium salts with dilute acids yield gelatinous substances of the nature of pectin. These pectin substances, in addition to acting as the binding material of the plant tissues, are considered to constitute a means for regulating the content of H- and OH-ions in the circulating fluids in the tissues and maintaining the cell contents in a slightly acid condition.

II. *Algic and fucic acids* (pp. 83–93).—Algic and fucic acids treated by the method noted above were shown to be true acids. From its elementary analysis, molecular weight, and properties, fucic acid is considered to be a dipentose-dicarboxylic acid.

A study of the cyanogenesis in Sorghum vulgare, C. T. DOWELL (*Oklahoma Sta. Bul. 122 (1919), pp. 8; Jour. Agr. Research [U. S.], 16 (1919), No. 7, pp. 175–181*).—The results are reported of an investigation of cyanogenesis in dry and fresh sorghum under various conditions. The method employed for determining the hydrocyanic acid was a modification of that used by Viehoever and Johns (E. S. R., 34, p. 11) and that of Knight (E. S. R., 33, p. 15), the sorghum being digested with water distilled into sodium hydroxid, the distillate evaporated on an electric hot plate, and the hydrocyanic acid converted into Prussian blue and determined gravimetrically.

Drying of the sorghum was found to remove approximately three-fourths of the hydrocyanic acid, the rapidity of drying determining the percentage of acid retained by the sorghum. This is considered of importance on account of the fact that in dry seasons the sorghum is often cut after it has been partially dried while standing. Under such conditions a large percentage of the hydrocyanic acid would be retained in the fodder.

Contrary to the results of Avery and Peters (E. S. R., 14, p. 921), the enzyms of the sorghum were apparently not rendered inactive in the process of curing, as shown by the fact that the addition of emulsin to the cured sorghum did not cause the hydrocyanic acid to be liberated in larger quantities.

The addition of dextrose and of maltose even in small amounts appeared to retard or prevent the liberation of about three-fourths of the hydrocyanic acid. It is assumed that this retention is due either to a reaction between the sugars and the hydrocyanic acid or to a lessening of the activity of the enzym. The suggestion is made that in case there is any doubt about the poisonous nature of the sorghum, a concentrate should be fed first in order to produce a considerable quantity of dextrose and maltose which would tend to prevent liberation of the hydrocyanic acid of the sorghum.

No evidence was obtained that a part of the hydrocyanic acid exists in a nonglucosidic form as claimed by Willaman (E. S. R., 37, p. 113).

Determinations of the acid concentrations of the green and dry sorghum indicate that a slightly acid condition would exist in the paunch of ruminants fed upon sorghum and that this acidity would be favorable to the action of the enzyms causing hydrolysis of the glucosid with liberation of hydrocyanic acid.

New methods of preserving soy bean urease, G. M. Robinson and C. J. Oppenheim (*Jour. Lab. and Clin. Med., 4 (1919), No. 7, pp. 448, 449*).—Camphor in 0.25 per cent suspension was found to preserve the activity of the soy bean urease for at least 45 days, a much longer period than that of toluol or other preservatives. A permanent wet preparation of the enzym can be made by triturating 20 gm. of powdered soy bean with 100 cc. of pure glycerol, percolating the mixture through a layer of glass wool of approximately 1 in. thickness for not less than 48 hours, and titrating the extract for innate alkalinity. The extract thus prepared is said to be more active than aqueous extracts of the enzym, especially when activated at 35° C.

Mass cultures on solid media, J. Schereschewsky (*Berlin. Klin. Wchnschr., 55 (1918), No. 41, pp. 972–974, figs. 2*).—An apparatus for rapid filling and inoculation of agar plates is described, which consists essentially of a cylindrical glass vessel with outlets at the top and bottom and in which is placed a tier of 12 glass dishes, similar to the ordinary Petri dish but with inward sloping sides so that each rests securely on the dish below. In the bottom of each dish is an opening of from 1.5 to 2 cm. diameter, the dishes being so arranged that the openings of consecutive dishes are on opposite sides. After sterilization the hot agar is admitted through the opening at the top of the cylinder and passes through the holes in each dish to the bottom, forming on cooling a thin layer of the medium in each dish. The inoculation is made by admitting in a similar manner a suspension of the organism in physiological salt solution, a slight rotation of the cylinder being sufficient to cover the media uniformly with the suspension. The usual procedure of incubation, etc., is then followed.

Notes on the reactions of bacteriologic media, J. F. Norton (*Amer. Jour. Pub. Health, 9 (1919), No. 3, pp. 190–193*).—Data are presented on the relation between the titratable acidity, using phenolphthalein as an indicator, and the hydrogen-ion concentration. This relation is considered to depend entirely upon the ingredients of the medium. Sterilization effected an appreciable change in the reaction of neutral and alkaline media and but little change in acid media.

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The author considers the method of Barnett and Chapman, previously noted (E. S R., 39, p. 9), satisfactory for the determination of the hydrogen-ion concentration of media in routine laboratory work, but suggests slight modifications, including the use of a 0.04 per cent solution of brom thymol blue as an indicator.

A mechanical pipette for easy measurement of small volumes, H. C. Bazett (*Jour. Physiol., 52 (1919), No. 5, pp. LXI, LXII, figs. 2*).—A pipette devised for the rapid and accurate measurement of amounts of fluid as small as 0.05 cc. is described and illustrated.

The pipette is made by heating a fine bore, thick-walled glass tube to form two constrictions of capillary bore. One of these constrictions is plugged with a small wad of cotton wool, and mercury is drawn up to fill the space between the constrictions. The mercury is discharged into a watch glass, 0.05 cc. (or the volume to which the tube is to be adapted) is deducted, and the remainder is again drawn up into the tube. The other capillary end is then plugged with cotton, the mercury forming a valve which prevents the entrance into the tube of a larger volume of liquid than that of the mercury discarded.

It is necessary in actual practice to standardize each pipette. With proper precautions the errors are said to be less than +0.25 per cent.

Protection against drip water in an extraction apparatus, F. Liebert (*Chem. Weekbl., 16 (1919), No. 3, p. 74*).—To prevent water that collects on the outside of the condenser from dripping on the extraction flask, it is recommended that the lower part of the condenser be covered with a paste made from shredded filter paper, powdered calcium carbonate, and a solution of calcium hydroxid. After hardening, this paste will absorb the water that tends to collect on the surface.

Picramic acid as a standard in colorimetric determination of nitrogen by Nessler's method, G. Egerer and F. Ford (*Jour. Lab. and Clin. Med., 4 (1919), No. 7, pp. 439–442*).—The disadvantages of Nessler's reagent as a standard in the colorimetric determination of nitrogen by Nessler's method are pointed out, and the suggestion is made that for clinical work the blood sugar standard, picramic acid, be used in place of Nessler's reagent. It is said that all color comparisons in which Nessler's test can be used can be made as readily by picramic acid, the color of which is practically permanent.

A process of purifying picric acid is described, and attention is called to the modified method for the preparation of picramic acid previously noted (E. S. R., 40, p. 203).

A scrubber for ammonia distillations, B. S. Davisson (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 465, 466, figs. 2*).—This contribution from the Ohio Experiment Station describes in detail the scrubber which is one of the features of the all-glass nitrogen apparatus described by Allen and Davisson (E. S. R., 40, p. 609).

The device consists of a 200 cc. bulb of Pyrex glass, the inlet tube of which is provided with a small bulb having three openings in the same horizontal plane. The first steam which passes into the scrubber condenses on the surface of the large bulb and flows down about the small bulb, acting there as a scrubbing solution for the remaining vapors. Diagrams are given of the device and of a special adapter provided with a small perforated bulb, which is said to insure better scrubbing of the steam than is accomplished with a straight tube.

Recovery of platinum and alcohol from the potash determination, A. E. Smoll (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, pp. 466, 467*).—The method involves first a distillation of the alcoholic washings, with resulting reduction of the platinum to platinum black. The distillate is freed from acetaldehyde by distillation with a reflux condenser, the temperature being so regulated that the acetaldehyde passes out through the top of the reflux condenser into a delivery tube connected with a coil condenser and the alcohol drops back into the distilling flask. A few pieces of sodium hydroxid are then added to the distilling flask and the alcohol distilled until a specific gravity of 0.8645 is obtained.

A sensitive copper reaction.—Application to the analysis of ash and of arable soils, L. Maquenne and E. Demoussy (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 10, pp. 489–492*).—A method of determining minute amounts of copper is described, the technique of which as applied to the analysis of the ash of grains and of soils is as follows:

The material is ashed in a quartz crucible in the presence of a few drops of nitric acid and a slight excess of sulphuric acid. From 0.05 to 0.2 gm. of the ash is mixed with 1.5 cc. of 5 per cent sulphuric acid, and kept at boiling temperature for 20 minutes to transform the pyrophosphates to orthophosphates. It is then washed into a small tube, centrifuged to separate the particles of silica and calcium sulphate remaining in suspension, and the liquid, the volume of which should be about 2.5 cc., subjected to electrolysis. After 12 hours the cathode is washed with 8 drops of hot nitric acid and a little water, and the solution is evaporated, ashed, taken up with 3 drops of hydrochloric acid, and washed into a tube. The total volume of liquid at this point should not exceed 2 cc. To the solution are added 2 drops of a 1.104 per cent solution of zinc sulphate and 1 drop of a freshly prepared 10 per cent solution of potassium ferrocyanid. If the copper is abundant, there appears immediately a rose color, which changes to blue on shaking the tube. If less than 0.00001 gm. of copper is present, the blue color appears only at the end of several minutes.

The necessity is pointed out of using quartz or porcelain crucibles instead of platinum and of running blanks to prove the absence of copper in the reagents employed.

The content of copper in various seeds as wheat, corn, peas, beans, etc., has been found by this method to be between 3 and 8 mg. per kilogram, and that of certain arable soils from 2 to 30 mg. per kilogram, which allows the determination to be conducted on as small an amount as 5 gm. of the soil.

Estimation of the water content of meat products and sausages, E. Seel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 11, pp. 393–411*).—The author discusses the use of Feder's proportionate number (the ratio of the estimated water to organic material not fat) as a means of estimating the water content of meats, and states that it can be used to determine the amount of water in minced meat or in sausages which are made from lean meat without the addition of fat or other kinds of meat.

Judging buttermilk porridge, J. D. Filippo (*Chem. Weekbl., 16 (1919), No. 2, pp. 41–44*).—The author describes a buttermilk porridge which has recently come into use in Holland, and outlines a method to detect adulteration or the use of buttermilk of doubtful composition.

The porridge is made by treating oats or wheat with warm water or steam to the required consistency and then warming with buttermilk. According to the Codex Alimentarius 1 liter of the porridge should contain no less of the constituents of buttermilk than are found in 0.8 liter of true buttermilk.

The constants considered of greatest value are the amount of casein and the rotatory power, methods of determining which are described. The standard porridge should contain not less than 1.8 per cent casein and have a specific rotatory power of not less than 2.7 per cent.

The determination of the content in oil of oleaginous seeds, R. Biazzo (*Ann. Chim. Appl. [Rome], 10 (1918), No. 9–12, pp. 130–133*).—The author discusses the extraction of oil from seeds, and outlines necessary precautions to be taken to insure accurate results.

A method for the purification of certain azo dyes, H. A. Lubs (*Jour. Indus. and Engin. Chem., 11 (1919), No. 5, p. 456*).—The method consists essentially in precipitating the dye from a hot aqueous solution by solid sodium acetate and purifying it by repeated digestion with hot alcohol. The method is said to remove both inorganic and organic impurities usually present in commercial azo dyes, and to be of particular value if the compound is to be used for pharmacological purposes.

Practical industry of preserving food, N. F. Oliván (*Industria Práctica de las Conservas Alimenticias. Barcelona, Spain: Libr. Domingo Ribó, 1917, pp. 184, figs. 31*).—This book contains a preliminary section devoted to a theoretical discussion of the problems of food preservation and a description of machinery required in the food preservation industry. This is followed by a detailed description of methods employed for the conservation of meats, fruits, vegetables, etc., by heat, refrigeration, and desiccation.

Muscadine grape paste, C. Dearing (*U. S. Dept. Agr., Farmers' Bul. 1033 (1919), pp. 13*).—This publication gives general directions for making paste from muscadine grapes (E. S. R., 38, p. 114). Suggestions are given as to the variety of fruit to use, the methods of obtaining pulp, the different sweetening agents that may be used, and the cooking, drying, cutting, and storing of the product. Variation in products obtainable by the use of paste from different varieties of grapes and by combining the paste with fruits, nuts, etc., are described.

Cholam (A. sorghum) as a substitute for barley in malting operations, B. Viswanath, T. Lakshmana Row, and P. A. Raghunathaswami Ayyangar (*Mem. Dept. Agr. India, Chem. Ser., 5 (1919), No. 4, pp. 117–129*).—This paper deals with investigations conducted with the object of finding a satisfactory substitute for barley from among the common South Indian cereals. After a preliminary examination of the malting capacities of paddy (*Oryza sativa*), cholam (*Andropogon sorghum*), ragi (*Eleusine coracana*), tenai (*Setaria italica*), maize (*Zea mays*), and cumbu (*Pennisetum typhoideum*) cholam was selected as the most suitable grain for malting, and barley and cholam malts prepared under like conditions were compared as to percentage of soluble matter, acidity, and diastatic activity.

The results of the first two determinations showed the cholam malt to be sound in the technical sense. It was found to be more active diastatically than barley malt according to the iodin test, but less active as determined by the copper reduction method. This apparent discrepancy was shown to be due to the fact that in the hydrolysis of starch by the cholam malt the proportion of dextrin to glucose is greater than in the case of barley malt.

The authors conclude that cholam, which is much cheaper and more available in India than barley, may be used wholly or partially as a substitute for barley in malting operations.

How to make cider and vinegar, C. I. Lewis (*Oreg. Countryman, 11 (1918), No. 1, pp. 16–18*).—The fundamentals of good vinegar manufacture are discussed, and the causes of common failures are pointed out.

METEOROLOGY.

Rainy days and rain probability in the United States, R. DeC. Ward (*Geogr. Rev., 7 (1919), No. 1, pp. 44–48, figs. 2*).—The subject is discussed with the aid of two maps, showing (1) the average annual number of rainy days in the United States, and (2) the mean annual probability of rainy days in the United States.

Briefly summarizing, the author states that "the ninety-fifth meridian divides the country into two halves, over the eastern of which the average number of rainy days exceeds 100 a year, while over the western, with certain exceptions, rain falls on less than 100 days. From the ninety-fifth meridian eastward there is an increase in the number of rainy days toward the Atlantic Ocean and especially toward the Great Lakes (maximum of 170). From the ninety-fifth meridian westward there is a general decrease except on the north Pacific coast, where there is a maximum of 180 rainy days. . . .

"The extreme northwestern coast and the Great Lakes have the greatest probability of rain. Both of them are regions of marked cyclonic activity. One day in every two days is likely to be rainy on the coast of Washington. East of the Great Plains the probability of rain is more than 20 per cent. Over much of this area, especially toward the coast and the Great Lakes, it is over 30 per cent, and more than 35 per cent of all the days of the year are likely to be rainy over a considerable portion of the Great Lakes region and on the New England coast. The central Appalachians have a slightly higher rain probability than the surrounding lowlands, while to leeward, chiefly in Virginia, there is a small area under 30 per cent.

"With decreased cyclonic control and less favorable rainfall conditions, most of the vast area west of the one hundredth meridian and east of the Pacific slope mountains has less than 20 per cent, the rain probability being somewhat greater over the Rocky Mountains and decreasing to less than 5 per cent in the arid Southwest. It is seen that the New England coast and much of the Great Lakes area have more than seven times as many rainy days as southwestern Arizona; that the eastern margin of the Great Plains has half, or less than half, as many as the Oregon coast; that the southern California coast has the same rain probability as extreme southeastern Texas.

"The seasons of greatest and of least probability of rain may easily be inferred from a knowledge of the seasonal distribution of rainfall in various sections of the country. The marked cyclonic activity of the colder months readily suggests that winter will bring the greatest probability of rain on the Pacific coast, over much of the western plateau area, and in considerable sections in the East, heading up toward the Great Lakes. Late spring and early summer bring the greatest probability over most of the Great Plains and eastward to the Mississippi Valley. The southern Atlantic and the Gulf coast, as well as the southwestern interior, have their greatest probability in middle or late summer and early autumn. About one-half of the United States has the greatest probability of rain in the warmer months. Summer, which is the 'dry season,' brings the minimum rain probability on the Pacific coast and over most of the plateau region. East of the Rocky Mountains autumn is the dominant season of minimum probability."

Ammonia and nitrous nitrogen in the rain water of southwestern Alaska, J. W. SHIPLEY (*Ohio Jour. Sci., 19 (1919), No. 4, pp. 230–234*).—Examinations of rainfall collected at different times from August 19 to September 15, 1917, showed the almost entire absence of ammonia in the rainfall of southwestern Alaska. Nitrous nitrogen was found in every case except one.

The nitrogen compounds in rain and snow, F. T. SHUTT and R. L. DORRANCE (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 11 (1917), Sect. III, pp. 63–72; abs. in Sci. Abs., Sect. A.—Phys., 22 (1919), No. 254, pp. 59, 60; Jour. Chem. Soc. [London], 116 (1919), No. 676, I, p. 116*).—Continuing previous observations

(E. S. R., 38, p. 619), "the paper summarizes the results of 10 years' work on the nitrogen compounds brought to the earth by rain and snow at a station near Ottawa. A total of 65.8 lbs. of nitrogen per acre was furnished in this way in the 10 years, made up of 34.1 lbs. in the form of free ammonia, 10.1 lbs. of albuminoid ammonia, and 21.6 lbs. of nitrates and nitrites. The rain was caught in a tray 60 in. by 30 in. Every separate fall of rain of more than 0.01 in. was analyzed, while in the case of continuous precipitation measurements were made twice a day. During a period of severe drought where bush fires were prevalent in the neighborhood the scanty rain was particularly rich in free ammonia. Rain was found on the average to be approximately twice as rich as snow in nitrogen compounds, but the individual samples showed more variability with rain than with snow."

The yearly course of the relation between precipitation, run-off, evaporation, and drainage in the continental climate of middle Europe, K. Fisher (*Naturw. Wchnschr., 33 (1918), No. 19, pp. 265–276, figs. 5*).—Observations in various parts of Germany and in England on different kinds of soil and with different kinds of plant cover and crops are reviewed. The controlling influence of transpiration and direct evaporation in reducing run-off and drying out the soil is brought out.

Normal mean value of rainfall in Italy, F. Eredia (*Reprinted from Gior. Gen. Civ., 56 (1918); abs. in Nature [London], 102 (1919), No. 2573, pp. 495, 496*).—"The mean values for each calendar month are shown for nine well distributed cities on the basis of the 50-year period 1866–1915; and it is calculated that the values are correct to within 5 mm. for the rainier winter months and 9 mm. to 12 mm. for the summer months of smaller rainfall and more irregular distribution.

"In northern or continental Italy, as exemplified by Milan and Turin, the seasonal variation of rainfall is not prominent, but the wettest periods are early summer and autumn, the highest figures being for May and October. In peninsular Italy the typical Mediterranean feature of wet winters and dry summers is conspicuous, especially in the extreme south."

The influence of rainfall on the fruit crop in Norway, O. M. Skard (*Tidsskr. Norske Landbr., 25 (1918), No. 8, pp. 305–332, figs. 7; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 9 (1918), No. 12, pp. 1405–1407*).—Reviewing the results of studies on the relationship between rainfall and yield of fruit at a number of localities in Norway, the author concludes that there is a direct relation between yield and the rainfall from March to June of the previous year and that there is an inverse relation between yield and rainfall of September and October of the previous year. An insufficient amount of moisture during the preceding spring period is fatal to the plant. It is also necessary that the second half of the preceding summer and early autumn should be dry and warm to mature properly the spring wood, fruit, and fruit buds and to store the necessary reserve material for growth the following spring.

Report on meteorological observations at Wisley, 1917, R. H. Curtis (*Jour. Roy. Hort. Soc., 43 (1919), No. 2–3, pp. 316–330, figs. 4*).—This is the fourteenth annual report on observations on temperature, precipitation, humidity, and winds at this place. The weather of each month is discussed with especial reference to its effect on horticultural crops.

"To the horticulturist the outstanding feature of the weather of 1917 was the unusual intensity and persistence of the cold which prevailed throughout the first four months of the year, and also during the closing four weeks." The chief climatological features of the year of immediate interest to horticulturists are indicated in four diagrams showing (1) departure of temperature and rainfall from the average for each month of the year, (2) the mean temperature of the air and of the soil at depths of 1 ft. and 4 ft. during each month, (3) the relative frequency of winds from different directions, and (4) relation between mean temperature of the air and its average daily variations, as well as the mean temperature of the ground surface where it is covered with short grass.

Phenological observations on cereals in Bavaria in 1917, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 16 (1918), Nos. 3–4, pp. 34–48; 5–6, pp. 54–69; 7–8, pp. 83–90*).—Observations at a large number of places of varying elevation and other conditions on dates of blooming and ripening are recorded, particularly for rye and to a limited extent for winter wheat and summer barley. The relation of the date of blooming to that of ripening is worked out for different districts of Bavaria.

Annual rainfall and mean temperature [of Ceylon], C. DRIEBERG (*Ceylon Agr. Soc. Year Book, 1919–20, p. 2*).—Observations at 27 places varying in altitude from sea level to 6,188 ft. are summarized. According to these observations the mean annual temperature of the island varies from 59.1° F. (at the greatest elevation) to 82.8°, the rainfall from 38.05 to 199.3 in. (Nawalapitiya), and rainy days from 66 to 232.

The ice-age question solved, R. A. MARRIOTT (*Sci. Prog. [London], 13 (1919), No. 52, pp. 586–604, figs. 3*).—This is an explanation of Drayson's theory (E. S. R., 32, p. 417) and a statement of the evidence and arguments in its favor, especially from the geological standpoint.

SOILS—FERTILIZERS.

A field study of the influence of organic matter upon the water-holding capacity of a silt loam soil, F. J. ALWAY and J. R. NELLER (*Jour. Agr. Research [U. S.], 16 (1919), No. 10, pp. 263–278, pl. 1, figs. 2*).—This paper, a contribution from the Minnesota Experiment Station, "reports a detailed study of the moisture conditions found on two adjacent Minnesota plats, both of which had a silt loam soil, very uniform in texture, but differing widely in content of organic matter as the result of great differences in cultural treatment.

"During the cool, wet summer of 1915, when cultivated crops were grown, the surface foot, and this alone, showed a very marked difference in the moisture content, especially in the available portion, the soil the richer in organic matter retaining the more water; but in the warmer and somewhat drier summer of 1918, when winter rye was used, much smaller differences were found.

"It is concluded that in the case of a finer-textured soil, with a fine-textured subsoil and a comparatively level surface, the differences in the water capacity that may be caused by differences in manuring or in cultural operations exert but little influence upon the productivity."

A list of 12 references to literature cited is given.

Nitrate and nitrite formation in moor soils, T. ARND (*Zentbl. Agr. Chem., 47 (1918), No. 10–11, pp. 291–294; abs. in Chem. Abs. 13 (1919), No. 5, pp. 489, 490*).—Contrary to the opinion expressed by Ritter (E. S. R., 30, p. 325) that nitrate formation may occur in peat soils through chemical changes without the presence of nitrifying organisms, the author states that none of the uninoculated soils examined by him showed any nitrite or nitrate formation, regardless of whether or not calcium oxid, a nutritive ammoniacal or ammonium sulphate solution, or mercuric chlorid were added. Upland moor soils were examined for ammonia, nitrites, and nitrates, then air dried at ordinary temperatures and reexamined. With the exception of one sample which contained traces of nitrate, these soils were found to be entirely free from both nitrites and nitrates. Nitrification in peat soils is believed to be exclusively a biological process.

The reactions of the soils supporting the growth of certain native orchids, E. T. Wherry (*Jour. Wash. Acad. Sci., 8 (1918), No. 18, pp. 589–598; abs. in Chem. Abs., 13 (1919), No. 1, pp. 50, 51*).—About 200 samples of soil supporting the growth of all of the commoner species of orchids native to the east-central States were studied with reference to acidity by a modification of the hydrogen-ion concentration method, using indicators of different degrees of acidity.

It was found that while there was considerable difference in the acidity of soils supporting different species of orchids, "in every case the acidity of the soils supporting each of these species varies within comparatively narrow limits." The fungus living symbiotically on the roots of each species appears to be less tolerant of changes in acidity than in moisture, for a given species of orchid may be found in habitats varying widely in wetness.

The observations reported indicate that the growth of the tall Cypripediums would be favored by the addition of a little powdered limestone to the soil. "On the other hand most species require the soil to be made distinctly or even strongly acid."

Solubility of lime, magnesia, and potash in such minerals as epidote, chrysolite, and muscovite, especially in regard to soil relationships, R. F. Gardiner (*Jour. Agr. Research* [*U. S.*], *16 (1919), No. 10, pp. 259–261*).—In this article, a contribution from the Bureau of Soils of the U. S. Department of Agriculture, experiments are reported in which epidote, chrysolite, and muscovite, ground to pass a sieve of 100 meshes to the inch, were kept in contact for two months with a water extract of an acid soil at a temperature of 25° C. (77° F.) The amount of soil extract in each case was 25 cc., and the amounts of ground minerals varied from 0.1 to 1 gm. of epidote and chrysolite and from 0.1 to 0.4 gm. of muscovite.

It was found that more potash was removed from muscovite than lime from epidote or magnesia from chrysolite, and that on the whole more lime was extracted from epidote than magnesia from chrysolite. On the average 0.27 per cent of lime was dissolved from epidote and 0.17 per cent of magnesia from chrysolite.

"The removal of such proportionally large amounts of lime and potash from silicates by an acid soil extract would seem to indicate that in time a soil's fertility index, with respect to lime and potash, would under proper conditions of acidity be quite appreciably lowered."

The nitrogen content of volcanic ash in the Katmai eruption of 1912, J. W. Shipley (*Ohio Jour. Sci., 19 (1919), No. 4, pp. 213–223, figs. 3*).—A study of the nitrogen content of volcanic ash from various places in the area devastated by the eruption of Katmai in 1912 shows that the amount of nitrogen present is so small as to preclude the possibility of vegetation securing its nitrogen supply from decomposition of the volcanic detritus. The total nitrogen found was less than one part per hundred thousand. It was observed that although the soil is almost devoid of nitrogenous compounds, lupines thrive and produce seed in abundance.

The water soluble salt content, the ferrous iron content, and the acidity of Katmai volcanic ash, J. W. Shipley (*Ohio Jour. Sci., 19 (1919), No. 4, pp. 224–229, figs. 2*).—Examinations of the ash, which had been found to be toxic to wheat seedlings, showed 0.558 per cent of ferrous iron. The water soluble salt content, however, was not very different from that of normal soil.

Report on a reconnoissance of the soils, agriculture, and other resources of the Kenai Peninsula region of Alaska, H. H. BENNETT (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 142, pls. 34, maps 5*).—This comprises a detailed report of a reconnoissance dealing primarily with the Kenai Peninsula, but touching also on the Knik Arm strip, the Prince William Sound region, and the Copper River delta, made during the summer of 1916 by a party composed of representatives from the Forest Service and the Bureau of Soils, for the purpose of studying the soils, agriculture, and other resources and the general economic conditions of the region. Considerable meteorological data are presented, together with descriptive material relating to the geography, physiography, geology, regional drainage, flora, forest fires, settlement and general development, soils, agriculture, furs, game, birds and animals other than game, insects, fish, and recreational and scenic features of the area.

The soils of the peninsula are said to have been derived from glacial and residual, glacial outwash, alluvial, marine sedimentry, wind-blown, and cumulose materials. The results of mechanical and chemical analyses of some of the more important soil types of the region are presented in tabular form, together with descriptions of the different types.

Detailed soil maps have been prepared of the Knik Arm strip, and of a 3-mile strip along Cook Inlet from East Foreland to the head of Kachemak Bay, the two areas comprising 39,680 and 54,400 acres, respectively. In the Knik Arm region various phases of Knik loam occupy 80.8 per cent of the total area, while in the Cook Inlet region Knik loam and muskeg occupy 47.3 and 25 per cent of the total area, respectively.

See also a previous report (E. S. R., 34, p. 209.)

Soil survey of Covington County, Miss., E. M. JONES and A. T. SWEET (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 40, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Mississippi Geological Survey, deals with the soils of an area of 262,400 acres situated in the south-central part of the State and lying entirely within the Gulf Coastal Plain. The topography of the region is generally rolling, and natural drainage is well established in most parts of the area.

The upland soils of the county are of residual origin, being derived from beds of sand, sandy clay, and clay, while the terrace and first-bottom soils are of alluvial origin. Twenty soil types representing 13 series are mapped. Ruston fine sandy loam, occupying 37.6 per cent of the total area, and Orangeburg fine sandy loam, occupying 15.4 per cent, are the prevailing types.

Soil survey of Phelps County, Nebr., B. W. TILLMAN and B. F. HENSEL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 42, fig. 1. map 1*).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 344,320 acres situated in the south-central part of the State. Approximately four-fifths of the county comprises a broad upland with a level to gently undulating topography known as the loess plain. The upland also includes a small area of dunes and an inextensive canyon having a rough topography. The lowlands border the Platte River and are flat except for low ridges and deserted stream channels. The elevations range from 2,180 to 2,500 ft. above sea level. Natural drainage is said to be adequate except in certain depressions in the loess plain.

The soils of the county consist of loessial material, unconsolidated deposits mostly sands, eolian material composed chiefly of dunesand, and alluvial deposits. In addition to dunesand, 11 soil types of 8 series are mapped. Holdredge silt loam and Colby silt loam, occupying 60.1 and 14.1 per cent of the total area, respectively, predominate.

Soil survey of Wayne County, Nebr., B. W. TILLMAN and B. F. HENSEL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1917, pp. 50, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey, deals with the soils of an area of 288,000 acres situated in the northeastern part of the State. About three-fourths of the region comprises upland, one-eighth bottom land, and the remainder terraces. The topography ranges from hilly and rolling to gently undulating and smooth. Natural drainage is generally well established except in depressions occurring mainly in the bottom lands.

The soils of the county consist of loessial material derived by weathering from the silt covering of the upland plain, drift soils derived from unconsolidated glacial drift deposits, and sedimentary soils from the surrounding upland. Nine soil types representing 8 series are mapped. Marshall silt loam and Wabash silt loam, occupying 67.9 and 16.9 per cent of the total area, respectively, predominate.

Soil survey of Clearfield County, Pa., R. A. WINSTON, R. W. MCCLURE, H. P. COOPER, and D. C. WIMER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 32, fig. 1, map 1*).—This survey, made in cooperation with the Pennsylvania State College, deals with the soils of an area of 730,880 acres situated a little west of the geographical center of the State and entirely within the Allegheny Plateau region. The topography of the county varies from rolling to hilly, with elevations ranging from 850 to 2,280 ft. above sea level. The region as a whole is said to have good natural drainage.

The soils of the county include residual or upland soils derived from weathering in place of shales and sandstones of the Coal Measures, and alluvial or stream-bottom soils. In addition to rough stony land, 13 soil types representing six series are mapped. Dekalb soils cover approximately 95 per cent of the upland area of the county. Dekalb gravelly silt loam, Dekalb stony loam, and Dekalb stony sandy loam predominate, occupying 29.2, 24.5, and 14 per cent of the total area, respectively.

Soil survey of Shelby County, Tenn., H. H. BENNETT, R. T. ALLEN, L. V. DAVIS, and C. R. WATKINS, JR. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 39, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Tennessee Geological Survey, deals with the soils of an area of 475,520 acres situated in the southwestern corner of the State. The greater part of the county consists of undulating to rolling upland, although extensive areas of nearly level first and second bottoms also occur. Natural drainage is generally well established in the upland region, while the bottom lands are for the most part imperfectly drained.

The upland soils of the county are of loessial origin and the bottom land soils of alluvial origin. Thirteen soil types of 7 series are mapped. Memphis silt loam, occupying 46.6 per cent of the total area, and Collins silt loam, occupying 17.3 per cent, are the prevailing upland and bottom land types, respectively.

Soil survey of Windsor County, Vt., J. A. KERR and G. B. JONES (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1916, pp. 24, fig. 1, map 1*).—This survey deals with the soils of an area of 606,720 acres situated in the east-central part of the State and bordered on the east by the Connecticut River. The topography is hilly to mountainous with elevations ranging from 350 ft. above sea level along the Connecticut River to about 3,000 ft. in the western part of the area.

The soils of the county are chiefly of glacial origin. The upland soils have been derived from unassorted glacial débris or till, the terrace or bench-land soils from old stratified deposits, and the overflow lands from recent alluvium. In addition to rough stony land and meadow, 10 soil types of 4 series are mapped. Hollis stony fine sandy loam, rough stony land, Hollis fine sandy loam, and Hollis loam predominate, occupying 44.4, 18.9, 14.9, and 12.8 per cent of the total area, respectively.

The oxidation of ammonia, J. R. PARTINGTON (*Jour. Soc. Chem. Indus.*, *37* (*1918*), *No. 17*, *pp. 337R, 338R, fig. 1; Sci. Amer. Sup.*, *87* (*1919*), *No. 2266, pp. 367, 368, fig. 1*).—This article deals particularly with the construction and operation of an ammonia oxidation apparatus devised in the course of investigations under the auspices of the Ministry of Munitions of Great Britain, and with the results obtained with the apparatus.

"Under established conditions, an output of 1.5 tons of nitric acid (HNO_3) per square foot of catalyst area per 24 hours, with an efficiency of 95 per cent, has regularly been attained. Without the application of external sources of heat, the efficiency, as mentioned, is of the order of 85 per cent. The output of a converter may, however, be reduced to 25 per cent of the maximum rate without affecting the efficiency."

It is stated that while the conversion of ammonia to oxids of nitrogen is a matter of no great difficulty once the conditions are understood, the utilization of oxids of nitrogen produced is an intricate problem to which a considerable amount of research has been devoted, particularly the question of the use of the oxids in sulphuric acid manufacture. "The ammonia oxidation process has already been adopted by several of the large sulphuric works in England, and undoubtedly has a very extensive future before it in this direction. There is a considerable saving of expense in the replacement of niter by ammonia oxidation, in addition to the much more regular working of the process." The conversion of the oxids into nitric acid and many other ways of utilizing them are also being investigated.

Fertilizer experiments with spoiled calcium cyanamid, M. POPP (*Zentbl. Agr. Chem.*, *47* (*1918*), *No. 10–11, pp. 299–307; abs. in Chem. Abs.*, *13* (*1919*), *No. 6, p. 627*).—Samples of calcium cyanamid stored in cork-stoppered glass bottles and analyzed for total nitrogen in 1913, 1914, 1915, and 1917 showed a marked falling off, said to be due to the absorption of water. Oats grown in pot experiments, employing both fresh and old calcium cyanamid recovered from 59 to 68 per cent of the nitrogen in the former, as compared with only 26 per cent of that in the latter. Old calcium cyanamid containing much dicyanodiamid nitrogen resulted in a high nitrogen content in the straw. The presence of 6.5 per cent dicyanodiamid injured oat plants when the calcium cyanamid was applied at the rate of 90 kg. per hectare (about 80 lbs. per acre).

Determination of the value of agricultural lime, S. D. CONNER (*Jour. Indus. and Engin. Chem.*, *10* (*1918*), *No. 12, pp. 996–999, figs. 3*).—In experiments at the Indiana Experiment Station, here reported, "the value of agricultural limes was determined by means of the acid-soluble calcium and magnesium by means of CO_2 determination with boiling hydrochloric acid, and by digesting in standard acid and titrating the excess acid. Pot cultures on two very acid soils were conducted using calcite, wollastonite, raw rock phosphate, gypsum, dolomite, magnesite, enstatite, and serpentine as correctors of soil acidity. Wheat and clover were grown in each soil and the crop increases reported. Soil acidity was determined after cropping by means of the Hopkins potassium nitrate method and the C. H. Jones calcium acetate method.

"Crop increases due to various treatments were obtained in the following order, the highest being placed first: Calcite, dolomite, magnesite, wollastonite, rock phosphate, serpentine, enstatite, and gypsum. The treatments decreased the soil acidity in the following order: Magnesite, dolomite, calcite, wollastonite, serpentine, rock phosphate, gypsum, and enstatite.

"The results obtained in these experiments indicate that the value of agricultural lime is in accordance with its acid-neutralizing power, rather than with the CaO, MgO, or CO_2 contained, and that the titration method is the most accurate and reliable method for determining the value of agricultural limes."

Cost of burning lime in the stack or heap, W. Frear and C. L. Goodling (*Pennsylvania Sta. Bul. 157 (1919), pp. 3–14, figs. 4*).—The preparation of a stack for burning limestone is described and the estimated cost of the operation indicated. It is concluded that the cost of assembling, erecting, and burning a 2,400-bu. stack of limestone already quarried amounted to 9.2 cts. per bushel when team work was valued at 40 cts. per hour, man labor at 17.5 cts. per hour, and bituminous coal at $2.60 per long ton f. o. b. freight station.

Supplementary report upon the limestone resources of Pennsylvania, W. Frear and C. A. Kern (*Pennsylvania Sta. Bul. 157 (1919), pp. 15–23*).—Analyses are given of 238 samples of Pennsylvania limestone examined during the 2-year period ended April 1, 1918, supplementing a previous report (E. S. R., 38, p. 22).

Calcareous marl finds increasing use in agriculture (*U. S. Geol. Survey Press Bul. 410 (1919), p. 1*).—It is stated that "calcareous marl, a variety of carbonate of lime, is finding increasing use in agriculture as a soil sweetener," 78,232 tons being sold for this purpose in 1918, as compared with 73,900 tons in 1917 and 58,088 tons in 1916. "The value in 1918 was $261,082, 58 per cent higher than in 1917. Besides that sold for agricultural use, 20,462 tons, valued at $57,582, was sold for the neutralization of acid waters, the manufacture of prepared fertilizers, and other uses.

"The marl represented in this statement includes two kinds—fresh-water marl, or ooze, taken from the bottoms of lakes, ponds, or swamps, and marine marl, or coquina, taken from deposits of partly consolidated masses of shell fragments deposited on the bottom of a shallow sea and later elevated above sea level. Fresh-water marl was produced in 1918 in Virginia, West Virginia, Pennsylvania, and New York; marine marl in North Carolina and South Carolina."

Sulphuric acid and fertilizer trades (*Rpt. Dept. Committee Sulphuric Acid and Fert. Trades [Gt. Brit.], Complete Ed., 1919, pp. 15; rev. in Nature [London], 103 (1919), No. 2578, pp. 67–69*).—This is a revision of a report previously noted (E. S. R., 39, p. 522). The amended report contains additional data regarding the prewar production of sulphuric acid, the principal consuming industries and their estimated annual consumption prior to 1914, the expansion of the sulphuric-acid trade during the war, the development of the zinc industry during the war and its influence on acid production, the probable postwar consumption of sulphuric acid, and acid factories owned or leased by the Government and their condition and output.

Of the estimated annual prewar consumption of 956,000 tons of sulphuric acid, 300,000 tons was used in superphosphate manufacture and 280,000 tons in making sulphate of ammonia. Extension of the fertilizer industry is proposed as the most obvious means of utilizing the excess production of sulphuric acid. This necessitates an increase in production of ammonia and in the available supply of mineral phosphates. With this in mind it is recommended that "the Government should take immediate steps by international commercial treaties or otherwise to secure an effective and permanent control or command of an adequate supply of phosphate rock, and that arrangements should be made in advance for the importation of large quantities of phosphate rock immediately on the termination of the war."

AGRICULTURAL BOTANY.

The unification of American botany, G. R. Lyman (*Science, n. ser., 49 (1919), No. 1267, pp. 339–345*).—The author presents an argument for broadening the teaching of botanical subjects so as to produce not merely specialists but broad-gauge men of wide perspective.

Note on the technique of solution culture experiments with plants, D. R. Hoagland (*Science, n. ser., 49 (1919), No. 1267, pp. 360–362*).—Attention is called to the desirability of better technique in experiments with plants grown in solutions in order that the results obtained by different investigators may be comparable. Conclusions are said to be based ordinarily on the concentration of the solutions as originally prepared, but experiments have shown that the composition of the solutions may be so changed in a few hours as to represent an entirely different solution. In one case barley plants six weeks old placed in a solution containing 100 parts per million of nitrate absorbed every trace of nitrate from the solution in less than 72 hours. Attention should also be given to optimal conditions of light and temperature or allowances made for suboptimal conditions. The author claims that each set of conditions should be tested by actual analysis of solutions and plants, and the results interpreted in terms not of the original solutions alone but also in terms of total supply and the varying conditions of the solutions in the periods between changes.

The dendrograph: A new instrument for recording growth and other variations in the dimensions of trees, D. T. MacDougal (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 59, 60*).—Two forms are described of a special device for measuring growth as employed with trees.

Plant genetics, J. M. and M. C. Coulter (*Chicago: Univ. Chicago Press, 1918, pp. IX+214, figs. 40*).—This is a textbook on genetics to meet the requirements of students who are in the last undergraduate or the first graduate year and who expect to follow botany as a profession or who wish to appreciate the significance of current work in genetics.

The chromosomes, their numbers and general importance, Ö. Winge (*Compt. Rend. Lab. Carlsberg, 13 (1917), No. 2, pp. 131–275, figs. 46*).—Since 1914 the author has collected information regarding chromosome numbers in the vegetable kingdom, this work dealing mainly with the theoretical aspects of the subject.

The nucleus is regarded as of phylogenetically younger origin than is the cell as a whole, indicating an advance in its differentiation. In Entorrhiza the spores possess a nucleus free from chromatin, and free, split chromosome-like bodies appear in the cytoplasm. Chromosome numbers in higher plants can as a rule be resolved into the prime factors 2 and 3, more rarely 5 and 7. The most frequently occurring chromosome numbers by far are 8 and 12. After this in order come 16, 6, and 9. The species (in higher plants) of a systematic group have chromosome numbers which are related by simple multiples of the same cardinal numbers and enter into an arithmetical progression. The formula for the Chenopodiaceæ appears to be $x=3n$ ($n\geqq2$). A certain regularity appears in such families as the Compositæ. The chromosome numbers for the groups Helianthеæ and Anthemideæ are represented by $x=8n$ and $x=9n$, respectively.

Chromosome number is thought to afford weighty evidence as regards genetic relationships. Apogamy is thought to be due to hybridization. In *Callitriche verna* the reduction division of the pollen mother cells originates heterochromosomes, which can not be homologized with those of animal origin. The mottled coloring of *Humulus japonicus albomaculata* is transmitted only through the sexual cells of the female plant, and especially through the cytoplasm. Cell and nuclear divisions involve occasionally loss of material, as parts of chromosomes, this fact affecting the genotypic constitution of the cell. It is assumed that occasional hybridization can give rise to apogamous or sexually abnormal new species, which persist as minor species or biotypes. In case of *Humulus lupulus*, which can develop fruits containing embryos on pollination with various related plants, pollination with *Urtica urens* produced large and strong fruits, though these were incapable of germination. It is presumed that a truly heterogeneous fertilization took place, that the hybrid was capable of development as long as it was nourished by the mother plant, but that lack of internal homogeneity rendered it incapable of independent activity.

The mitochondrial origin of plastids, A. Guilliermond (*Compt. Rend. Acad. Sci. [Paris], 167 (1918), No. 12, pp. 430–433*).—This is mainly a discussion of recent contributions of Mottier (E. S. R., 39, p. 332) and of Cowdry (E. S. R., 38, p. 524). It is considered as certain that the plastids in plants are derived by differentiation of mitochondria substantially identical with those of animals.

A colloidal hypothesis of protoplasmic permeability, E. E. Free (*Plant World, 21 (1918), No. 6, pp. 141–150*).—This hypothesis, which is to be discussed in a later paper, includes the assumption that the colloids are of the emulsion type, consisting of 2 (or possibly more) liquid phases which may differ, as regards composition, only in the relative proportions of the water and substance of the colloid or the proportion may even be reversed. Thus a gelatin sol is believed to consist of globules containing relatively more gelatin, suspended in a medium which contains relatively less gelatin. The medium may be thought of as a more dilute gelatin solution, the globules as a more concentrated one. At greater total concentrations of gelatin this condition may be reversed on passage of water from one phase to another with marked changes of properties, so that anything that changes the distribution of water between the phases will greatly affect the properties of the material. This distribution of water is known to be affected by temperature, the presence of salts and other solutes, and even by mechanical stresses, all these affecting such physical properties of the colloid as viscosity, sometimes in large degree.

It is considered probable that similar conditions may occur in protoplasm, that two at least of the liquid phases of protoplasm differ mainly as regards relative water content, and that the distribution of water between those two phases may be altered without causing the death of the protoplasm. This hypothesis is discussed in regard to its supposed bearings.

Colloidal phenomena in the protoplasm of pollen tubes: The effect of potassium and sodium on hydration and growth, F. E. Lloyd (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 67, 68*).—In continuation of work previously noted (E. S. R., 40, p. 28), the author has given attention to the comparative effects of sodium and potassium in the form of hydrate.

The hydration capacity of pollen of Phaseolus is increased by both hydrates (but more by potassium) over that of water with 20 to 25 per cent sugar solution employed alone. This increased hydration capacity expressed itself partly in growth and partly in swelling in excess of growth. Potassium appears to be absorbed more vigorously than is sodium by the protoplasm or by some element in the colloidal complex which is now regarded as protoplasm. A toxic effect also is more obvious in the case of potassium. The observations are supposed to be significant in view of the physiological effects of the two metals.

The colloidal properties of certain plant mucilages as affected by stains, F. E. Lloyd (*Carnegie Inst. Washington Year Book, 17 (1918), p. 72*).—Having observed that when substances such as the mucilaginous products of hydrolysis of cellulose walls which occur during abscission, the ripening of fruit, etc., are treated with certain staining materials, a quasi precipitation occurs, the author has studied the effects of a considerable series of dye materials on the mucilage of Opuntia, Abutilon, Œnothera, peach pericarp, and the products of cell-wall hydrolysis during abscission. The results are briefly indicated.

The mucilage of Opuntia, Abutilon, and Œnothera, F. E. LLOYD (*Carnegie Inst. Washington Year Book, 17 (1918), pp. 71, 72*).—The mucilages of several plants are discussed as to characters and behavior under conditions or treatments which are indicated.

Pine needles, their significance and history, J. DUFRÉNOY (*Bot. Gaz., 66 (1918), No. 5, pp. 439–454, figs. 29*).—A review of the morphology, development, and physiology of pine needles and related structures concludes with the statement that morphological variations are but the result of physiological variations, different forms of the different phyllodes of pines, juvenile leaves, scale leaves, fertile leaves (male and female flowers), and assimilatory organs, differing widely but being shown by abnormal transitory forms to be really different distorted features of a generalized ancestral organ. Needles are the physiological leaves of pines, though they may last for several seasons, being specialized to meet unfavorable conditions.

The present state of the study of anthocyanin, J. BEAUVERIE (*Rev. Gén. Sci., 29 (1918), Nos. 20, pp. 572–579, fig. 1; 21, pp. 604–612*).—The first part of this contribution deals with findings and views of various authors as to the origin, distribution, and relations of anthocyanin as regards heredity and function. The second part deals mainly with its chemical constitution.

The production of anthocyanins and anthocyanidins, III, A. E. EVEREST (*Proc. Roy. Soc. [London], Ser. B, 90 (1918), No. B 628, pp. 251–265*).—Although this work, which is a continuation of that previously noted (E. S. R., 33, p. 329), has been suspended in the preliminary stage of its present aspects, the author presents some findings and inferences for comparison with results of recent work by other authors. Evidence is discussed which is considered to strengthen the probability that anthocyan pigments are formed in plants and flowers naturally from flavonol glucosids, and that flavonols may give rise to anthocyanidins. It is claimed that the anthocyanin described in this report is identical with violanin.

Effect of certain compounds of barium and strontium on the growth of plants, J. S. MCHARGUE (*Jour. Agr. Research [U. S.], 16 (1919), No. 7, pp. 183–194, pl. 1*).—The author gives the results of experiments carried on at the Kentucky Agricultural Experiment Station to determine the effect of barium and strontium on the growth of plants. Cowpeas, oats, spring and winter wheat, corn, and soy beans were grown in barium-free sand to which the necessary plant foods were added, together with the desired compounds of barium and strontium.

From the results obtained, it is concluded that barium compounds in the absence of calcium carbonate are poisonous to plants, but in the presence of an excess of calcium carbonate barium carbonate exerts a stimulating influence on the growth of the plants studied. No tendency was observed for barium to replace calcium in the growth of plants when calcium carbonate was omitted from the plant-food ration. Strontium compounds in most instances gave larger increased yields than barium compounds. Strontium carbonate, it was found, can not be substituted for calcium carbonate in the growth of plants under the conditions studied, though strontium carbonate is less toxic to the growth of plants in the absence of calcium than is barium carbonate. It is claimed that the compounds of neither of the elements studied can be regarded as important plant foods, although the presence of small amounts of the carbonate of each gave increased yields in most instances. Both barium and strontium carbonates accelerated the growth of roots of plants investigated. Increasing the amount of strontium nitrate resulted in an increase of the nitrogen content of the wheat. No barium compounds were found in the residue obtained upon evaporating 25 liters of water collected from the drain tiles of the station farm, and this is considered to indicate that the barium found in plants is taken up in place by the plant roots.

The effect of manganese compounds on soils and plants, E. P. Deatrick (*New York Cornell Sta. Mem. 19 (1919), pp. 365–402*).—The investigation here reported was undertaken for the purpose of ascertaining the specific effect of manganese compounds in increasing plant growth, that is, to determine whether manganese is a direct plant stimulant, whether it increases the available food supply in the soil, or whether both of these factors are operative. The experiments were carried out with wheat, the plants being grown in distilled water alone and in distilled water to which nutrient solutions were added.

It was found that manganese salts added to water cultures affected the growth of wheat seedlings, high concentrations of both the sulphate and chlorid exerting toxic effects, while in lower concentrations marked stimulation was observed. The degree of toxicity was found to be reduced by full nutrient solutions, the reduction being directly proportional to the concentration of the nutrient salts. The food stored in the endosperms was also found to reduce the toxicity of the plant poison. The toxic influence of the salts was shown in the browning of the roots and the bleaching of the leaves. Yellow leaves of manganese plants contained more of that element than did green ones.

Manganese salts when added to soil were found to form manganese dioxid in proportion to the basicity of the soil and thus to develop a power to oxidize organic matter. Manganese sulphate in water cultures stimulated the oxidizing power of the roots of wheat seedlings. Low concentrations of manganese sulphate were found to stimulate the ammonification of dried blood in the soil. The nitrification of ammonium sulphate was inhibited.

Root variations induced by carbon dioxid gas additions to soil, H. A. Noyes, J. F. Trost, and L. Yoder (*Bot. Gaz., 66 (1918), No. 4, pp. 364–373, figs. 9*).—Following up preliminary work previously reported (E. S. R., 32, p. 422), the author has obtained results which support the conclusion of Cannon and Free (E. S. R., 37, p. 213) to the effect that soil aeration is a factor no less important than are water and temperature in plant growth.

In these experiments carbon dioxid was introduced subterraneously into soil in Wagner pots, the tests employing *Capsicum annuum abbreviatum*, *Lactuca sativa*, *Raphanus sativus*, and *Phaseolus vulgaris*.

It is stated that plants respond differently to carbon dioxid gas added to the soil in which they are grown, Christmas pepper, head lettuce, radishes, and string beans all being affected by the addition of carbon dioxid gas to the soil. The effects on root development are greater than those on the aerial portions. Plants were not affected to the same extent by intermittent and constant applications, although a constant treatment of 650 cc. of carbon dioxid gas per hour appeared to be sufficient to prevent normal root development.

Physical factors of transpiration in plants and transpiration in parasitized leaves, J. Dufrénoy (*Rev. Gén. Sci., 29 (1918), No. 20, pp. 565, 566*).—This is a synthetic review of the findings and views of a number of authors on factors in transpiration.

Some factors in the winterkilling of grain crops, S. C. SALMON (*Trans. Kans. Acad. Sci., 28 (1916–17), pp. 129–131*).—It is thought that of the wheat area not harvested, (more than 16 per cent of the total wheat area of Kansas) more than one-half (10 per cent of the total wheat area) is winterkilled. A study of the causes of loss from winterkilling has been carried on for about four years and has developed a method of seeding grain in furrows. The plants are protected from wind by the ridges and from freezing by the snow which fills the furrow. The crop is also injured less by heaving of the soil during freezing and thawing weather (being better rooted in the soil), and is in a better position to absorb moisture. Results of studies on different soils show that winter annuals suffer more on wet soils, except in case of easily injured plants which may be killed by comparatively brief periods of freezing, and that such plants suffer more on sandy soils than on those of the heaviest type except when heaving of the soil occurs.

On the quantitative differences in the water conductivity of the wood in trees and shrubs, J. B. FARMER (*Proc. Roy. Soc.* [*London*], *Ser. B, 90 (1918), No. B 628, pp. 218–250, figs. 5*).—This contribution is made up of two parts, the first dealing with the evergreens and the second with the deciduous plants. The author attempted to find whether the water conductivity of wood in a given species could be ascertained and usefully expressed in quantitative form, whether conductivity could be correlated with any obvious character such as deciduous habit, and whether definite changes in external conditions may cause corresponding changes in water conductivity.

The results, as presented in tabular detail with discussion, are considered to throw light on the habit of many xerophilous plants. Deciduous species, which may also vary among themselves, considerably exceed evergreens as regards specific conductivity, absolute fluctuation, plasticity, and sensitivity to external influences. Considerable difference appears to exist between normal adult wood of a given tree and that of leaders of young trees, this difference (a lowering of conductivity) being notable in the main shoot of most climbers. Arborescent and frutescent monocotyledons are defective as regards water conductivity, this feature entering probably into the determination of the habit of growth. It is suggested that the filling up of the wood of deciduous trees during early autumn, owing to the persistence of root pressure after transpiration is lowered, may find practical application in shortening the time normally required for the seasoning of felled timber. It is thought that the lower conductivity of evergreens is attributable to narrowness and shortness of the conducting vessels.

FIELD CROPS.

Nitrogen relations of certain crop plants when grown alone and in association, R. C. WRIGHT (*Jour. Amer. Soc. Agron., 11 (1919), No. 2, pp. 49–66, pl. 1, figs. 4*).—This paper, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, describes investigations conducted at the Arlington (Va.) Farm during 1914 and 1915 in a study of the effects of associative growth of legumes and nonlegumes under control conditions. The crops were grown to maturity in galvanized corrugated iron buckets, the use of which in studies of this sort has already been noted (E. S. R., 36, p. 524), the plants harvested close to the surface of the soil, dried, weighed, and ground fine for analysis for total nitrogen. The roots were removed from the soil, dried, ground, and returned and thoroughly incorporated with the soil, and the latter then sampled for a determination of total nitrogen. When two sorts of crops were grown together, one-half of the number of plants of each kind was used as when they were grown alone.

In 1914, a clay loam soil which had been composted with manure and left in a pile for several years was limed, brought to an optimum moisture content, and about 45 kg. introduced into each pot. Spring oats, spring barley, spring rye and dwarf Kafir corn were each grown in association with hairy vetch, field peas, and red clover. Corn was also grown with both oats and pearl millet. Each crop was also grown alone. Summarizing the results obtained, it is stated that a distinct loss of nitrogen in the soil followed a combination of barley and peas, rye and peas, rye and clover, and corn and millet, while there was a distinct gain with barley and vetch, barley and clover, oats and peas, oats and clover, and Kafir corn and vetch. In general, combinations of barley and vetch, barley and clover, oats and vetch, oats and peas, and Kafir corn and vetch produced more nitrogen and dry matter than when these crops were grown alone but did not remove so much nitrogen from the soil. Barley showed a gain in the percentage of nitrogen with vetch and peas and a loss with clover; rye lost slightly with vetch and clover and gained slightly with peas; while oats and Kafir corn both gained with vetch, peas, and clover. At the same time, vetch gained in nitrogen with barley, rye, and Kafir corn, but lost with oats; field peas gained with barley but lost with rye, oats, and Kafir corn; while red clover gained with barley, rye, and oats but lost with Kafir corn. A loss in nitrogen was observed in corn grown with both millet and oats, while the millet gained slightly and the oats lost materially.

The 1915 experiments were planned to observe the comparative results with a few plant combinations on different types of soil. Consequently, spring oats, spring barley, Kafir corn, soy beans, and purple vetch were grown on a coarse gravelly virgin loam from near Riverside, Cal., representing a semiarid soil; a heavy black virgin loam from near Manhattan, Kans., representing the Great Plains; and a practically virgin clay loam from near Arlington, representing eastern humid soils. In all other respects the experiments were conducted as in 1914. Summarizing the results it is stated that the percentage of nitrogen in oats increased with soy beans and vetch on all soils except in the case of soy beans on the Virginia soil. Barley lost in nitrogen with soy beans on all soils, gained with vetch on the California soil, lost on the Kansas soil, and remained unchanged on the Virginia soil. Kafir corn gained with soy beans and vetch on all soils, except with soy beans on the Kansas soil. Soy beans gained in nitrogen on all soils when grown with oats and barley, while with Kafir corn a gain occurred on the California soil and a loss on the Kansas and Virginia soils. Vetch showed a gain with oats on the California soil and a loss on the Kansas and Virginia soils, and a loss with barley and Kafir corn on all soils.

Experiments with soil and cultures as inoculating material for lupines and vetch on upland moor soils, H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 33 (1919), No. 1, pp. 33–43, figs. 6*).—Pot experiments with lupines and vetch on soil from an uncultivated upland moor region are described. The soil was either untreated or treated with pure cultures of the root nodule bacteria of lupines and vetch, or with soil from fields on which these crops developed numerous root nodules and produced large yields, or with nitrate of soda at the rate of 75 kg. per hectare (67 lbs. per acre).

In the experiments with lupines, conducted in triplicate, the following average yields per pot of green substance were secured from the different series of pots: Uninoculated 88 gm., inoculated with soil 133 gm., inoculated with Barthel's culture 145 gm., and treated only with nitrate of soda 123 gm. It is concluded that the treatment with pure culture was fully as effective as the use of soil from a field having produced lupines successfully.

A similar test with vetch, but including an additional culture known as Azotogen and with only two pots treated with inoculating soil, resulted in the following average yields per pot of air dry substance for the different series: Uninoculated 9.7 gm., inoculated with soil 31 gm., Barthel's culture 34.3 gm., Azotogen 18.7 gm., and nitrate of soda 26 gm. The average increase in nitrogen taken up by the plants as compared with the average for the check pots was as follows: Inoculated with soil 540.2 mg., Barthel's culture 672.2 mg., Azotogen 289.1 mg., and nitrate of soda 72.3 mg. In the pots receiving nitrate of soda all roots were entirely free from nodules. It is pointed out that in both experiments Barthel's culture proved fully equal to inoculating soil in effectiveness.

Cereal improvement at Svalöf, W. J. PROFFIT (*Scot. Jour. Agr., 1 (1918), No. 4, pp. 404–414*).—This comprises a general discussion of the origin and purpose of the Swedish Seed Association and of the methods employed at Svalöf for the improvement of the cereals.

[Tropical grasses as paper-making materials] (*Bul. Imp. Inst. [So. Kensington], 16 (1918), Nos. 2, pp. 127–134; 3, pp. 271–275*).—Brief notes are presented on observations made at the Imperial Institute regarding the relative value for paper materials of some tropical grasses, including *Sorghum halepense, Andropogon buchananii, A. dregeanus, A. auctus,* and *A. hirtiflorus semiberbis* from South Africa; lalang grass (*Imperata arundinacea*) from the Federated Malay States; and bamboo grass from Australia.

Handbook of Indian agriculture, N. G. MUKERJI (*Calcutta: Thacker, Spink & Co., 1915, 3. ed., rev., pp. XIV+620, pl. 1, figs. 118*).—This is a third and revised edition of a work designed as a textbook on Indian agriculture for the use of advanced students, and embraces chapters on soils, crops, cattle, manures, insect and fungus pests, implements, methods of analysis, and Indian famines.

Dry farming: A system of agriculture for countries under a low rainfall, J. A. WIDTSOE, trans. by G. ROSSATI (*"Dry farming." Sistema di Agricoltura per le Regioni dalle Pioggie Scarse. Rome: Min. delle Colonie, 1917, pp. 523, figs. 109, pls. 3*).—This is a translation into Italian of a work previously noted (E. S. R., 25, p. 31).

Report of the committee on standardization of field experiments, A. T. WIANCKO, F. S. HARRIS, and S. C. SALMON (*Jour. Amer. Soc. Agron., 10 (1918), No. 9, pp. 345–354*).—Supplementing a previous report (E. S. R., 39, p. 828), the committee of the American Society of Agronomy on the standardization of field experiments presents a brief discussion of information obtained from questionnaires, dealing with the size, shape, and arrangement of plats employed in soil fertility and crop investigations and with the use and management of check plats, which were sent to workers along these lines in the experiment stations throughout the United States. No definite conclusions have been reached.

Additions to the bibliography previously noted include 49 titles.

[Report of field crops work in Hawaii], L. A. HENKE (*Col. Hawaii Bul. 5 (1918), pp. 2–13, figs. 2*).—This comprises the first annual report of the Department of Agriculture, College of Hawaii, including brief notes on variety tests with alfalfa, corn, peanuts, dry land rice, sorghums for forage, and sugar cane; cultural tests with cowpeas and Sudan grass; and experiments on the eradication of nut-grass (*Cyperus rotundus*) for the year ended June 30, 1918.

[Report of work at the Rothamsted Experiment Station, 1914–1917] (*Rothamsted Expt. Sta., Harpenden, Ann. Rpt. 1914, pp. 42; Rpt. 1915–1917, pp.*

69, fig. 1).—These reports note the progress of investigational work at this station, and are supplemented by tabulated data showing the treatment and yields per acre of the experimental plats for each year of the period indicated. Recent papers based on work done at Rothamsted and published elsewhere are briefly reviewed.

[The Woburn field experiments, 1917], J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 78* (*1917*), *pp. 220–231; Woburn Expt. Sta. Rpt., 1917, pp. 2–13*).—This describes the continuation of work previously noted (E. S. R., 39, p. 529). The season of 1916–17 is said to have been very unfavorable for practically all crops grown in the experiments.

The highest wheat yield in the continuous wheat experiments was obtained from the plat receiving mineral manures and nitrate of soda and amounted to 30 bu. of grain and 2,043 lbs. of straw per acre, the average yield for the untreated checks being 11 bu. of grain and 714 lbs. of straw. The next best results were obtained with mineral manures and in alternate years, nitrate of soda, with a yield of 28.5 bu. of grain and 1,843 lbs. of straw per acre, while barnyard manure was next in order with 27.9 bu. of grain and 2,062 lbs. of straw. With mineral manures alone there was produced 13.9 bu. of grain and 993 lbs. of straw. The sulphate of ammonia plats continued to show the need of lime for profitable crop production. Nitrate of soda showed markedly better results than sulphate of ammonia. With potash without phosphate there was produced 2.3 bu. more than with phosphate without potash.

The highest yield in the continuous barley experiments amounted to 27.2 bu. of grain and 1,568 lbs. of straw, from the plat receiving mineral manures and sulphate of ammonia with applications of one ton of lime made in 1905 and again in 1916. The barnyard manure plat with a yield of 26.7 bu. of grain and 2,029 lbs. of straw, and the plat receiving mineral manures and in alternate years, nitrate of soda, with a yield of 26.7 bu. of grain and 1,629 lbs. of straw per acre were next in order. The average yield for the untreated checks amounted to 15.8 bu. of grain and 1,069 lbs. of straw. With mineral manures alone there was produced 18.5 bu. of grain and 1,104 lbs. of straw, and with the addition of one ton of lime in 1915, 21.5 bu. of grain and 1,340 lbs. of straw. Nitrate of soda failed to show any superiority over sulphate of ammonia this season, while the usual failures with the latter when used without lime were observed. With potash about one bu. more grain was produced than with phosphate.

Further observations on the comparative manurial value of unexhausted residues from so-called cake and corn feeding on the rotation plats are said to indicate that cake feeding is not necessarily superior to corn feeding as measured by increases in the yields of wheat and barley grown on the respective plats.

Green manuring experiments with wheat failed to give conclusive results. An application of four tons of magnesia per acre made in 1915 resulted in a yield of 10.2 bu. of wheat in 1917 as compared with 6.5 bu. from the untreated check. A similar application made in 1917 also gave 10.2 bu. of grain.

In the improvement of old pasture land the highest yield, 3,556 lbs. of hay per acre, followed an application of 12 tons of manure made in 1913. Buxton lime and magnesium lime with yields of 3,052 and 3,024 lbs. per acre, respectively, proved best for grass land in a comparison of different sorts of lime. Comparing different forms of lime, ground chalk with a yield of 3,528 lbs. of hay per acre and ground limestone with 3,360 lbs. were best. A grass plat always harvested for hay produced 2,786 lbs. per acre as compared with 2,884 lbs. from a plat alternately mown for hay and grazed. A botanical examination of the hay from these plats is said to have shown little difference in the herbage.

[Crop and soil investigations in India, 1917–18] (*Sci. Rpts. Agr. Research Inst. Pusa, 1917–18, pp. 11–15, 27–65, 121–131, 135–144*).—This describes the progress of crop improvement and soil fertility work at the Agricultural Research Institute, Pusa, for the year 1917–18, much of which has been reported on from time to time in more detail. A report of the imperial cotton specialist is included.

[Report of field crops work in the United Provinces of Agra and Oudh, India, 1917–18], G. PRASAD (*Rpt. Agr. Stas. West Circle, United Prov. Agra and Oudh [India], 1918, pp. 28*).—This describes the continuation of work along the same general lines as that previously noted (E. S. R., 40, p. 230) for the year ended June 30, 1918.

[Report of field crops work in Bihar and Orissa, India, 1917–18] (*Rpt. Agr. Activ. Govt. Bihar and Orissa, 1918, pp. 2–8, 16, 17, 22–29, 32–41, 46, 56, 60–64, 68, 70*).—In continuation of work previously noted (E. S. R., 40, p. 523), this describes the progress for the year ended June 30, 1918.

[Report of work with field crops at the Partabgarh and Benares Agricultural Stations], L. C. SHARMA (*Ann. Rpt. Partabgarh and Benares Agr. Stas., United Provs. Agra and Oudh, 1918, pp. 2–10, 1–8*).—The continuation of work along the same general lines as previously noted (E. S. R., 37, pp. 824, 825) is described, embracing variety, culture, rotation, and fertilizer tests with rice, sugar cane, wheat, barley, gram, peanuts, and miscellaneous crops.

[Report of field crops work in Punjab, 1917–18], W. ROBERTS, FATEH-UD-DIN, and D. SINGH (*Rpt. Dept. Agr. Punjab, 1917–18, pp. XII–LXXXIII, pl. 1*).—This describes the progress of work along the same general lines as that previously noted (E. S. R., 40, p. 230) for the year ended June 30, 1918.

[Report of field crops work in Queensland, 1917–18] (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1917–18, pp. 54–59, 99–107, 113, 114, pls. 3*).—This describes the continuation of work along the same general lines as previously noted (E. S. R., 40, p. 230) for the year ended June 30, 1918, together with tabulated data on the acreage and production of the more important field crops.

New crops for Rhodesia, II, J. A. T. WALTERS (*Rhodesia Agr. Jour., 15 (1918), No. 6, pp. 529–534, pls. 3*).—In continuation of work previously noted (E. S. R., 40, p. 333), the author describes cultural, fertilizer, and rotation experiments with the more established crops including corn, peanuts, wheat, oats, barley, buckwheat, and miscellaneous legumes and grasses.

Mosaic-like splitting in a barley hybrid, B. MIYAZAWA (*Bot. Mag. [Tokyo], 30 (1916), No. 359, pp. 359–369, figs. 4*).—The author describes observations made on the F_1, F_2, and F_3 progeny of a cross between Sekitori and Goldenmelon barleys in which a study was made of the inheritance of the color of the grain. Sekitori is said to have been cultivated in Japan for a long time and to have a black grain, while Goldenmelon is described as an Australian two-rowed sort having whitish yellow grains. Reciprocal crosses were made, although the recorded observations have been confined to the Sekitori×Goldenmelon cross. The F_1 generation was also back-crossed with each parent.

The F_1 progeny showed a splitting into both black and whitish yellow individuals in the ratio of 1:1, while in the F_2 so-called pure blacks, mosaic, and pure whitish yellows appeared in the ratio of 1:2:1. The mosaic individuals also gave rise to the same distribution in the F_3 generation.

Assuming that the grain color was due to pigment present in the cells of the pericarp and testa, respectively, the author explains his results on the basis of a vegetative segregation of the hereditary factors shortly before the development of the growing point of the ear. This results in the formation of a number of cell complexes with and without the factor for black color.

Xenia in barley, M. Sô and Y. Imai (*Bot. Mag.* [*Tokyo*], *32* (*1918*), *No. 382*, *pp. 205–214*).—Stating that the grain color studied by Miyazawa as noted above is due to a pigment located in the aleurone cells which form the outer layers of the endosperm, the authors report the results of observations made on about 10,000 grains from F_1 plants of several barley crosses, involving whitish yellow and so-called blue grained sorts. They found a segregation of approximately three blue grains to one whitish yellow individual, and from this they conclude that grain color in barley is transmitted by xenia. They also deem it probable that about one-half of the whitish yellow grains classified as such by Miyazawa were, in fact, dilute blue, their observations revealing various degrees of intensity of the blue color.

An early paper on maize crosses, H. F. Roberts (*Amer. Nat.*, *53* (*1919*), *No. 625*, *pp. 97–108*, *figs. 2*).—The author reviews a paper by McCluer, dealing with crossing experiments with corn previously noted (E. S. R., 4, p. 134), which he believes has lacked adequate appreciation by later investigators.

Chimeras in corn hybrids, J. L. Collins (*Jour. Heredity*, *10* (*1919*), *No. 1*, *pp. 2–10*, *figs. 7*).—The author describes a grain of dent corn appearing among the purple starchy F_1 progeny of a cross between Extra Early Adams white dent and Black Mexican sweet corn, in which one-half of the grain was white and the other half dark purple in color. The F_2 progeny of this grain approximated the expected dihybrid ratio in a cross in which starchy endosperm and purple aleurone were dominant characters. Among the 1,083 grains comprising the F_2 progeny, 12 showed the reappearance of the mosaic pattern exhibited by the parent; but this number is deemed to be insufficient to indicate Mendelian inheritance. Similar phenomena observed by other investigators in corn and several plant genera are briefly noted and evidence is presented which is believed to disprove the theory of an independent development of the second pollen tube nucleus and the endosperm nucleus, a factor mutation occurring in a single somatic cell and producing a chimera being regarded as a more probable explanation.

The appearance of a half purple and half white sweet grain among the F_2 progeny is expected to furnish proof supporting the mutation hypothesis, for "if the progeny from this grain gives evidence that the embyro is homozygous for the purple color, then the change from purple to white in the aleurone can only have come about by somatic mutation in the manner herein described," whereas if this grain proves to be heterozygous for purple and for white, "no violence will be done to our mutation conception of the origin of the chimera."

Proceedings of the Nebraska Corn Improvers' Association (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, *9* (*1918*), *pp. 35–59*, *92–100*, *125–138*, *figs. 15*).—This comprises a report of the ninth annual meeting of the association held at Lincoln in January, 1918. The following papers were presented: The Seed Corn Problem, by T. A. Kiesselbach; The Value of Continuing Competitive Corn Exhibits, by F. J. Rist; The Futility of the "Pretty Ear" Corn Show, by E. Hopt; Relation of Climate to Crops, by G. A. Loveland; Emergency and Special Purpose Crops, by L. L. Zook; and Corn as a Factor in the Development of Agriculture in Nebraska, by S. C. Bassett.

Corn production in Brazil, 1916–17 (*Estimativa da Producção do Milho no Brazil* (*Safra de 1916–17*). *Rio de Janeiro, Brazil: Min. Agr., Indus. e Com.*, *pp. 92*, *pls. 4*).—Considerable statistical information is given relative to the acreage and yield of corn in Brazil.

Some observations on the relation of lint length to rainfall, R. E. Kelsick (*West Indian Bul., 17 (1918), No. 2, pp. 79–82, fig. 1*).—Observations made during the season of 1917–18 showed a reduction in the length of lint from selected plants of different strains of Sea Island cotton, grown at La Guérite, St. Kitts, of from 1.8 to 8.2 mm. as compared with the lint obtained during 1916. The rainfall from May to December, 1916, was 56 in., and for the same period in 1917 only 31 in., indicating a possible correlation between the moisture supply and the length of lint.

Tabulated data are presented showing the daily rainfall of the first 24 days of the history of bolls opening on 10 different dates in 1917. Bolls opening between September 9 and 13 had only 2.5 in. of rain during their critical period of development, while those opening between October 9 and 13 had 6.98 in. The respective lint lengths were 49 and 57 mm. It is concluded, therefore, that in this region the length of lint is dependent upon the moisture supply of the plant at the critical period of boll development. Furthermore, it is deemed essential that considerable care be exercised in making comparisons of the length of lint produced by cotton grown in different seasons or in different localities, the rainfall of which are in no way comparable.

Flax: Its cultivation and preparation for market, H. R. Carter (*London: John Bale, Sons and Danielsson, Ltd., 1918, pp. VIII+84, pls. 2, figs. 8*).—Detailed directions are given for growing and harvesting the crop and for preparing the fiber for market, with special reference to conditions prevailing in Great Britain.

Flax culture, its development, decline, and restoration, H. J. Dannfelt (*K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), No. 7–8, pp. 472–481*).—This article discusses flax culture from a historical and statistical standpoint, and emphasizes the quality of fiber produced in different countries, including Sweden. A table is given showing the area devoted to flax and the yields of seed and fiber in the different provinces of Sweden for the years 1870, 1900, and 1915. The data presented point out a very marked decline of the Swedish flax industry during this period.

Flax preparation and its prospects [in Sweden], H. Hennig (*K. Landtbr. Akad. Handl. och Tidskr., 57 (1918), No. 7–8, pp. 482–500, figs. 21*).—This article represents an illustrated lecture on methods of retting, drying, breaking, and scutching flax. The organization, on April 20, 1916, of a Swedish association for the handling and preparation of flax for fiber is briefly noted.

[Flax production in Ireland] (*Ann. Rpt. Flax Supply Assoc. Ireland, 50 (1917), pp. 59*).—Tabulated statistics are presented showing the acreage and yield of fiber flax in Ireland in 1917, together with information relative to the textile industry throughout the world.

The varieties of Helianthus tuberosus, T. D. A. Cockerell (*Amer. Nat., 53 (1919), No. 625, pp. 188–192, figs. 2*).—*H. tuberosus* varieties *typicus*, *nebrascensis*, *alexandri*, *purpurellus*, *fusiformis*, *albus*, and *purpureus* are briefly described, all but the first having been grown by the author at Boulder, Colo.

The occurrence of dwarfness in oats, C. W. Warburton (*Jour. Amer. Soc. Agron., 11 (1919), No. 2, pp. 72–76, pl. 1*).—In this paper, a contribution from the Bureau of Plant Industry of the U. S. Department of Agriculture, the author notes the appearance of a dwarf type in a head row of Victory oats grown on irrigated land at the Aberdeen (Idaho) substation in 1916. The dwarf plants are described as "dense tufts of basal leaves with occasional culms not over 9 in. in height, bearing very small panicles. At the time these plants were found, early August, the normal plants were nearing maturity, while the upper portions of the panicles on the dwarf plants were just emerging from the sheaths. In most cases only 3 or 4 spikelets emerged, though a few additional ones remained enclosed within the sheaths. These dwarf plants for the most part failed to mature seeds before frost, though they were watered and protected from injury."

In 1917 all the viable seeds from the dwarf plants produced dwarfs exactly like the parents, while seed from 10 of the tall plants grown in the same head row with the dwarfs in 1916 and sown in individual plant rows in 1917 produced 168 tall plants and 66 dwarfs, 4 rows producing all tall plants. In 1918 seed produced in 1917 from individual tall plants in 4 of the segregating plant rows were sown again at Aberdeen, together with seed from the dwarfs and from rows showing all tall plants. The seed from both tall and dwarf plants in one segregating row was also grown by H. H. Love at Cornell University, and that from the remaining row by H. K. Hayes at the Minnesota Experiment Station. Of the 168 tall plants produced in 1917, 65 proved to be homozygous for tallness and 103 heterozygous. The latter produced 1,536 tall and 514 dwarf plants.

It is stated that "no adequate explanation of the sudden appearance of this dwarf forms has yet been found. The plant from which it developed grew in 1915 in the varietal classification nursery at Aberdeen, and for two or three years previous this lot of Victory oats had been grown from bulk seed produced from rows in this nursery. The Victory oat originated as a pure-line selection from a commercial variety, not a hybrid, at the Swedish Seed-Breeding Institute, Svalöf, Sweden. . . . There is no evidence that hybridization has entered into the production of this dwarf, though natural hybrids in oats are not infrequent at Aberdeen."

The author discusses briefly the occurrence of dwarfness in wheat with particular reference to plants described by W. Farrer.[1]

The potato and the war, J. M. Harraca (*La Pomme de Terre et la Guerre. Paris: Libr. Agr. de la Maison Rustique, 1918, pp. 64, fig. 1*).—The author presents a brief compilation of information relative to improved cultural methods resulting in increased yields of potatoes in France, with particular reference to the use of the so-called "vegetative tip" or bud end of the tuber for seed. The choice of adapted varieties and the improvement of existing strains is recommended. The importance of potato growing in the Army zone and the place of the potato in military vegetable gardens are discussed.

Soy beans in Alabama, E. F. Cauthen (*Alabama Col. Sta. Bul. 203 (1918), pp. 89–123, figs. 10*).—Directions are given for growing the crop in the State based on a review of fertilizer, cultural, and variety tests.

With acid phosphate applied at the rate of 240 lbs. per acre on sandy soil there was an average increase in yield of hay of 504 lbs., while with kainit and sodium nitrate there was no appreciable increase. Similar amounts of acid phosphate and rock phosphate resulted in gains of 323 and 243 lbs. of hay per acre, respectively. Chemical fertilizers failed to produce any appreciable increase in yields of grain, while cottonseed meal showed a sufficient increase on poor soil to justify its use. Lime also showed an increase.

Disinfected seed planted on soil where soy beans had not been grown for several years or never grown resulted in some inoculated plants, while plants from seed similarly treated but sown on land well supplied with barnyard manure possessed many nodules the first year.

Drilling in the seed at the rate of 5 pk. per acre gave the largest yield of both grain and straw, while the largest tonnage of hay of Mammoth Yellow was secured from a seeding rate of 45 lbs. per acre in rows 2.5 ft. apart.

[1] Agr. Gaz. N. S. Wales, 9 (1898), pp. 152–156.

The leading varieties in seed production included Blackbeauty, Haberlandt, Mammoth Yellow, Sherwood, Tokyo, Hollybrook, and Biloxi. The proportions of straw and grain in the yield varied, ranging from 18 per cent of grain for Barchet to 42 per cent for Blackbeauty. The time required for the best sorts to mature seed varied from 115 to 135 days. In 1917, in cooperation with the U. S. Department of Agriculture, 41 varieties and strains were grown for seed, all of which yielded less than Mammoth Yellow. Considerable variation in the fat and protein content of the different varieties was also noted.

Average yields of hay were secured ranging from 2,332 to 5,658 lbs. per acre. The growing period for 10 varieties varied from 85 to 112 days. Ebony, Hollybrook, Wilson, and Otootan are said to produce a good quality of hay, while Mammoth Yellow and Biloxi are somewhat woody.

A mixture of soy beans and cowpeas seeded broadcast at the rate of .5 pk. each produced about 1.25 tons of excellent hay per acre. Reducing the seeding rate to 48 lbs. per acre did not affect the yield, while soy beans seeded at the rate of 64 lbs. produced only about half as much as cowpeas seeded alone.

Cotton grown after soy beans, cowpeas, and corn produced 1,459, 1,426, and 1,141 lbs. of seed cotton per acre, respectively. Mixtures of Red Rust Proof oats and crimson clover, Blue Stem wheat and crimson clover, and crimson clover alone following the crops noted above produced 4,249, 4,268, and 3,391 lbs. of hay per acre, respectively. Winter oats following soy beans showed an increased yield of 178 per cent over that following corn. The average yields of grain for an 8-year period amounted to 1,677 lbs. of corn per acre, 611 lbs. of cowpeas, and 721 lbs. of soy beans.

Rabbits, nematodes, wilt, and root rot are said to be the most common enemies of soy beans.

Brief descriptions are presented of 22 leading varieties.

Growing soy beans in Alabama, E. F. Cauthen (*Alabama Col. Sta. Bul. 202 (1918), pp. 81–84*).—This is a popular edition of the bulletin noted above.

Studies in Indian sugar canes.—III, The classification of Indian canes with special reference to the Saretha and Sunnabile groups, C. A. Barber (*Mem. Dept. Agr. India, Bot. Ser., 9 (1918), No. 4, pp. 129–218, pls. 11, figs. 2*).—The author presents a further contribution to the subject (E. S. R., 33, p. 835; 36, p. 737), comprising a report on a classification of heretofore unidentified indigenous sugar cane varieties grown at the cane-breeding station, Coimbatore. Two additional groups of varieties have been recognized and are designated as the Saretha and the Sunnabile, respectively, these being the names of typical varieties in each group.

Observations were made during the 1916 and 1917 cropping seasons. The work as presented embraces a general list of the characters dealt with followed by a summary in tabular form of the principal differences noted between the two groups; notes on the dissection of stools as demonstrating the thickness of early and late canes and the relative systems of branching in the groups; outlines of a method for constructing an ideal cane for a variety or group by averaging measurements of the lengths of organs at successive joints; and a detailed list of the characters in which differences were observed with tables of measurements for the individual varieties in each group.

It is stated that the data upon which the classification is based also present information regarding the lines of evolution among certain cultivated canes, and that marked progress has been made in tracing the origin from the wild ancestor. A series of connecting links between the cultivated sorts and wild Saccharums now growing in India are believed to have been established.

The classification of indigenous Indian canes, C. A. Barber (*Agr. Jour. India, 11* (*1916*), *No. 4, pp. 371–376*).—This is a brief preliminary note of work described in detail above.

Growing sugar cane for sirup, P. A. Yoder (*U. S. Dept. Agr., Farmers' Bul. 1034* (*1919*), *pp. 35, figs. 15*).—Directions are given for growing and harvesting sugar cane in those regions where sirup is produced essentially as a small farm enterprise. Insect and disease pests affecting the crop are briefly described. Information is also presented relative to the equipment and labor required for cane production and sirup making. Notes on marketing the sirup and on the utilization of the by-products are included.

A more detailed account of the subject has been noted (E. S. R., 36, p. 835).

The inheritance of the length of the flowering and ripening periods in wheat, W. P. Thompson (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 12* (*1918*), *Sect. IV–V, pp. 69–87*).—Crosses made between many wheat varieties differing widely in regard to the length of the ripening and heading periods are described. The crosses involved parents differing only slightly over the whole range of variation as well as those showing successively greater differences. The varieties used included Prelude, Bobs, Marquis, Preston, Red Fife, Alaska, Kubank, and Club in the order of ripening in 1917. All parental stock had been grown in pure lines for several years. The data presented in this paper for the parental varieties and F_2 progeny refer to the season of 1917 and for the F_1 plants to the season of 1916.

Summarizing, the author states that the F_1 plants matured with the late parent, this appearing to be a case not of dominance but of postponement of the hereditary maturation period due to vigor of crossing. The F_2 plants formed regular curves of probability with intermediate means, in most cases the variation extending from below the mean of the lower parent to above the mean of the higher parent. Where parents differed only slightly the parental extremes were sometimes exceeded, while with wide differences the parental extremes were not always reached though the parental means were usually exceeded.

"Interpreting the results on the basis of the multiple determiner hypothesis of blending, the sum of the differences between each successive pair of parents seems to be much greater than it should be on the evidence of direct crosses. This hypothesis therefore fails to explain satisfactorily the results as a whole, though it may explain satisfactorily the results of each individual cross. Earliness can be combined with other desirable qualities by Mendelian methods, though it is necessary to raise very large numbers of plants because the great majority are intermediate."

Investigations on the content of sugar and dry matter of several winter wheat varieties, Å. Åkerman, H. Johansson, and B. Platon (*Sveriges Utsädesför. Tidskr., 28* (*1918*), *No. 5, pp. 216–224, figs. 2*).—Samples of four different varieties of winter wheat, Swedish Common, Sol Wheat II, Wilhelmina, and Small Tystofte II, were taken on eight different dates from November 12, 1917, to February 15, 1918, inclusive. The percentage of dry matter in the fresh material and the percentage of reducing substances, designated as sugar in the dry matter, were determined to ascertain a possible relationship between winter wheat resistance and the content of reducing substances. The results of the determinations, presented in tables, indicated that in the hardier varieties the sugar content was higher as a rule than in the varieties having lower winter resistant qualities.

Swedish Common, the hardiest variety in the group, was in every determination the highest in reducing substances, while Sol Wheat II stood next and Small Tystofte II, the least resistant of the three, was last. Wilhelmina, which has shown the smallest degree of winter resistance of the varieties under test, did not in all of the eight tests have a sugar content lower than that of Small Tystofte II. Results thus far obtained in these investigations are not considered adequate to warrant their application in wheat breeding work.

A dwarf wheat, G. H. CUTLER (*Jour. Amer. Soc. Agron., 11 (1919), No. 2, pp. 76–78*).—In this paper, a contribution from the University of Alberta, the author notes the occurrence of dwarf plants in a head row of Marquis wheat grown at the University of Saskatchewan from seed of typical Marquis plants selected in 1913. The dwarf is described as being about 9 in. in height, while typical Marquis measured as high as 40 in. Head rows from both tall and dwarf plants were grown in 1915 and 1916, it being stated that "all observations seemed to point to the fact that this dwarf condition was a simple dominant to tallness, despite the fact that the original parent was to all intents and purposes a normal tall."

Although Marquis wheat was derived from a cross between a dwarf Indian wheat, known as Hard Red Calcutta, and Red Fife, it is regarded as questionable whether the dwarfness observed in the cultures noted above can be attributed to the Indian ancestor. Dwarf forms occurred frequently in Marquis in 1914, 1915, and 1916, and in other varieties of wheat similarly treated, including Red Fife.

Russian wheat, L. FELDE (*Le Blé Russe., Lausanne and Paris: Libr. Payot & Co., 1917, pp. 158, pls. 2, figs. 6; rev. in Science, n. ser., 48 (1918), No. 1240, pp. 336, 337*).—This paper deals with the production and export of Russian wheat, including a rather detailed discussion of soil, climatic, technical, and social conditions pertaining to wheat production, and of all phases of internal and external transport, with particular reference to exports to Switzerland.

Wheat growing and wheat experiments (*Union So. Africa, Dept. Agr. Local Ser. No. 23 (1918), pp. 38*).—This briefly describes cultural, fertilizer, and variety tests with wheat in South Africa.

Seed Reporter (*U. S. Dept. Agr., Seed Rptr., 2 (1919), No. 10, pp. 8, figs. 4*).—The principal features of this number include observations on European seed conditions, as reported by A. J. Pieters and W. A. Wheeler, and tentative seed production and consumption maps showing the counties of the United States reported as normally producing either a surplus, a sufficient, or an insufficient quantity of Siberian millet, Japanese millet, sumac sorgo, and Sudan grass seed as compared with the planting requirements of each county.

Market conditions relating to various kinds of field seeds in five geographical divisions are noted, together with information regardng the movement and supplies of soy beans, cowpeas, and velvet beans, and wholesale and retail selling prices of 30 kinds of field seeds about March 20, 1919. Tabular data are also presented showing the average percentage of different varieties of soy beans and cowpeas normally handled by wholesale and retail dealers, together with the amount normally shipped out from producing sections by local shippers for a number of States.

The advantages to the farmer in buying labeled seed only are briefly discussed by E. Brown.

The usual statistics relating to imports of forage plant seeds permitted entry into the United States are included.

Agricultural seed inspected in March and April, 1918, C. P. SMITH (*Maryland Sta. Bul. 224 (1918), pp. 127–155*).—This bulletin reports the results of purity and germination tests with 725 official samples of agricultural seeds collected during March and April, 1918, showing the values given on the tags and those found by examination.

Report on the State seed control, K. Dorph-Petersen (*Tidsskr. Planteavl, 25* (*1918*), *No. 4, pp. 569–628*).—A general discussion of the activities for the year ended June 30, 1918, representing the forty-seventh year of the work, is presented, and statistics regarding the number of seed analyses and their results for the year in question as well as for the period from 1908 are given.

In the year 1917–18, 19,242 seed samples were examined, as compared with 4,197 for the year 1906–7. The average results of all tests for each species from 1908 to 1918 and also for the year 1917–18 are set forth in tables, with the data relating to number of samples. 1,000 kernel weight, foreign seeds, weed seeds, inert matter, clean seed, time required for germination, and vitality of seed.

Report on the activities of the Swedish Seed Association in Noorland in 1917, A. Ulander (*Sveriges Utsädesför. Tidskr., 28* (*1918*), *No. 5, pp. 225–240*).—Results are briefly reported of crop tests in different parts of Norrland with timothy, meadow fescue, meadow foxtail, red clover, grass and clover mixtures, barley, oats, peas, rye, and root crops.

Investigations of weed growth as related to mineral soils in Denmark, C. Ferdinandsen (*Tidsskr. Planteavl, 25* (*1918*), *Nos. 4, pp. 629–758; 5, pp. 763–926*).—This article presents an historical review of the more important methods of classifying species according to environment and locality, discusses the relation of the chemical and microbiological soil reactions to the distribution of species, and notes the changes occurring in plant groups or populations. The plant survey methods used by different investigators are described, and the determination of the number of individuals or sprouts in relation to weight, area and volume, and of the distribution to frequency and area values are discussed. The author classifies the more important species according to their frequency as abundant, subabundant, frequent, and subfrequent, and explains by means of formulas and otherwise how he arrives at these different degrees of frequency.

In studying the plant populations of different localities the soil reactions were determined, and the results are tabulated showing the number of times the species were found on acid or lime poor and on alkaline soils. Lists are submitted of the species of weeds showing preference for acid, alkaline, or neutral soils. Observations were made further regarding the age of plant populations, the causes determining changes in the flora of a locality, and the successions which occur. Studies were made also of a large number of plant populations with reference to the species represented and their relative importance, the kind of soil and its reaction, the effect of soil inoculation with Azotobacter and the crop rotation followed. The results thus obtained are given in a series of 63 tables. A bibliography of 90 references is appended.

The protein content and microchemical tests of the seeds of some common Iowa weeds, L. H. Pammel and A. W. Dox (*Proc. Iowa Acad. Sci., 24* (*1917*), *pp. 527–532*).—Tabulated data are presented showing the weight of 50 seeds, the number of seeds per gram, and the protein content of 59 different kinds of weed seeds, together with the results of microchemical tests for starch, protein, and fat in 108 kinds.

The weight of 50 seeds ranged from 0.0034 gm. for mullein (*Verbascum thapsus*) to 2.326 gm. for horse gentian (*Triosteum perfoliatum*). The protein content of the seeds examined varied from 3.24 per cent for sumach (*Rhus glabra*) to 35.05 per cent for sweet clover (*Melilotus alba*).

Useful farm weeds, W. E. Brenchley (*Jour. Bd. Agr.* [*London*], *25* (*1918*), *No. 8, pp. 949–958*).—The uses of the common farm weeds other than bracken and heather for medicine, dyes, forage, human food, green manures, fiber, and for miscellaneous purposes such as fuel, scouring agents, etc., are briefly indicated.

Injurious weed seeds in grasses and clovers harvested for seed in Britain (*Jour. Bd. Agr. [London], 25 (1918), No. 8, pp. 941–948*).—Weed seeds found in samples of rye grasses and clovers are listed, methods of eradicating certain harmful weeds indicated, and means of identifying weeds scheduled as injurious in the Testing of Seeds Order briefly noted.

The eradication of yellow rattle (*Aberystwyth: Univ. Col. Wales [1919], pp. 8*).—This weed (*Rhinanthus crista-galli*), said to be largely parasitic on the roots of grasses, is briefly described, and methods for its eradication in meadows outlined. Relatively heavy applications of salt (about 0.5 ton per acre) proved most effective in exterminating the seedling plants.

HORTICULTURE.

Horticulture and the war, C. A. McCue (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 68–72*).—A brief discussion of horticultural activities in relation to the war, including a list of horticulturists in the military and naval services on special war work.

Horticultural extension work in Indiana, C. L. Burkholder (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 56–59*).—Extension work in various branches of horticulture is outlined.

Extension work in horticulture, W. R. Beattie (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 45–49*).—An outline of extension activities of the U. S. Department of Agriculture along the line of vegetable production.

Vegetable gardening on a war basis in the colleges and stations, C. E. Myers (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 93–99*).—A review of activities at the various colleges and stations dealing with the stimulation of vegetable production.

The war garden victorious, C. L. Pack (*Philadelphia: J. B. Lippincott Co., 1919, pp. XVI+179+[64], pls. 65, figs. 140*).—This is essentially a report of the activities of the National War Garden Commission in connection with the stimulation of vegetable production throughout the country during the period of the war.

The city home garden, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1044 (1919), pp. 39, figs. 16*).—This contains practical instructions for growing the more important vegetables, special attention being given to problems that confront the city gardener.

Vegetable seed growing and breeding, J. W. Crow (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 88–93*).—An account of vegetable seed breeding work conducted at the Agricultural College, Guelph, Ontario, during recent years.

Instructions for seed production in Switzerland, E. Rey (*Instruction Sommaire sur la Production des Principales Graines Potagères en Suisse. Bern: Dépt. Suisse Écon. Pub., 1917, pp. 18*).—This is designed to encourage production, by Swiss growers, of more and better vegetable seeds, giving directions for cultivation, selection, and storage.

Onions, garlic, and spinach, F. Garcia (*New Mexico Sta. Bul. 115 (1918), pp. 26, figs. 9*).—This bulletin, which is issued in Spanish, contains practical directions for growing onions, garlic, and spinach, based on cultural experiments conducted at the station.

Pollination of tomatoes, A. G. B. Bouquet (*Oregon Sta. Bul. 158 (1919), pp. 29, figs. 5*).—In continuation of previous work (E. S. R., 32, p. 636), an account is given of experiments conducted in the station greenhouse and in cooperation with commercial growers during the period 1915–1919. In obtaining necessary data a total of about 80,000 tomato blossoms have been under observation. The results of other investigators are reviewed and a bibliography is appended.

Hand pollination of flowers has reduced the number of unfruitful blossoms from 66 per cent to 20 per cent of the total number of flowers produced, the percentage of reduction depending upon the comparative thoroughness of the pollination. For various causes difficult to control, when working with a large number of blossoms, a reduction below 20 per cent of unfruitful blossoms seemed to be impossible. The average fruitfulness in typical plants of 15 crops of tomatoes was 72 per cent for pollinated blossoms and 36 per cent for unpollinated blossoms. The average yields for pollinated and unpollinated plants were 7.4 and 4.4 lbs. of tomatoes, respectively. The percentage of fruitfulness and unfruitfulness of individual clusters of a crop given specific treatment varied to a considerable extent, but total and average records indicated a remarkable mean of percentage of uniformity of all clusters.

Of various methods of pollination tried, the emasculation method has been more widely used than any other, and is recommended principally because of ease in applying pollen, prevention of duplication of pollination, and thoroughness of application at a time when the flower is most receptive. Details developed at the station in using the emasculation method are described.

Hand pollination of blossoms stimulated early development of the fruit as compared with naturally pollinated blossoms. Fruits produced from hand-pollinated flowers have been harvested as early as 21 days before fruit from plants not artificially pollinated. The author points out that the cost of pollination for the entire season, which was approximately 3 cts. per plant, may be covered by increased yields from pollinated plants in the first two weeks of harvesting, when higher prices prevail. The comparative net returns of plants after deducting the cost of pollination show an increased value of from 16 to 67 cts. a plant, or an average of 38 cts. a plant for pollination.

It is pointed out that whereas regularity and thoroughness of pollination are conducive to high plant yield, inexperienced labor, haste, and irregularity in doing the work may not produce profitable net results.

Organizing canhouse tomato growers for emergency production, R. W. De Baun (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 59–62*).—The method of organizing tomato growers' associations in Delaware, Maryland, and New Jersey is described.

Extension service in pomology in the U. S. Department of Agriculture, C. P. Close (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 49–52*).—An outline of the Department's extension activities relating to fruit production.

Extension work in pomology in New York, R. W. Rees (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 53–56*).—An outline of extension activities in New York State.

Report of committee on variety testing, J. H. Gourley (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 106–110*).—A list is given of large or notable collections of fruits and nuts at American colleges and experiment stations, together with partial lists of variety collections in the hands of private growers and nurseries.

Winter injury of fruit trees, J. Oskamp (*Indiana Sta. Circ. 87 (1918), pp. 11, figs. 9*).—A brief survey of the extent and nature of winter injury to fruit trees in Indiana during the severe winter of 1917–18, with suggestions on the treatment and care of winter-injured trees. A note on Insects Associated with Winter Injury, by R. W. Kelley, of the Bureau of Entomology of the U. S. Department of Agriculture, is also included.

The author concludes that the damage cut the bearing acreage of peaches in the State at least 60 per cent, whereas only a small percentage of the apple acreage was completely killed. Elevation and varieties were among the most important factors in influencing winter injury. A high elevation proved to be a decided protection for both peaches and apples. Baldwin, Stayman, Ben Davis, Northern Spy, York Imperial, and Jonathan were the most tender varieties, about in the order named. Grimes Golden, Winesap, and Rome Beauty were not damaged sufficiently to be classed as tender. Northwestern Greening and Delicious appeared to be entirely hardy in Indiana. Since Elberta is the chief commercial peach grown, very few data were secured on peach varieties.

Of the less important fruits, pears and plums, except the American varieties, suffered somewhat more than apples. Sweet cherries were next in tenderness to the peach. Sour cherries and American plums were practically uninjured.

Winter injury to fruit trees in New Jersey, M. A. Blake (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 24, 25*).—A discussion similar to the above.

Winter injury in New York State during 1917–18, W. H. Chandler (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 18–24*).—A discussion of the nature and extent of winter injury to fruit trees in various parts of New York State.

Winter injury to fruits in Wisconsin in 1918, J. G. Moore (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 31, 32*).—A brief discussion similar to the above.

Winter injury in Canada, W. T. Macoun (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 13–17*).—A discussion of the nature and extent of winter injury to fruit trees at the Experimental Farm, Ottawa, and elsewhere in Canada, with special reference to the winter of 1917–18.

Winter injury in Indiana, J. Oskamp (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 25–30*).—A discussion similar to the above, including some data on a limited experiment in pruning frozen peach trees. Although the results are not conclusive, they indicate that the trees should receive only a moderate pruning while in a dormant condition. Heavy pruning and dehorning was disastrous when performed while the trees were dormant, but was fairly successful when performed after the trees were in full leaf. Moderate pruning either early or late seemed to be all the trees required.

Winter injury in Ohio, W. Paddock (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 30, 31*).—A discussion similar to the above. The experience of practical growers in Ohio demonstrated that moderate pruning of frozen peach trees gives better results than either severe or very light pruning, or than no pruning at all.

The pruning of winter-injured peach trees, A. J. Gunderson (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 32–38*).—A discussion of winter-injury to peach trees in Illinois, including the results of pruning experiments conducted under the direction of the Illinois Experiment Station.

On three, four, and five-year old Elberta peach trees, moderate pruning in the form of clipping back of last year's growth gave the best results from the standpoint of size, shape, and openness of the trees and in the number of strong fruit buds. Dehorning winter-injured peach trees of these ages proved to be a poor practice, and was entirely unnecessary. No pruning at all gave better results than dehorning. Nitrate of soda at the rate of 1 lb. per tree increased the amount and color of the foliage on moderately pruned 4-year-old Elberta trees, but was of little value on dehorned trees.

Discoloration of the inner wood of peach trees is not an absolute indication of the inability of trees to recover from the effects of winter injury. New sapwood formed in most cases when pronounced discoloration had resulted.

The relation of time of blooming to ripening period in peach varieties, J. B. S. NORTON (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 66, 67, fig. 1*).—The author presents tables, based on an examination of data bearing on peaches of New York (E. S. R., 38, p. 42), relative to the blooming and fruiting periods of 179 varieties of peaches. These indicate in a general way that the later the blooming of peaches the later the ripening.

Five years' results in plum pollination, A. H. HENDRICKSON (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 65, 66*).—A summary of the author's paper on this subject, discussing the results of five years' investigations in pollination studies conducted at the University of California. Of the Japanese varieties tested, Combination, Kelsey, Satsuma, Burbank, Wickson, Sultan, and Abundance were self-sterile. The Climax was self-fertile or at least partly so.

Among the European plums and prunes Clyman, Tragedy, and Robe de Sergeant were self-sterile. Imperial occasionally set fruit with its own pollen, but for commercial purposes may be classed as self-sterile. The French (Agen) and Sugar prunes were self-fertile. No cases of inter-sterility, either in the Japanese or European plums, were found.

Some factors favoring or opposing fruitfulness in apples.—The effect of certain conditions and practices on the development and performance of the individual fruit spur, C. C. WIGGANS (*Missouri Sta. Research Bul. 32 (1918), pp. 3–60, pls. 4, fig. 1*).—The results of a number of experiments dealing with fruitfulness in apples are reported. These include performance records of fruit spurs; sap concentration studies, both by the freezing method and by actual chemical analyses; fertilizer experiments, and experiments in girdling, tillage, pruning, and etherization. A review of the literature bearing upon the favoring or opposing fruitfulness in apples is included.

Various performance records of individual fruit spurs on trees of different varieties of apples were started in 1913 and continued for a 5-year period in order to determine whether an individual spur or branch blossoms two or more years in succession, in alternate years, or only once in its life history as a fruit bearer. The data from these records are here tabulated in summarized form and discussed.

Jonathan, Grimes, and Winesap were able to develop a fairly high percentage of blossoms each year while Rome, York, and Gano produced an exceedingly high percentage of blossoms one season and a very low one the next. The varieties used show remarkable uniformity with respect to the percentage of the individual fruit spurs which alternate, that is, bloom only once in two years. Jonathan and Winesap were able to develop blossoms in successive seasons on the same spur in a much greater proportion than the other varieties observed.

The work indicates that the soil in which the tree is growing has little effect upon the performance of the individual spurs with respect to alternation. Contrary to the results of some investigators, however, it appears that the fruitful year of certain alternating sorts may be changed by the removal of the blossoms through either accident or design. The age of the spur systems of the various varieties is practically the same, ranging usually from 2 to 8 years, 3 to 6 or 7 years being apparently the most effective fruiting age.

In order to determine whether there is a correlation between the concentration of plant sap and stored reserves in bearing and nonbearing parts and the observed bearing or nonbearing condition, determinations were made by the freezing point method and also by making an actual chemical analysis of the parts under consideration. Results as here presented indicate that sap from bearing spurs has a slightly higher concentration (lower freezing point) during a considerable portion of the year than sap from nonbearing spurs. A marked decrease in the sap concentration of both bearing and nonbearing spurs occurs in late June or early July. Leaf sap from bearing and nonbearing spurs shows considerable variation in concentration. The number of fruits on a spur affects the concentration of neither spur nor leaf sap. Sugar and starch were found to be present in slightly greater amounts in the bearing spur than in the nonbearing one.

Counts and measurements were made of the leaves on fruit spurs during three seasons. They indicate that bearing spurs have a smaller total leaf area than nonbearing spurs, the difference being due to the number of leaves developed rather than to the size of the individual leaves.

To determine the effects of girdling upon the concentration of plant sap a number of nursery trees ranging from 3 to 5 years old were girdled in the two seasons 1915 and 1916. Girdling, regardless of the season, caused an increased concentration of sap in the parts above the girdle and a decreased concentration in the parts below. The most marked effects are in the parts nearest the girdle, the effect being lessened as the distance from the girdle increased.

Fertilizer experiments were conducted with dwarf Rome apple trees planted in boxes of sand or soil. Nitrogen, potash, and phosphorus were used both alone and in combination. The results showed that effects upon the size of the tree, the development of its fruiting wood, and the production of blossoms could be attributed only to the use of nitrogen, which was a very decisive factor in both the formation of fruiting parts and the development of blossom buds.

Tillage experiments have been conducted at the station for a number of years. Some data are given showing the effect of the tillage method upon depression of twig sap in several varieties. The results, as a whole, show that trees growing in a permanent sod of either grass or a legume had a higher concentration of twig sap than trees growing in plats planted with either annual or biennial cultivated crops.

A pruning experiment was begun in 1914 with 1-year-old Delicious apple trees to determine the relative influence of different pruning systems upon the size, character of growth, and fruiting age of apple trees. The results thus far secured show that trees headed at 5 or 6 ft. did not produce so many short branches (potential fruiting wood) during the first three years in the orchard, as trees headed at 2 ft.

In view of the fact that etherization has proved to be a very effective stimulant upon the enzym activity of detached parts of woody tissues 12 Jonathan apple trees were etherized, one each month, beginning December, 1914, and continuing until November, 1915. The data given show that etherization has little effect upon the concentration of either twig or leaf sap, and the small differences observed seemed to be only temporary.

Hardiness in top-worked varieties of the apple, M. J. Dorsey (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 38–45, fig. 1*).—A discussion of winter injury in Minnesota, including tables showing the degree of wood browning of 60 standard apple varieties in 1916–17 and also summarizing the degree of winter injury to standard apple varieties growing on different stocks during the winter of 1917–18.

Spraying apple trees in bloom, W. S. Brock (*Proc. Amer. Soc. Hort. Sci., 15 (1918), pp. 80, 81*).—The results of experiments conducted in the three seasons, 1916–1918, are briefly noted. They indicate that none of our common spraying materials applied at pressures not exceeding 300 lbs. have any deleterious effects upon the bloom, or cause any appreciable reduction in the quantity of fruit produced. The observations seem to indicate that an application of a fungicide during full bloom would be advantageous, especially on scab susceptible varieties.

Some effects of high temperatures and humidity upon the keeping quality of Bartlett pears, R. H. TAYLOR and E. L. OVERHOLSER (*Mo. Bul. Cal. Com. Hort., 8 (1919), No. 3, pp. 118–125*).—The preliminary investigation here reported confirms the results secured by Shamel as to the retarding effect of high temperatures on the ripening of pears when stored under high humid conditions (E. S. R., 36, p. 741), and indicates that both the high temperatures and high humidity were responsible for the retarding effect. The authors conclude that while the experiments show that temperatures ranging from 95 to 110° F., with the optimum at about 104 to 105°, will delay or prolong the normal ripening process of Bartlett pears at least two weeks when contrasted to fruit placed at average room temperatures of 70 to 80°, the danger from rot and the development of abnormal flavors limit the practical use of these higher temperatures.

How the strawberry sets fruit, W. D. VALLEAU (*Minn. Hort., 46 (1918), No. 12, pp. 449–454, figs. 4*).—A contribution of the Minnesota Experiment Station, discussing the flower cluster and flowering habit of the strawberry with relation to the formation of nubbins, the decline in size and yield of fruit in the latter part of the picking season, and the relative productivity of pistillate and staminate varieties. The paper is based on the author's study of sterility in strawberries (E. S. R., 39, p. 48).

Strawberry varieties in the United States, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 1043 (1919), pp. 36, figs. 8*).—An aid to both commercial and amateur strawberry growers in the selection of varieties best suited to their needs and conditions. The varieties listed, which are given for different sections and regions, are based upon information furnished by successful growers, commercial canners, experiment station tests, and the author's personal observations. Varieties having particular value for different purposes are grouped under appropriate heads.

Strawberry culture.—Eastern United States, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 1028 (1919), pp. 50, figs. 18*).—This bulletin discusses commercial methods in the eastern United States, including approximately one tier of States west of the Mississippi, but not including the South Atlantic and Gulf coast region. In addition to complete directions for growing, harvesting, and marketing strawberries, methods of using the surplus in canning, preserving, and by means of cold storage for future use are also presented.

Strawberry culture.—South Atlantic and Gulf coast regions, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 1026 (1919), pp. 40, figs. 21*).—A bulletin similar to the above, describing methods of growing and handling strawberries adapted to the South Atlantic and Gulf States.

Strawberry culture.—Western United States, G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 1027 (1919), pp. 29, figs. 16*).—A bulletin similar to the above discussing commercial strawberry practices in the irrigated regions of the West.

Fig growing in the South Atlantic and Gulf States, H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul. 1031 (1919), pp. 45, figs. 24*).—This describes the varieties of figs most suitable for the South Atlantic and Gulf States, their culture and protection from diseases and insects, and methods of making them into desirable products for the table.

The hybrid direct bearers in the valley of the Drome in 1918, A. DESMOULINS and V. VILLARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 40 (1919), Nos.*

11, pp. 253–257; 12, pp. 277–279; 13, pp. 302–307).—In continuation of previous data (E. S. R., 39, p. 242), observations are given for the nineteenth year relative to the behavior of a large number of hybrid direct-bearing grapes, with reference to their resistance to disease, adaptation to various soil condition, production, etc.

Developing new grape industries, G. C. HUSMANN (*Proc. Amer. Soc. Hort. Sci., 15* (*1918*), *pp. 73–79*).—A summarized account of the more important viticultural investigations of the U. S. Department of Agriculture.

An investigation of the abnormal shedding of young fruits of the Washington navel orange, J. E. COIT and R. W. HODGSON (*Univ. Cal. Pubs. Agr. Sci., 3* (*1919*), *No. 11, pp. 283–368, pls. 18, figs. 9*).—Observations and experiments dealing with the excessive "June drop" of Washington navel oranges in certain sections of California are reported. Most of the field experiments were conducted in Kern County in orchards situated to the leeward of a considerable stretch of desert, typical of the southern San Joaquin Valley, where aside from the annual heavy drop and the light crops borne, the navel orange matures early and is of excellent quality. The problem was studied both from the pathological and physiological standpoints.

The shedding was found to constitute true abscission, involving the separation of living cells along the plane of the middle lamellæ. Of the stimuli investigated, two, a fungus, *Alternaria citri*, and climatic conditions are held to be responsible for the abscission. "It is considered highly probable that a certain varying percentage of the drop, occurring relatively late in the season, is brought about by the stimulation of this fungus, which is also responsible for a black rot of those infected fruits which remain on the trees to maturity. This fungus is of very wide distribution and infection of the young fruits is made possible through the peculiar structure of the navel orange. The amount of infection is dependent upon weather conditions and the more or less fortuitous configuration of the navel ends of the young fruits. On account of the peculiar manner of infection and the relatively small amount of shedding due to the fungus, spraying will probably not pay for the labor and materials involved. By far the greater part of the shedding, which occurs earlier in the season, is due to a stimulus to abscission arising from daily water deficits in the young developing fruits, resulting from the asperity of the climatic complex to which the trees are subject.

"The principal factor in causing these abnormal water deficits lies in the fact that citrus trees are not adapted to withstanding the heavy water loss incident to the desert conditions under which they are grown. The amplitude of stomatal movement is small and cuticular transportation very high. It is further believed that under the prevalent clean cultivation practice the soil temperatures during a part of the day are so high as to result in the inhibition of absorption at the very time of day that water loss by transpiration is greatest. It has been found possible to modify climatic conditions in an orchard so as to set crops in every way comparable with those produced in much more climatically favored citrus districts. Under these modified climatic conditions the abnormal water relations referred to apparently do not occur.

"Practical means of amelioration lie in heavier and more frequent irrigation, the planting of intercrops, mulching with straw and other materials, protection by means of windbreaks, and a reduction of leaf area by moderate winter pruning. Measures of an anticipatory nature lie in the judicious selection of the site for the orchard with reference to its exposure, nearness to large irrigated bodies of land, and other features calculated to ameliorate climatic conditions. Orchardists should be on the lookout for mutant strains which are dry heat resistant and satisfactory in other features."

Influence of foreign pollen on the development of vanilla fruits, T. B. McClelland (*Jour. Agr. Research* [*U. S.*], *16* (*1919*), *No. 9*, *pp. 245–251*, *pls. 5*).—In connection with adaptation studies conducted with several species of vanilla at the Porto Rico Experiment Station, various reciprocal crosses were made at Mayaguez with a view to the development of valuable strains. It was observed that the fruits of these hybrids were noticeably different from the others on the same vines, hence numerous additional crosses were made to study this phenomenon. Tabular data are given showing the girth measurements of fruits resulting from reciprocal crosses between *Vanilla planifolia* and several other species commonly grouped together and called "vanillon." Variations among the hybrids are also shown in photographical illustrations.

Where to either the *V. planifolia* or the vanillon stigma pollen of the other has been applied a very decided modification in the form of the fruit has resulted. The modification is in most instances so decided that these fruits can be distinguished from close-fertilized fruits at a glance. The author attributes this phenomenon to variations in flower structure. The column of the vanillon species is much longer than that of *V. planifolia*, exceeding the length of the latter in some instances by as much as 60 to 70 per cent.

"It seems quite reasonable to suppose, from the heavy fertilization of ovules near the apex and sparse fertilization or entire absence of fertilization near the base of the ovary when the vanillon stigma has been pollinated with *V. planifolia* pollen, that these pollen tubes are unable to reach or reach in only limited numbers the ovules in the far end of the ovary, which are at a considerably greater distance from the stigma than the farthest ovules of the *V. planifolia* ovary. Even in its own ovary, the *V. planifolia* pollen causes a much heavier fertilization near the apex than near the base. This inability of *V. planifolia* pollen tubes to reach the farthest ovules was particularly marked when *V. planifolia* pollen was applied to V48, which is one of the largest flowered of the vanillon varieties.

"The vanillon pollen tubes, however, reach ovules in the *V. planifolia* ovary at a much shorter distance from the stigma than in their own flower. Many of these first ovules which the *V. planifolia* pollen would fertilize are left unfertilized by the vanillon pollen, the pollen tubes passing by to other ovules which are nearer the normal distance from stigma to ovary in the vanillon flower, and causing a much heavier fertilization in the base of the pod than would the *V. planifolia* pollen.

"This might possibly indicate in this instance the necessity for a certain maturity of development of the pollen tube before the ovule can be fertilized."

Notes on geranium breeding, W. R. Ballard (*Proc. Amer. Soc. Hort. Sci.*, *15* (*1918*), *pp. 62–65*).—Some breeding experiments were started with the geranium at the Maryland Station in 1907 with the view of improving it as a bedding plant. Some 125 named varieties of the zonal group and a few plants of the Lady Washington and scented-leaved sections were used in the work.

Several hundred seedlings have been grown, but the greatest difficulty has been encountered in the attempt to combine the disease-resistant character with the flower characters which would make them of special value for bedding. Because of the hybrid nature of most varieties considerable segregation takes place in the F_1 generation. The results from one season's crop of seedlings in relation to the form of the flower gave the following totals: Singles×singles gave 84 singles and 6 doubles; singles×doubles gave 59 singles and 74 doubles; doubles×doubles gave 40 singles and 30 doubles.

In the course of the work it was observed that the nectar tube was not a constant character in the zonal group, but was apparently correlated with the single flowering character. The majority of the double flowering sorts were without this nectar tube. At attempt to hybridize different species met with but little success. Hybrids of the zonal group and the ivy-leafed sections are not very fertile. The Lady Washington type will combine with some of the scented-leaved types, but the zonals will not hybridize with either the show or the scented-leaved groups.

After a three years' test it was determined that leaf spot in geraniums can be almost completely prevented by keeping the foliage dry. There was a marked variation in the ability of the varieties studied to resist leaf spot when grown in the open ground. Most of the varieties extensively used for bedding show a marked resistance to it, indicating special selection with relation to this disease.

FORESTRY.

Influences of the National Forests in the southern Appalachians, W. L. Hall (*Jour. Forestry, 17 (1919), No. 4, pp. 402–407*).—The author discusses the influences at present discernible on local population, local improvements, and local industries which use wood as a material, and on forest management in the region in which the National Forests are located.

A program of forest conservation for the South, J. G. Peters (*Jour. Forestry, 17 (1919), No. 4, pp. 364–370*).—A paper on this subject read before the Washington section of the Society of American Foresters, February 13, 1919.

Some aspects of silvical research as an after-the-war activity, C. Leavitt (*Jour. Forestry, 17 (1919), No. 3, pp. 273–280*).—The author briefly outlines silvicultural studies that are being conducted in eastern Canada, and calls attention to the need of pursuing similar studies in the recently created National Forests and at selected experiment stations in the eastern United States.

Forestry and the war in Italy, N. C. Brown (*Jour. Forestry, 17 (1919), No. 4, pp. 408–412*).—A brief survey of the present status of forests and forest activities in Italy.

Forest survey.—Third annual report, 1918, G. H. Prince (*Ann. Rpt. Crown Land Dept. New Brunswick, 58 (1919), pp. 74–121, pls. 18*).—A progress report of the forest survey of the Crown Lands of New Brunswick for the year ended October 31, 1918. A total of 1,660,000 acres, or about 22 per cent of the Crown Lands, have been classified.

Tropical reconnaissance with special reference to work in the Philippines and British North Borneo, D. W. Matthews (*Jour. Forestry, 17 (1919), No. 4, pp. 371–377*).—A brief review of the present status of forest reconnaissance in the Philippines and British North Borneo.

Observations on unburned cut-over lands in the Adirondacks, E. F. McCarthy (*Jour. Forestry, 17 (1919), No. 4, pp. 386–397, figs. 2*).—Results are given of a study, conducted under the direction of the New York State College of Forestry, of stand and reproduction on unburned cut-over lands in the Adirondacks.

Thunder Mountain, H. S. Graves (*Amer. Forestry, 25 (1919), No. 303, pp. 907–911, figs. 9*).—The author describes the present devastated condition of Thunder Mountain in central Idaho as a striking illustration of the poor policy of leaving public lands unprotected and subject to the abuses of unregulated grazing of sheep.

Conifer additions to shelter belts on the northern Great Plains (*U. S. Dept. Agr., Bur. Plant Indus., 1919, pp. 6*).—This circular points out the desirability of adding evergreens to shelter-belt planting in the northern Great Plains, and gives the terms of a proposed cooperative plan for establishing demonstration conifer shelter belts. Suggestions for growing such shelter belts are also included.

Care of cooperative shelter belts on the northern Great Plains (*U. S. Dept. Agr., Bur. Plant Indus., 1919, pp. 5*).—Instructions are given for the care of shelter belts, and their protection from insects, animal pests, and diseases.

Some biological and economic aspects of the chaparral, E. N. MUNNS (*Jour. Forestry, 17 (1919), No. 1, pp. 9–14*).—The author briefly discusses the influence of chaparral on forest reproduction and the present economic uses of chaparral growth.

Bear clover, Chamaebatia foliolosa (mountain misery, bear-mat, tarweed), J. A. MITCHELL (*Jour. Forestry, 17 (1919), No. 1, pp. 39–43*).—A discussion of the influence of bear clover (*C. foliolosa*) on forest reproduction, including tabular data showing the results of observations made by G. W. Lyons and J. V. Wulff on the Eldorado and Stanislaus National Forests in 1912.

These observations indicate that in general reproduction on a given site is adversely affected by a ground cover of bear clover, and that the relative percentage of incense cedar reproduction increases while the percentage of pine reproduction falls off as the density of the bear clover cover increases. In the densest stand of bear clover the reproduction of all species has been completely excluded.

The influence of thinning on western hemlock and grand fir infected with Echinodontium tinctorium, J. R. WEIR and E. E. HUBERT (*Jour. Forestry, 17 (1919), No. 1, pp. 21–35, fig. 1*).—Experiments conducted in the Priest River Valley, Idaho, under the direction of the Bureau of Plant Industry of the U. S. Department of Agriculture are reported. The thinning experiments were conducted without regard to the selection of marketable timber, but as a method of opening up the original stand.

The results thus far secured indicate that a less favorable condition for fungus activity exists within the cut-over area, and show plainly that a highly favorable condition for the fungus is present in the uncut areas. The total number of infected trees, the total number of live sporophores, and the total number of sporophore-bearing trees are comparatively less on the cut-over area for both species of trees.

Thinning was found to affect appreciably the vigor of the trees of the cut-over areas, as shown by the increased diameter, crown, and height growth, as well as the number of injuries healed. The thinning influences affecting the fungus *E. tinctorium* were not considered to be of sufficient importance to cause any variation from the predetermined sanitation rules to be applied to these species of trees.

Importance of clearing out hardwoods and balsam fir emphasized by experience, W. R. BROWN (*Canad. Forestry Jour., 14 (1919), No. 3, pp. 169–172, fig. 1*).—The author briefly describes the general silvical systems employed by a large lumber company in northern New Hampshire and Maine, and the results obtained from them twenty years later.

The relation of gray birch to the regeneration of white pine, J. W. TOUMEY (*Jour. Forestry, 17 (1919), No. 1, pp. 15–20*).—The author reports some studies relative to the effect of gray birch of varying ages and densities on white pine reproduction and on its rate of height growth. The studies were conducted largely on the forests owned by the Yale School of Forestry at Keene, N. H., and in adjoining forests.

The results indicate that pure stands of gray birch in southern New Hampshire are never sufficiently dense to cause the death from shading of white pine growing beneath. The rapidity of height growth in white pine under gray birch is dependent upon the density of the birch, and is regulated more by the competition for soil moisture and nutrients than by the shade of the birch canopy. Pure stands of gray birch of all densities may be underplanted with white pine and the birch removed when the slowing-down of growth in the pine or the economic utilization of the birch makes it advisable.

The regeneration of sal (Shorea robusta) forests, R. S. Hole (*Indian Forester, 45 (1919), No. 3, pp. 119–132, fig. 1*).—A summary of conclusions, based on the results of a long series of experiments carried out at Dehra Dun in recent years, including a sketch of the proposed system of regeneration.

Mahogany and some of its substitutes, S. J. Record (*Jour. Forestry, 17 (1919), No. 1, pp. 1–8*).—A contribution from Yale School of Forestry, comprising a descriptive key based on the gross and lens characters of most of the woods known to the trade as "mahogany," or used as a substitute for the true mahogany.

Tapping experiments on Hevea brasiliensis, A. W. K. de Jong (*Arch. Rubbercult. Nederland. Indië, 3 (1919), No. 1, pp. 1–6*).—Results are given of tapping experiments conducted over a period of 5½ years.

Preliminary note on the seasoning of some Indian timbers, by natural methods, R. S. Pearson (*Indian Forest Rec., 7 (1918), No. 1, pp. 74, pl. 1*).—Preliminary data are given on seasoning tests conducted with some 33 species of Indian timbers.

A formula method for estimating timber, E. I. Terry (*Jour. Forestry, 17 (1919), No. 4, pp. 413–422, fig. 1*).—With tree measurements made by the author and others in the western yellow pine region of Colorado as a basis, the author evolved a board-foot form factor method which is here presented as a means of simplifying the work of computation in working out timber estimates. The application of the method is described.

Appraisal of fire damage to immature timber for statistical purposes, F. G. Clark (*Jour. Forestry, 17 (1919), No. 1, pp. 36–38*).—The author here proposes a modified replacement formula, which it is believed will overcome certain difficulties met with in the use of straight expectation or replacement methods of appraising fire damage to immature timber.

Production of lumber, lath, and shingles in 1917, F. H. Smith and A. H. Pierson (*U. S. Dept. Agr. Bul. 768 (1919), pp. 44, figs. 3*).—Detailed statistics are given of the 1917 production of lumber, lath, and shingles, with comparative figures from previous annual reports (E. S. R., 39, p. 452). The production is given both by States and by species.

The estimated total lumber production in 1917 was 36,000,000,000 ft. b. m., or a decrease of 10 per cent over the estimate for 1916.

DISEASES OF PLANTS.

A convenient heating and sterilizing outfit for a field laboratory, G. L. Peltier and D. C. Neal (*Phytopathology, 8 (1918), No. 8, pp. 436–438, figs. 2*).—The authors report having found an autoclave used in home canning work well suited for use for heating and sterilizing in field laboratories.

Imbedding and staining of diseased wood, J. S. Boyce (*Phytopathology, 8 (1918), No. 8, pp. 432–436*).—The author describes some modified practices which have been found very satisfactory for the study of lignified tissues invaded by fungus mycelium.

Preparation of copper and copper-arsenic sprays, Liautard (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 35, pp. 585–590, figs. 2*).—The author gives an account of means and methods employed in successful operations against animal pests and grape mildew in Boufarik, Algeria.

A check list of Porto Rican fungi and a host index, J. A. Stevenson (*Jour. Dept. Agr. P. R., 2 (1918), No. 3, pp. 125–264*).—This list, regarded by the author as a starting point for more intensive work rather than as a complete enumeration of Porto Rican fungi, is intended to include all fungi known or reported to occur in the island with their host plants. A brief history of the work of collectors on the island is given. The data herein recorded include the locality where each fungus is found and appropriate bibliographical citations. No attempt is made at a critical study of the species listed.

Plant quarantine [as related to plant diseases and injurious animals], J. A. Stevenson (*Rev. Agr. Puerto Rico, 1 (1918), No. 4, pp. 176–180*).—A discussion of protective action against the transmission of pests and diseases of plants includes the illustrative mention of the fungi Marasmius, Melanconium, Colletotrichum, and Cytospora as causing disease of sugar cane in Porto Rico.

Disease in plants with special reference to fungi parasitic on crops in British Guiana, C. K. Bancroft (*Jour. Bd. Agr. Brit. Guiana, 11 (1918), No. 1, pp. 47–57*).—The present article, the first of a series, gives a list of diseases of plants occurring in British Guiana which have been attributed to definite causes and which have engaged the attention of the author during a period of four years.

An epitome of bacterial diseases of plants in Great Britain and Ireland, S. G. Paine (*Ann. Appl. Biol., 5 (1918), No. 1, pp. 62–76*).—This is an attempt to bring together the principal known facts regarding bacterial diseases of plants in the British Isles, these including a white or soft rot (*Bacillus carotovorus*) of various crucifers and other vegetables, soft rot or heart rot of celery, also due to *B. carotovorus*, blackleg (*B. atrosepticus*) of the potato, brown rot of potato and tomato, iris rot (*B. omnivorus* and *Pseudomonas* spp.), yellow disease (*P. hyacinthi*) of hyacinth, black rot (*P. campestris*) of cabbage and nearly all other cruciferous plants, bacterial blight of fruit blossoms and of tomatoes, leaf spot disease of orchid, bacterial disease (*P. seminum*) of *Pisum sativum*, potato scab (*Actinomyces chromogenus*), crown gall, and a few diseases of undetermined causation, such as potato leaf roll and sprain, tomato mosaic, and plum silver leaf.

Diseases of plants and their treatment, B. T. P. Barker (*Jour. Bath and West and South. Counties Soc., 5. ser., 12 (1917–18), pp. 189–193*).—The author states that most of the inquiries under this head directed to the institute were concerned with potatoes, considerable confusion being apparent as between late blight and potato rust, the latter being severe in certain districts in 1916 and 1917. No specific organism has been established as the cause. Home-grown seed, a dry spring, and an early summer appear to be conditions favorable to the development of the trouble.

Inquiries made regarding fungus diseases considered as worthy of mention related to tomato collar rot and a root disease of belladonna, each due to a species of Phytophthora, a bacterial disease of plum trees, a disease of alder wood due to *Fomes igniarius* and *Polyporus sulphureus*, and a glassy condition of potatoes probably associated with rust. Special investigations undertaken as a result of inquiries dealt with Rhizoctonia of asparagus, apple leaf scorch and fruit spot disease, and tomato collar rot.

Diseases new or little known in France, G. Arnaud (*Min. Agr. [France], Ann. Serv. Épiphyties, 4 (1915), pp. 49–70, figs. 12*).—This is a discussion of mildew of cereals, Cytisus, and Buddleia; crown gall of alfalfa; *Nectriella miltina* on Agave; *Gibberella* sp. on Sophora; *Botrytis cinerea* on peony; and root gummosis of beet. Bibliographies of these diseases are given.

Phytopathological report for 1915, P. MARCHAL and G. ARNAUD (*Min. Agr. [France], Ann. Serv. Épiphyties, 4 (1915), pp. 81–42*).—The portion of this report here noted deals with parasitic and nonparasitic plant diseases and other troubles, including those due to such causes as weather.

Summary reports of entomological and pathological laboratories (*Min. Agr. [France], Ann. Serv. Épiphyties, 4 (1915), pp. 343–350*).—Very condensed reports are given from entomological stations at Paris, the Marne, Blois, Beaune, Montpellier, and Bordeaux, and from phytopathological stations at Paris and Cadillac (Gironde). That from the last-named station deals with grape downy mildew, wheat foot disease (*Leptosphæria herpotrichoides*), a disease of pea associated with *Fusarium vasinfectum* (conidial form of *Neocosmospora vasinfecta*) and *Heterodera* sp., a plum disease associated with *Monilia cinerea* and *Exoascus pruni*, and potato late blight (*Phytophthora infestans*). Short lists are given also of various reports of studies on plant diseases and insects injurious to plants.

Operations against plant diseases in Italy, H. LATIÈRE (*Min. Agr. [France], Ann. Serv. Épiphyties, 4 (1915), pp. 76–144, 337–342*).—This is an account of the several stations and laboratories dealing with plant diseases in Italy, the principal parasites and other agencies causing loss, and legislative and other measures in use or in view for the control of plant diseases.

Administration report of the government mycologist for the year 1917–18, W. MCRAE (*Rpt. Dept. Agr. Madras, 1917–18, pp. 77–80*).—This report includes a statement regarding the fungus noted on page 852 under the name of *Phytophthora meadii* as attacking *Hevea brasiliensis*. Experiments have shown that all parts of the tree above ground may be attacked. Control measures are restricted practically to removal of diseased wood and fruits and to protection of the tapped portions of the tree.

Other diseases of various plants are briefly noted.

Mycology and operations against diseases, G. A. D. STUART (*Rpt. Dept. Agr. Madras, 1917–18, pp. 17, 18–20*).—Brief reference is made to the above work of McRae on the fungus which he has named *Phythopthora meadii*. Other fungus diseases of rubber are under investigation.

Rice blast (*Piricularia oryzæ*) severely attacked at villages in Tanjore the productive rice variety Korangu Samba, which has been recently introduced in the deltas. Bleeding disease of coconuts is cured by excision of the diseased portion of the stem. Applications of Bordeaux and Burgundy mixtures reduced fungus disease of grapes in the Salem district.

Palmyra disease in Godavari and Kistna is found to be usually curable by removal of all infected portions unless the central shoot is attacked. Return outbreaks in previously treated districts have been rather frequent. Mahali disease on areca nuts is aided by local economic conditions hindering proper treatments. The same is true of smuts affecting various cereals which are briefly named.

Bean rust: Its control through the use of resistant varieties, F. D. FROMME and S. A. WINGARD (*Virginia Sta. Bul. 220 (1918), pp. 3–18, figs. 9*).—After describing the effect of bean rust (*Uromyces appendiculatus*) on beans in Virginia, the authors give an account of tests of field and garden varieties for resistance to this disease. Very great differences in resistance were noted, and for the control of this and other diseases the authors recommend the use of resistant varieties, selection of clean seed from clean pods, rotation of crops, and avoiding the working or picking of beans while wet with dew or rain.

The blackleg disease of cabbage caused by Phoma lingam, M. P. Henderson (*Phytopathology, 8 (1918), No. 8, pp. 379–431, figs. 10*).—This disease, which is said to be widely distributed in Wisconsin and to cause at times considerable loss, may attack plants in the seed bed, the disease appearing in the field shortly after transplanting. The fungus may attack the plants through leaf invasions or through the roots. Stem infection often results in an elongated lesion extending from the roots to the leaves or it may girdle the stems and allow the head to break off at the surface of the soil. Frequently nothing is left of the plant but a blackened stump. In addition to the cabbage, quite a number of other cruciferous plants have been inoculated with the fungus, while a few species have been found nonsusceptible under the conditions of the experiments.

The fungus appears to be carried over in the seed, probably in the form of dormant mycelium, and the most satisfactory treatment from the standpoint of seed germination has been found to be immersion for 20 to 25 minutes in a 1:200 solution of 40 per cent formaldehyde. This was found to kill the spores, but was not sufficient to disinfect seed which had been invaded by the fungus mycelium. The removal of diseased tissues from the soil and deep fall plowing are recommended as means of control on infected fields.

Physoderma disease of corn, W. H. Tisdale (*Jour. Agr. Research [U. S.], 16 (1919), No. 5, pp. 137–154, pls. 10, fig. 1*).—A detailed account is given of a study made in the Bureau of Plant Industry, U. S. Department of Agriculture, of the disease of corn due to *P. zeæ maydis*, the occurrence and distribution of which have already been noted (E. S. R., 38, p. 351). The history of the disease, its distribution, economic importance, factors favoring its spread, etc., are described, after which an account is given of the causal organism, its germination, host penetration, dissemination, etc.

While no definite means of control have been discovered, there is considered to be a possibility of preventing the disease by sanitation, rotation of crops, and use of resistant varieties.

A morphological and cultural note on the organism causing Stewart's disease of sweet corn, L. McCulloch (*Phytopathology, 8 (1918), No. 8, pp. 440–442, pl. 1*).—According to the author, a study of the organism which has borne the names *Pseudomonas stewarti* and *Bacterium stewarti* has shown that it is improperly classified and should bear the name *Aplanobacter stewarti*.

Observations of cultures of this organism have shown that there are two distinct types of surface colonies as seen on peptonized beef agar plates. In virulence, character of infection, general cultural characteristics, and morphology, including the lack of flagella, the two types appear to be identical, the only difference being the behavior of the colonies on the agar mentioned above.

Bacterial oat blight, C. Elliott (*Phytopathology, 8 (1918), No. 9, pp. 489, 490*).—The author reports a severe bacterial blighting of oats in southern Wisconsin in 1918 and a similar condition in southern Minnesota, northern Illinois, northern Indiana, and Ohio. The disease seems to be due to the organism previously described by Manns (E. S. R., 22, p. 458).

In addition to the above blight, another distinctly different bacterial disease was found on oats. This was first collected in June, 1917, at Urbana, Ill., and later at Lafayette, Ind., and at Wooster, Ohio. This disease differs from the first in the absence of the halo effect on the leaves and the presence of an exudate. To this latter disease the name stripe blight is tentatively given.

Report of the conference on diseases of potatoes and seed certification, G. R. Lyman et al. (*Washington: War Emergency Bd. Amer. Plant Path., 1918, pp. 1–20, pls. 2*).—This is the report of the secretary to the conference held at Buffalo, N. Y., August 16 and 17, 1918, on potato diseases, called for the consideration especially of the so-called degeneration diseases of potatoes and of the problems of certification of seed potatoes. Projects were organized in connection with potato mosaic, leaf roll, and curly dwarf. Reports under these heads were presented and discussed, and a project committee was appointed to take charge of the various problems connected with the certification of seed potatoes.

Some serious potato diseases, S. L. Bastin (*Jour. Bath and West and South. Counties Soc., 5. ser., 12 (1917–18), pp. 88–106, pls. 2*).—The author discusses with appropriate control measures locally important potato diseases, including late blight (*Phytophthora infestans*), potato scab (*Actinomyces chromogenus*), corky or powdery scab (*Spongospora subterranea*), wart disease or black scab (*Synchytrium endobioticum*) and other scab diseases, stalk disease (*Sclerotinia sclerotiorum*), Botrytis disease (*B. cinerea*), and blackleg or black stem rot (*Bacillus phytophthorus*).

Observations on obscure potato troubles, H. T. Güssow (*Phytopathology, 8 (1918), No. 9, pp. 491–495, figs. 4*).—Descriptions are given of attacks of *Heterodera radicicola* on the potato tuber, the effect of unfavorable storage conditions, leaf streak, and mosaic disease. The last disease the author claims to have successfully transferred by inarching diseased plants with vigorous ones, the resulting tubers having produced typical mosaic disease.

Seed tuber treatments for potatoes, G. H. Coons (*Phytopathology, 8 (1918), No. 9, pp. 457–468, figs. 6*).—The value of seed tuber disinfection for the prevention of scab and Rhizoctonia having been questioned, the author conducted a series of experiments to determine, if possible, improvements in the method of seed treatment, as well as to test the whole matter of the desirabiliy of treatments.

Clean, scabby, and scurfed potatoes were treated in various ways with formaldehyde, corrosive sublimate, and bleaching powder. It was found that the formaldehyde used in dilute solution for either soaking or sprinkling the tubers, together with planting in clean ground, was efficient in reducing the amount of scab, and the soaking of the tubers for 1½ hours in a 1:240 solution controlled to a slight extent the attack of Rhizoctonia. Corrosive sublimate 1:1,000, in which the tubers were soaked for ½ hour to 1½ hours, controlled both scab and black scurf. When the solution was heated to 54° C. (129.2° F.), with a treatment of 5 minutes' duration, efficient control of scab and black scurf was obtained. Prolonged treatment with corrosive sublimate or treatment with hot corrosive sublimate resulted in poor stands. Bleaching powder (5 per cent solution) had no bad effect on the stand and but little beneficial effect in controlling scab. It was not tested against Rhizoctonia.

The experiments conducted by the author seem to show that the important source of both Rhizoctonia and scab is infected seed, the soil furnishing a negligible amount of infectious material. This conclusion is held to apply for the present only to the conditions under which the experiments were conducted.

Fusarium blight of potatoes under irrigation, H. G. MacMillan (*Jour. Agr. Research [U. S.], 16 (1919), No. 11, pp. 279–304, pls. 5*).—An account is given of an investigation of Fusarium blight of potatoes conducted by the Bureau of Plant Industry, U. S. Department of Agriculture, in Colorado, where considerable losses are reported as due to Fusarium blight. Three general stages of blight are recognized; first, a stage in which decay and death of the seed piece and the new plant occur before the new shoot emerges from the ground; second, a later stage in which the young plant shows many symptoms of infection by *Fusarium* spp. often resulting in death; and third, the mature stage resulting in death, usually at an advanced stage of growth, often with infection and decay of the new tubers. Infection is said to be of two kinds, that from the soil to the roots and root hairs and that of the seed piece whereby the plant becomes diseased.

For the control of the disease, the author suggests selection of disease-resistant varieties, proper cultural conditions for the potato plant whereby it may maintain a degree of resistance through activity and health, lengthened rotation, judicious irrigation practices, and the use of whole seed tubers free from wound or injury. While these different methods have been investigated to some extent, they are not yet known to be wholly effective in preventing loss.

Vascular infection of the seed is not the first but is one of the conditions assisting in bringing about decreased resistance to new infection from the soil.

Internal rust spot disease of the potato tuber, S. G. PAINE (*Ann. Appl. Biol., 5 (1918), No. 1, pp. 77–79*).—Examination and inoculation studies by the author of potatoes sent from two farms in the south of England have led to the conclusion that the disease in question is very similar to one which has been described under different names by several authors. The name internal rust spot is suggested for the disease. Fuller discussion and description of this disease are reserved for a later paper.

The potato wart disease, a new and serious disease recently discovered in Pennsylvania, C. R. ORTON and F. D. KERN (*Pennsylvania Sta. Bul. 156 (1919), pp. 3–16, figs. 4*).—A popular account is given of the discovery in Pennsylvania of the potato wart disease due to *Chrysophlyctis endobiotica*, and the life history and development of the parasite causing the disease are described at considerable length. At the time of the preparation of the publication, the disease had been found in 26 towns in three counties of eastern Pennsylvania.

Black wart of potato, G. FRON (*Min. Agr. [France], Ann. Serv. Épiphyties, 4 (1915), pp. 45–48, pl. 1*).—This is a brief descriptive discussion of potato black wart or black canker, due to *Chrysophlyctis endobiotica*, as existing in other countries but not yet known to exist in France.

A cane leaf spot, P. A. VAN DER BIJL (*Union So. Africa Dept. Agr., Sci. Bul. 10 (1918), pp. 16, figs. 7*).—An account is given of a disease noted by the author in 1917 and marked by leaf spots which are described. The spores of the fungus found in connection with the trouble, often in association with *Leptosphæria sacchari*, show some resemblance to those of Helminthosporium. The symptoms resemble somewhat those due to *Cercospora sacchari*. The fungus is aerobic. Viability of the spores is lost after about 49 days in dry places. Attempts to inoculate and reisolate the fungus were successful.

Root disease of sugar cane, J. A. STEVENSON (*Rev. Agr. Puerto Rico, 1 (1918), No. 6, pp. 269–279, figs. 3*).—The author discusses in connection with practical prevention a disease or group of diseases of sugar cane roots in Porto Rico, as occurring in association with *Marasmius sacchari*, *Himantia stellifera*, and *Odontia saccharicola*.

An immune variety of sugar cane, C. O. TOWNSEND (*Science, n. ser., 49 (1919), No. 1272, pp. 470–472*).—In connection with a study of the mottling disease of sugar cane in Porto Rico (E. S. R., 39, p. 53), a Japanese variety of sugar cane, obtained by the experiment station at Mayaguez, P. R., from Argentina several years ago, has proved quite resistant. The variety seems to ratoon strongly and to have considerable resistance to root disease, borer, and stem rot.

Angular leaf spot of tobacco, an undescribed bacterial disease, F. D. FROMME and T. J. MURRAY (*Jour. Agr. Research [U. S.], 16 (1919), No. 8, pp.*

219–228, pls. 3).—In a contribution from the Virginia Experiment Station, the authors describe a leaf spot disease of tobacco caused by *Bacterium angulatum* n. sp. The disease is said to have been prevalent in the flue-cured tobacco belt of Virginia in 1917, apparently having been present to some extent for several years, and it may have a wide distribution. The disease produces losses in both yield and grade, which were calculated in one field at 20 per cent reduction in yield and 40 per cent reduction in grade.

Ergot on Manitoba wheat, J. Chifflot (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 33, pp. 931–934*).—The presence of ergot (*Claviceps purpurea*) on Manitoba wheat imported into France is briefly discussed in connection with the degree of resistance offered by that variety to the disease.

The eelworm disease of wheat and its control, L. P. Byars (*U. S. Dept. Agr., Farmers' Bul. 1041 (1919), pp. 10, figs. 10*).—A popular account is given of the nematode or eelworm disease (*Tylenchus tritici*) of wheat, a previous report upon which has already been noted (E. S. R., 39, p. 649).

To avoid infection, the author recommends the use of clean seed, crop rotation, and sanitation. In order to secure clean seed, the employment of the salt brine method is advised. This consists in placing the wheat in a 20 per cent salt solution, stirring thoroughly, and skimming the nematode galls and other light material from the surface of the liquid, the sound grains sinking to the bottom. After treatment with the salt solution, the grain should be rinsed in fresh water and dried.

Drought injury to McIntosh apple, H. T. Güssow (*Phytopathology, 8 (1918), No. 9, pp. 490, 491, fig. 1*).—Injury to apples of the McIntosh variety observed in 1917 and 1918 is described, this being attributed to the extraordinarily severe drought of 1917 and the lack of precipitation at certain periods in 1918.

Apple scald, C. Brooks, J. S. Cooley, and D. F. Fisher (*Jour. Agr. Research [U. S.], 16 (1919), No. 8, pp. 195–217, figs. 11*).—In continuation of studies on the effect of various factors on apple rot fungi and the scald of apples in storage (E. S. R., 36, p. 649; 38, p. 353), the authors give a report of additional work conducted in the Bureau of Plant Industry, U. S. Department of Agriculture, on the nature and control of apple scald.

Apple scald is claimed to be due to volatile or gaseous substances that are produced in the metabolism of the apple and can be taken up by various absorbents. Well matured apples are less subject to scald than immature ones, and apples from heavily irrigated trees scald worse than those from trees receiving moderate irrigation. In storage the development of apple scald was found to increase with a rise in temperature up to 15 or 20° C., but the trouble has not been observed to occur at 25 or 30°. The effects of water vapor, carbon dioxid, and oxygen on the development of scald were investigated, and it was found that scald was considerably reduced by decreasing the humidity, although the beneficial effects were not entirely due to the decreased moisture in the air. Accumulations of carbon dioxid did not favor the development of apple scald, rather tending to prevent it, and apples susceptible to scald were made immune by storing them for a few days in an atmosphere of pure carbon dioxid. The effect of ventilation on scald in storage is reported upon, it having been found that thorough aeration aids materially in reducing the amount of injury due to this cause.

Spraying tests at Te Kauwhata, J. F. Shepherd (*Jour. Agr. [New Zeal.], 16 (1918), No. 4, pp. 228–230*).—Tests were made with various fungicides used as dormant sprays against black spot of pears, the results being somewhat inconclusive. Spraying with lime-sulphur controlled apple mildew with no detriment to the foliage.

A wither tip of plum trees, H. WORMALD (*Ann. Appl. Biol., 5 (1918), No. 1, pp. 28–59, pls. 3*).—The author has made a study of a Monilia found on withered leaves and dead twigs of Victoria plum trees in 1916 during a study of a blossom wilt of apple trees which proved to be due to *M. cinerea*. The fungus on plum was found to be morphologically indistinguishable from that on apple, and is therefore considered a physiological strain of *M. cinerea*.

The disease on plum appears to spread from the leaf which is first infected into the shoot, causing it to wilt and die beyond that point. Although only negative results were obtained from inoculations of plum tree leaves with pure cultures of a strain obtained from a withered twig, inoculation of the stigmas was followed in every case by the death of the bloom, and in some cases the flowering spur was killed and the branch developed a canker. Uninjured plums were not attacked, but conidia applied to wounds produced a brown rot which spread over the fruit, attacking in some cases other fruits with which it was in contact. Apple blossoms inoculated with the wither tip strain fell, but did not extend the infection to other parts as in the case of the apple blossom wilt strain of the organism.

[Grape diseases], L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 20, pp. 457–468*).—The author summarizes a number of facts in regard to grape downy mildew and appropriate control measures, with observations on grape Oïdium.

[Grape diseases], L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 23, pp. 531–533*).—Grape mildew is said to be favored by heavy applications of soluble nitrogenous fertilizers and of farm manures, phosphate, and potash showing little, if any, influence. The effects of powdered fungicides are also discussed.

Studies of outbreaks of grape downy mildew in 1915, J. CAPUS (*Min. Agr. [France], Ann. Serv. Epiphyties, 4 (1915), pp. 162–217, figs. 19*).—This is an elaborate presentation of a large body of information on grape downy mildew, some of which has been noted previously (E. S. R., 36, p. 650).

Recent studies on mildew control, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), Nos. 14, pp. 313–315; 16, pp. 361–363*).—Tests in 1916 with milk of lime at a strength of 3 to 6 per cent are considered to show that this preparation is ineffective as against grape downy mildew, except possibly during very dry seasons. Iron sulphate at 2 per cent with lime was also ineffective. Mixed preparations, including Bordeaux mixture, gave inconclusive results and are to be tested again. It is said, however, that in every case the copper-arsenic spray was at least as efficacious as the basic copper spray, but addition of the iron salt gave no advantage.

Tests with copper sulphate in powdered form are said to have shown greater fungicidal efficacy than was shown by that in the liquid form. The powdered form permitted greater ease and economy in application, although it was apparently less adherent.

[Grape] anthracnose, H. E. LAFFER (*Jour. Dept. Agr. So. Aust., 21 (1918), No. 6, pp. 462–471, figs. 7*).—Grape anthracnose or black spot (*Manginia ampelina*) has become prevalent in South Australia owing to the recurrence of favorable conditions and the use of nonresistant varieties. The present article discusses the life history of the fungus, methods of spreading, and varietal susceptibility.

Black rot, A. PRUNET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 39 (1918), No. 23, pp. 533–545*).—Besides making comparisons with other grape diseases, such as Oïdium and downy mildew, the author discusses at greater length black rot

(*Guignardia bidwellii*) as regard outbreaks, both primary and secondary, and appropriate treatment, in connection with methods of preparing fungicides.

Control of brown rot, J. A. CAMPBELL (*Jour. Agr. [New Zeal.], 16 (1918), No. 4, pp. 221, 222*).—A provisional report is made on experiments continued for three years on the same plan as those carried out at Arataki and noted below. These are said to have given valuable information but a comparatively slight degree of present success in control of brown rot. Previous indications in favor of summer spraying for this trouble have not been confirmed, although the tests were vitiated considerably through abnormal conditions.

Brown rot experiments at Arataki, T. E. RODDA (*Jour. Agr. [New Zeal.], 16 (1918), No. 4, pp. 222–228*).—Spraying tests on brown rot of peaches and nectarines gave no decided results owing to unfavorable weather conditions. All the copper compounds at the strengths used were injurious to both fruit and foliage, and their fungicidal effects were uncertain. Spraying tests for brown rot of apricot gave the best results for Bordeaux mixture, which, however, disfigured the fruit. Very good results were obtained by the use of lime-sulphur. The tests on apricot rust were not decisive.

Algal disease of cacao, J. B. RORER (*Proc. Agr. Soc. Trinidad and Tobago, 17 (1917), No. 9, pp. 345–348; abs. in Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Lucia, 1917–18, pp. 13, 14; Agr. News [Barbados], 17 (1918), No. 421, p. 190*).—Since 1912 the author has observed a disease of cacao due to the presence of an alga, *Cephaleuros virescens*, said also to attack tea and mango in India. It is said to check the normal growth of the twigs, killing the outer bark and allowing entrance to other disease organisms which may kill the branch down to the main trunk of the tree. Apparently the alga may attack almost any cacao tree, but it is more injurious to weak trees on areas which are insufficiently drained, poorly shaded, or exposed to the wind.

A root rot of orange in Tripoli, G. LEONE (*Agr. Colon. [Italy], 12 (1918), No. 4, pp. 209–215, figs. 4*).—A root rot of orange is described which has caused considerable damage for some time in Tripoli. It is found even on certain sandy soils if they are underlaid by layers relatively impermeable to water. The trouble may also be connected with deep planting, abundant organic fertilizer, and overabundant irrigation. Certain varieties are measurably resistant.

The susceptibility of a nonrutaceous host to citrus canker, H. A. LEE and E. D. MERRILL (*Science, n. ser., 49 (1919), No. 1273, pp. 499, 500*).—The results are given of a cooperative investigation made by the Bureau of Plant Industry, U. S. Department of Agriculture, and the Philippine Bureau of Science. In this, inoculation experiments repeated several times have shown that *Lansium domesticum*, a tree cultivated in the Philippines for its edible fruit, may be infected by *Pseudomonas citri*, the cause of citrus canker.

Root disease of tea, R. D. ANSTEAD (*Planters' Chron., 13 (1918), No. 23, p. 394*).—A case is said to have been reported in which tea was attacked by a fatal root disease, supposed to have spread from dead or dying roots or stumps of *Erythrina lithosperma*.

Black rot of chestnuts, L. MANGIN (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 32, pp. 885–889*).—Studies carried out during and since 1917 have convinced the author that black rot is a very important disease of chestnuts. Of one lot of nuts examined, 26 per cent were affected with black rot. This is said to be due entirely to a fungus, *Harziella castaneæ*, which causes very active evaporation, resulting in a great decrease of specific gravity, this fact being utilized to separate the diseased chestnuts. The fungus does not attack the nuts on the tree, the contamination originating from the soil after the fruit drops and then developing very rapidly. Sulphur gas seems effective for destroying the fungus.

The fungus flora of pine seed beds, A. E. RATHBUN (*Phytopathology, 8 (1918), No. 9, pp. 469–483*).—In continuation of a study of the fungus flora of the soils of a forest nursery at Brown University (E. S. R., 39, p. 254), the author reports that a dozen or more species of fungi occur in soil at various depths from 1 to 44 in. With the exception of Fusarium, no fungus known to cause damping-off was isolated from the soil of the nursery. Grubs and earthworms were found to be carriers of the spores of the soil fungi. Some of the soil fungi are considered to be possibly facultative anaerobes, but this point is to be further investigated.

Incubation period of Cronartium ribicola on the white pine, R. E. STONE (*Phytopathology, 8 (1918), No. 8, pp. 438–440, fig. 1*).—As a result of observations made on the white pine blister rust, the author has reached the conclusion that the most common period of incubation is 2 years and 9 or 10 months, with a life cycle of 3 years, and that sometimes the incubation period may be 3 years and 9 or 10 months, with a life cycle of 4 years.

Additional list of State and national quarantines against the white pine blister rust, R. G. PIERCE (*Phytopathology, 8 (1918), No. 9, pp. 484–486*).—A tabulated statement is given of quarantines in effect, from which it appears that not only is there a general quarantine for the United States Government but that 15 States have quarantined against the movement of white pine, Ribes, Grossularia, etc.

[Notes on Hevea canker], P. E. KEUCHENIUS (*Arch. Rubbercult. Nederland. Indië, 2 (1918), No. 7, pp. 433, 434, 436*).—Hevea canker may arise from superficial wounding of the bark. Tapping cuts and latex channels should be tarred as soon as made, and the treatment should be repeated as often as necessary. It is regarded as desirable to tap on the lower portion of the trunk during the dry season and higher up during the period of heavy rainfall.

Phytophthora meadii n. sp. on Hevea brasiliensis, W. MCRAE (*Mem. Dept. Agr. India, Bot. Ser., 9 (1918), No. 5, pp. 219–273, pls. 3, figs. 3*).—The author has studied this fungus in connection with abnormal wilting, leaf fall, fruit rot, and dieback of Hevea in portions of India.

Though the fungus under natural conditions has been found to attack only *H. brasiliensis*, it has been induced by artificial manipulation to infect *Manihot glaziovii* and *Ricinus communis*. A technical description is noted below.

The fungus, appearing at comparatively few points just at the close of the dry season, spreads rapidly after the bursting of the monsoon, affecting both fruits and leaves. Sporangia and zoospores are produced in great abundance, rain drops supposedly aiding in their dissemination. Recently, resting conidia have been produced in cultures at Pusa but not at Coimbatore, probably on account of the differences in range of temperature at the two places. The discovery of conidia may cause a change of view as to the relationships of this fungus.

Preventive measures considered as feasible include removal and destruction of branches and fruits attacked by the disease, diversion of rain water from latex cups, and general sanitation.

A new species of Phytophthora parasitic on the Para rubber tree, W. MCRAE (*Jour. Bombay Nat. Hist. Soc., 25 (1918), No. 4, p. 760*).—This gives a technical description of the fungus *P. meadii* n. sp., which is said to attack leaves, fruits, and shoots of *Hevea brasiliensis*, causing fruit drop, branch dieback, and tapping rot.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A synopsis of the bats of California, H. W. Grinnell (*Univ. Cal. Pubs. Zool., 17 (1918), No. 12, pp. 223–404, pls. 11, figs. 24; abs. in Science, n. ser., 44 (1919), No. 1260, pp. 193–195*).—But three families of bats are known to occur in the Western Hemisphere north of the Bahama Islands and Central Mexico, namely, the Phyllostomidæ, represented in California by a single species; the Vespertilionidæ, represented by 26 species and subspecies; and the Molossidæ, represented by 4 species. The synopsis includes a 6-page bibliography.

The crow in Colorado, W. H. Bergtold (*Auk, 36 (1919), No. 2, pp. 198–205*).—The author finds that two subspecies of the crow occur in Colorado, namely, *Corvus brachyrhynchos brachyrhynchos* and *C. brachyrhynchos hesperis*. Both are found on the eastern slope, but only the latter on the western slope of the Rocky Mountains.

Report of the entomologist of the Arizona Commission of Agriculture and Horticulture for the year ended June 30, 1917, A. W. Morrill (*Ariz. Com. Agr. and Hort. Ann. Rpt., 9 (1917), pp. 15–61, pl. 1, figs. 24*).—In the first part of this report (pp. 15–31) the author deals with the activities of the plant inspection service, including the work against the alfalfa weevil and cotton boll weevil; investigations of the clover seed chalcid fly, which is one of the most injurious crop pests in Arizona; grasshoppers, an account of which has been noted (E. S. R., 39, p. 359); etc. In the second part (pp. 33–61) notes are presented on the more important insects of the year.

The peach twig moth, which has not previously been recognized in Arizona, was very destructive to peaches in 1917 in three widely separated orchards in the Salt River Valley. Observations in the Salt River Valley by the author indicate that the life history of the pest is somewhat different from that observed elsewhere. The young fruit from one-fourth to a third of an inch in diameter may be destroyed in March by the same generation that destroys the young twigs, and the adult moths may appear as late as November. The injured fruit in the valley is subject to a secondary attack by a small dark brown beetle, known as the dry fig beetle (*Carpophilus hemipterus*). In one orchard where the twig moth occurred in 1917 more than 50 per cent of the peaches were infested and the loss practically complete.

Specimens of the moth borer from pear trees, mention of which was made in the previous report (E. S. R., 37, p. 846) were reared and proved to be the carpenter worm (*Prionoxystus robiniæ*). In some instances the trees were seriously injured and nearly destroyed by it. The adult usually appears in June and July, three years being required for the completion of its life cycle.

Injury to a fig tree near Tempe was found to be due to a species which closely resembles the three-lined fig borer (*Ptychodes trilineatus*).

Unripe apricots in certain orchards in the Salt River Valley were seriously scarred by a new species of thrips to which Morgan has given the name *Frankliniella morrilli*. The scarring of the apricots is said to be similar to that done by the citrus thrips to citrus fruit, but is much more severe since the injured apricots are more frequently stunted in growth and deformed. In control work with this thrips good results are said to have been obtained from the use of blackleaf 40 at the rate of 1.25 fluid ounces and 7 oz. of whale-oil soap to 10 gal. of water (1:1,000). A carefully applied driving spray under at least 150 lbs. pressure was essential for the control of the pest.

A nitidulid beetle (*Conotelus mexicanus*) was found in great abundance on November 7 on cucumber blossoms in a garden near Mesa. Other insects of importance during the year are considered under the headings of citrus and olive pests, pests of field and forage crops, vegetable crop pests, cotton insects, etc.

[Economic insects in Hawaii], H. P. AGEE (*Hawaii. Sugar Planters' Assoc., Rpt. Expt. Sta. Committee, 1918, pp. 19–21*).—This report includes a discussion by Swezey of data relating to the efficiency of the introduced egg parasites of the leaf hopper and by Swezey and Muir of foreign entomological work.

It appears that when the H 109 variety of cane is affected by eye-spot disease the leaf hoppers may have an increased preference for it, and the combined attack of disease and insect is apt to be very severe. The Formosan egg parasite Ootetrastichus, introduced by Muir in 1916, greatly increased in abundance during the year and gives promise of becoming a very valuable introduction. A species of Entomophthora is reported to be quite beneficial in checking the spread of leaf hoppers at Pepeekeo, as many as 19 hoppers killed by this fungus having been found in a single leaf. The Anomala beetle has become so well checked by *Scolia manilæ*, which was introduced from the Philippines in 1915–16, that no places are known where the cane is being badly injured. This parasite is now found to be abundant in all the regions occupied by the Anomala grubs and has even spread beyond the infested areas. Brief mention is made of other parasites of the Anomala beetle, *Dolichurus stantoni* which parasitizes the cockroaches *Phyllodromia hieroglyphica* and *Loboptera extranea*, and of foreign work by the entomologists.

Insects which attract public attention, H. B. WEISS (*Sci. Mo., 8 (1919), No. 2, pp. 179–186, figs. 23*).—Tabular data compiled from the reports of the entomologist of the New Jersey Experiment Stations for the five years 1913–1917 are presented and digested.

Annual report of the State entomologist for the year 1915–16, H. C. SEVERIN (*Ann. Rpt. S. Dak. Hort. Soc., 14 (1917), pp. 195–203*).—A brief report on the entomological work for the year.

Notes and observations on agricultural entomology, G. DEL GUERCIO (*Agr. Colon. [Italy], 12 (1918), Nos. 1, pp. 1–30, figs. 9; 2, pp. 65–102, figs. 36; 3, pp. 147–166, figs. 23*).—Papers are here presented on the Somali cotton stainer (*Dysdercus scassellatii*) and its parasites; the chestnut bur borer (*Carpocapsa splendana*) and its effect upon chestnut flour; the larvæ of cecidomyiids attacking olives in Eritrea; and the cotton lygæid (*Oxycarenus hyalinipennis*) in Somali and sporozoa that attack it.

Administration report of the government entomologist for the year 1917–18, T. V. RAMAKRISHNA AYYAR (*Rpt. Dept. Agr. Madras, 1917–18, pp. 74–77*).—In this report a brief discussion of the occurrence of the more important insects of the year is included.

A preliminary report on the cotton pests of South Africa, C. K. BRAIN (*Union So. Africa, Dept. Agr. Local Ser. No. 59 (1918), pp. 27, figs. 23*).—A brief discussion of the more important insect enemies of cotton in South Africa.

[Insect enemies of tobacco in Dutch East Indies], P. E. KEUCHENIUS (*Meded. Besoek. Proefstat. [Java], 1915, Nos. 14, pp. 12–22, pl. 1; 19, pp. 23, figs. 3; 1917, No. 26, pp. 1–56, pl. 1*).—The first of these papers deals with thrips, *Opatrum depressum*, *Lita solanella*, etc.; the second with *O. depressum*, *Gnorimaschema heliopa*, and the tobacco moth (Setomorpha); and the third with the cigarette beetle and *Setomorpha margalaestriata* n. sp.

Insects attacking vegetables in Porto Rico, R. T. COTTON (*Jour. Dept. Agr. P. R., 2 (1918), No. 4, pp. 265–317, figs. 44; Rev. Agr. Puerto Rico, 1 (1918), Nos. 3, pp. 119–131, figs. 8; 4, pp. 150–165, figs. 12; 5, pp. 198–212, figs. 13; 6, pp. 253–268, figs. 12*).—A general discussion of the insect enemies which attack vegetables in Porto Rico, with directions for their control. An earlier bulletin on the subject by Jones has been noted (E. S. R., 33, p. 59).

Insects injurious to maple tree, H. L. BAILEY (*Proc. Vt. Maple Sugar Makers' Assoc., 24 (1917), pp. 74–84*).—This paper contains a list of the insects known to attack maples.

[Work with stored grain insects] (*Rpts. Grain Pests (War) Committee Roy. Soc. [London], 1919, No. 1, pp. 24; 1918, Nos. 2, pp. 48, pls. 11, fig. 1; 3, pp. 18*).—These reports include the following papers: No. 1, Report on the Effect of Air-tight Storage upon Grain Insects, I, by A. Dendy (pp. 6–24); No. 2, Bionomic, Morphological, and Economic Report on the Acarids of Stored Grain and Flour [*Aleurobius farinæ, Glyciphagus cadaverum, Cheyletus eruditus,* and *Acarophenax tribolii* n. g. and n. sp.], by R. Newstead and H. M. Duvall (pp. 3–41); Preliminary Note on Samples of Flour Submitted for Bacteriological Examination by Prof. Newstead, by J. M. Beattie (pp. 42, 43); Report on Six Samples of Flour into Which Mites Have Been Introduced, by A. E. Humphries (pp. 44–48); No. 3, Report on the Effect of Air-tight Storage upon Grain Insects, II, by A. Dendy and H. D. Elkington (pp. 3–14); Experiments with Two Secondary Grain Pests [*Tribolium castaneum* and *Silvanus surinamensis*], Showing Their Inability to Attack Sound Wheat (pp. 15, 16) and Observations on the Attraction of Certain Grain Beetles, Especially Weevils, by Water (pp. 17, 18), both by A. Dendy.

The conclusions of Newstead and Duvall are as follows: "Wheat and flour are liable to attacks and injury by acarids. *A. farinæ* is the acarid responsible for most of the damage. Mites will not injure wheat and flour in which the moisture is 11 per cent and under, whatever the temperature may be. They may flourish and increase exceedingly when the moisture is over 13 per cent. Given favorable (to them) moisture conditions increase is very rapid at temperatures between 60 and 75° F., less so between 50 and 60°, while between 40 and 50° increase is slow. The remedy for mite-infested wheat is to screen it thoroughly, in order to remove as many of the mites as possible, and subject it to some treatment whereby the excessive moisture is reduced, such as a blast of hot air followed by cooling.

"The injury to flour is much more serious and much less readily combated than in wheat. Flour which is heavily mite-infested is unfit for human consumption."

The graduated tent fumigation dosage system, A. W. MORRILL (*Cal. Citrogr., 4 (1919), No. 3, pp. 52, 74, 76, fig. 1*).—In this paper the author reviews the history of the origin of the graduated tent or improved system of dosage now in general use in the citrus fruit growing districts of California.

The graduated tent and the process of using it for the estimation of dosage, which was devised as a result of work by the author while an agent of the Bureau of Entomology of the U. S. Department of Agriculture, was described and illustrated in specifications of Letters Patent No. 902,674, filed December 30, 1907, and dedicated by the author to the public. This system, which was described and illustrated in a bulletin by the author issued in 1908 and previously noted (E. S. R., 20, p. 555), was a graduated tent dosage system and was not connected with any system or method of measuring tents used prior to 1907.

The biological method of control of Oeceticus platensis, P. CARIDE MASSINI and J. BRÈTHES (*An. Soc. Rural Argentina, 52 (1918), No. 4, pp. 207–215, pl. 1, figs. 11; abs. in Rev. Appl. Ent., Ser. A, 6 (1918), No. 11, pp. 517, 518*).—A report upon parasite control work with the bagworm (*O. platensis*) in Argentina, in continuation of that previously noted (E. S. R., 38, p. 658), which deals in part with a new dipterous parasite described as *Parexorista caridei.*

Experience with an outbreak of grasshoppers on overflowed land in Louisiana, E. S. TUCKER (*Trans. Kans. Acad. Sci., 28 (1916-17), pp. 265-275*).—The author reports upon an outbreak of grasshoppers in the vicinity of Oscar, La. Poisoned baits apparently did not attract them, but plaster of Paris dusted over the plants appeared to deter the grasshoppers from eating the coated leaves.

The Orthoptera (cockroaches, locusts, grasshoppers, and crickets) of Nova Scotia, with descriptions of the species and notes on their occurrence and habits, H. PIERS (*Proc. and Trans. Nova Scotian Inst. Sci., 14 (1916-17), No. 3, pp. 201-354, pls. 4, figs. 4*).—A brief discussion of the Orthoptera in general is followed by an account of the Orthoptera of Nova Scotia and a systematic description of Nova Scotian Orthoptera in which 28 species are listed.

Report on cacao thrips (Heliothrips rubrocinctus) in Grenada in 1917, F. W. URICH (*Abs. in Agr. News [Barbados], 17 (1918), No. 432, pp. 362, 363; Rev. Appl. Ent., Ser. A, 6 (1918), No. 11, pp. 496, 497*).—The author reports the cacao thrips to be a serious pest in Grenada.

Mississippi cicadas, with a key to the species of the southeastern United States, W. T. DAVIS (*Jour. N. Y. Ent. Soc., 26 (1918), No. 3-4, pp. 141-155, pls. 2, fig. 1*).—Eighteen species are recognized as occurring in Mississippi, one of which (*Okanagana viridis*) is described as new.

A froghopper on sugar cane in British Guiana, C. B. WILLIAMS (*Bul. Ent. Research, 9 (1918), No. 2, pp. 163-173, figs. 3*).—The data here presented relate to *Tomaspis flavilatera*, which attacks sugar cane along the coast of British Guiana. Although it has not as yet done any serious damage, it is viewed with suspicion by the planters.

A cercopid enemy of fields of parana (Panicum numidianum) (*Sec. Agr. Com. y. Trab., Com. Sanid. Veg. Cuba, Circ. 4 [1917], pp. 31, figs. 8*).—The data here presented, which have been noted from another source (E. S. R., 38, p. 556), relate to *Monecphora bicincta*. This cercopid has been the source of much damage to parana grass in Camaguey. Collection of the adults by means of trap lights and by rakes painted with tar or tanglefoot is recommended, as is also burning over of badly infested fields.

The woolly white fly in Florida citrus groves, W. W. YOTHERS (*U. S. Dept. Agr., Farmers' Bul. 1011 (1919), pp. 12, figs. 8*).—This is a popular summary of information relating to *Aleurothrixus howardi*, including its introduction and subsequent spread, life history, natural enemies, and remedial measures.

Since its discovery at Tampa in 1909 it has spread rapidly throughout Florida, and is now well distributed over Hillsborough, Pinellas, Manatee, Polk, De Soto, Orange, Lee, and portions of Palm Beach Counties, and doubtless soon will infest all the cirtus groves in the State. A report of investigations of this species by Back has previously been noted (E. S. R., 23, p. 257).

Notes on the green bug (Toxoptera graminum) in Texas, E. S. TUCKER (*Trans. Kans. Acad. Sci., 28 (1916-17), pp. 276-291*).—A report of studies conducted at Plano, Tex., in 1907.

The larger corn stalk borer (Diatraea zeacolella), G. G. AINSLIE (*U. S. Dept. Agr., Farmers' Bul. 1025 (1919), pp. 11, figs. 8*).—This is a revision of Farmers' Bulletin 634 previously noted (E. S. R., 32, p. 449).

The insect and related pests of Egypt.—I, The insect and related pests injurious to the cotton plant: I, The pink bollworm, F. C. WILLCOCKS (*Cairo, Egypt; Sultanic Agr. Soc., 1916, pp. XXIII+339, pls. 10, figs. 17; rev. in Jour. Econ. Ent., 11 (1918), No. 6, pp. 486, 487*).—This part, the first of a volume on the insect and related pests injurious to the cotton plant in Egypt, deals with the pink bollworm (*Pectinophora* [*Gelechia*] *gossypiella*). Accounts of the history and origin of the pest, the nature and extent of the losses caused by it, food plants, etc., first presented, are followed by a detailed report of studies of its life history and habits and of its natural enemies and control measures.

The estivation or resting stage of the larvæ is of particular importance, since they may remain in cotton seed in a dormant state from six or eight months to almost two years before pupating, and in this way be widely disseminated. Following an extended discussion of its life history and habits, the author deals with its natural enemies, including predacious insects, mites, spiders, birds, etc. The parasitic enemies considered include *Pimpla roborator*, which has rapidly increased and become quite common, the life history and habits of which are considered at length; a large and a small pteromalid (*Pteromalus* spp.), a braconid (*Rhogas kitcheneri*), *Limnerium interruptum*, and a bethylid.

Methods of control considered include winter destruction of food plants, destruction of infested bolls, destruction of teel or hemp (*Hibiscus cannabinus*) and bamia (*H. esculentus*) seed capsules, early maturity of the crop, and destruction of the pink bollworm in cotton seed in various ways, including heat, fumigation, etc. A note on fumigation of the seed, by V. Mosseri (pp. 308–312), is followed by one on the use of arsenical poisons in control of the pink bollworm.

Several insects which are liable to be confused with the pink bollworm are listed, namely, the cotton boll Pyrodercus (*Pyroderces simplex*), the hollyhock moth (*Crocidosema plebiana*), and *Cryptoblabes gnidiella*. A note on the possible relation between the pink bollworm and the ordinary bollworm (*Earias insulana*) and a brief discussion of the effect of injury by the pink bollworm on the germination of cotton seed and ginning outturns of sound and injured seed cotton from bolls of the first and second picking are appended, together with a bibliography of three pages. Four plates in colors which illustrate the pink bollworm, the nature of its injury, natural enemies, and insects likely to be confused with it are included.

The review is by W. D. Hunter, a recent bulletin by whom on the pink bollworm has been noted (E. S. R., 39, p. 764).

The seedling gum moth (Nola metallopa), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 30 (1919), No. 3, pp. 203–206, figs. 5*).—The author records extensive damage by this moth to red gum forests (*Eucalyptus rostrata*) in the Deniliquin district, Australia.

Malaria endemicity of the rice districts of Louisiana and Arkansas, with some observations on types of mosquitoes breeding therein, J. C. GEIGER, W. C. PURDY, and L. I. BATES (*Jour. Amer. Med. Assoc., 71 (1918), No. 16, pp. 1283–1285, fig. 1*).—"The control of the human carrier plus the factor of good screening have, so far, made negligible the malaria incidence in a typical rice district. As it is not yet humanly possible to obtain absolute mosquito control in the rice fields, these measures are indispensable.

"The persistent breeding of *Anopheles quadrimaculatus* in the rice fields and the repeatedly recorded 'obvious flight distance' of this mosquito of more than a mile emphasize the necessity of the foregoing measures. The observation that Culex superseded anophelines in 'dead' water in the rice fields deserves further study. The positive indications of breeding in crayfish holes, which abound everywhere, is suggestive enough to offer a simple solution to the sudden appearance of large larvæ or pupæ in puddles after rains, which before were dry.

"The history incidence index in two widely separated rice districts is the same. The incidence, though less than one would expect, is probably representative. The average incidence in school children taken as a unit invariably equaled that of the community as a whole, indicating strongly their availability for experimental index work and the obtaining of data."

Effective malaria control in a rice field district, with observations on experimental mosquito flights, J. C. GEIGER, W. C. PURDY, and R. E. TARBETT (*Jour. Amer. Med. Assoc., 72 (1919), No. 12, pp. 844–847, fig. 1*).—"Malaria has been eliminated from a typical rice field district. The question of flight of *Anopheles quadrimaculatus* may of necessity be regarded from two angles, that of experiment and that of observation. In one, the largest experiment of its kind ever undertaken in the United States, we have a record flight of 1 mile. In the other observation, there has been recorded continuously and on different occasions a flight of 1.7 miles.

"The use of 10 grains of quinin sulphate by mouth for sterilization of the blood of malaria carriers is evidently efficient for one malaria season if used actively over a period of 30 days.

"The completely negative clinical history of the 19 malaria carriers discovered on microscopic examination indicates, on the one hand, an immense difficulty in obtaining complete malaria control, but emphasizes, on the other hand, the importance of the detection of the human carriers."

A revision of the genus Sciara of the family Mycetophilidæ, F. W. PETTEY (*Ann. Ent. Soc. Amer., 11 (1918), No. 4, pp. 319–342, pls. 2*).—Thirty species are described by the author as new, of which seven belong to the genus Sciara and 23 to the new genus Neosciara. Two additional species of sciarids from South America are also described as new.

A contribution to the knowledge of the botflies, Gastrophilus intestinalis, G. hæmorrhoidalis, and G. nasalis, S. HADWEN and A. E. CAMERON (*Bul. Ent. Research, 9 (1918), No. 2, pp. 91–106, pl. 1, figs. 10*).—"The eggs of the three species of botflies discussed in this paper are distinguished by the fact of that of *G. hæmorrhoidalis* being the only one stalked. It is also longer than those of the other two species, which are of about equal length. Further, it is brownish black in color, that of *G. intestinalis* being whitish yellow and *G. nasalis* yellow. The egg of *G. intestinalis* adheres to the hair by clasping flanges, which run only two-thirds of its length, whilst the flanges of the *G. nasalis* egg run almost the entire length.

"The egg of *G. hæmorrhoidalis* is not inserted nor screwed into the skin of the host. The eggs of *G. intestinalis* are laid indiscriminately on the body of the host, but preferably on the long hairs investing the inside of the foreleg. *G. nasalis* lays its eggs on the hairs of the intermaxillary space and *G. hæmorrhoidalis* on the hairs of the lips, preferably the lower.

"Of the recently emerged larvæ, that of *G. intestinalis* is largest in size and *G. hæmorrhoidalis* smallest. In these two species there are 13 body segments, whilst *G. nasalis* has but 12 and is the only one bearing slender, elongate hairs. The larval posterior spiracles of the latter species are sessile; whereas in the others the two spiracles are borne on the distal ends of two cylindrical processes arising from the ultimate abdominal segments.

"The eggs of *G. intestinalis* do not readily hatch unaided, but apparently require the application of moisture and friction or shock. A large number of *G. nasalis* eggs hatched spontaneously and a few of the *G. hæmorrhoidalis* eggs also. This latter fact is regarded as supporting the theory that the newly emerged larvæ of these two species may penetrate directly into the integument of the host. The lesions on the skin of the intermaxillary space and lips of the host observed at the time the eggs were hatching may be due to direct penetration of the larvæ of *G. nasalis* and *G. hæmorrhoidalis*, respectively. The newly emerged larvæ of *G. intestinalis* failed to penetrate the hair-bearing integument of the host, but positive results were obtained when they were placed on portions of the buccal mucosa of a horse and calf recently killed. A larger number succeeded in penetrating the papillated portion of the calf's tongue, as compared with the unpapillated.

"The three species are probably present in each of the western Provinces of Canada. As regards their seasonal appearance, *G. intestinalis* is somewhat later than *G. nasalis* and *G. hæmorrhoidalis*, which appear simultaneously and are on the wing for about the same time. *G. intestinalis* continues to be active far into the autumn. Of the three species, *G. intestinalis* causes the animal less apprehension than the other two.

"The provision of leather flaps on the lips of the horse, cut into strips, combwise, is advocated as likely to give good results in warding off the attack of *G. hæmorrhoidalis*."

A list of 14 references to the literature and illustrations of the three species in color are included.

An examination of the sense reactions of flies, O. C. LODGE (*Bul. Ent. Research, 9 (1918), No. 2, pp. 141–151, pls. 3*).—"There appears to be a general similarity in the tastes of the different species with regard to various chemicals and foods; the tastes of *Musca domestica* and *Phormia azurea*, in many cases, being found to approximate most nearly. It will be interesting to discover whether there is a closer correspondence between the sense organs of these flies than between those of other species.

"These experiments emphasize the extreme curiosity of house flies, and again show the catholicity of their tastes and the difficulty of finding any substances which will either attract or repel all those that come near it. The mineral and tar oils seem to be amongst the most repellent substances. With regard to poisons, good results were obtained with sodium iodate, large numbers being killed when very small amounts were used, although it did not always attract many flies. Sodium iodate has the disadvantage of being very expensive. But further experiments require to be made before any definite conclusions can be arrived at as to the importance of the iodates of sodium and other metals as poisons for general use.

"House flies were not found to show any color preference. For house flies the optimum temperature was found to be between 36 and 44° C. [96.8 and 111.2° F.], the maximum and minimum between 55 and 58° and 10 to 13°, respectively.

"It appears that curiosity plays an important part in causing house flies to come to baits and to investigate traps, etc., although the senses of smell and to a less extent that of sight are also concerned; the former, however, to a much less extent than it is with blow flies, and it appears to be most used when the flies are close to the baits."

New muscoid genera, species, and synonymy, C. H. T. TOWNSEND (*Insecutor Inscitiæ Menstruus, 6 (1918), Nos. 7–9, pp. 151–156; 10–12, pp. 157–182*).—Fifty-eight genera are erected and 37 species described as new.

Two species of Pegomyia mining the leaves of dock, S. W. FROST (*Jour. Agr. Research* [*U. S.*], *16 (1919), No. 9, pp. 229–243, pls. 3, fig. 1*).—This is a report of studies at the New York Cornell Experiment Station of the life history and habits of two anthomyids (*Pegomyia calyptrata* and *P. affinis*) which extensively mine the leaves of *Rumex crispus* and *R. obtusifolius*, species of dock that occur commonly throughout the United States.

Studies of *P. calyptrata*, which is by far the more common of the two, are reported upon at more length. It appears that both species mine solely in species of Rumex.

Two parasites were reared by the author from the puparia of *P. calyptrata*, namely, *Opius quebecensis* and *Dacnusa scaptomyzæ*, and *Trichogramma minuta* from the eggs.

An hereditary tumor in the fruit fly, Drosophila, M. B. Stark (*Jour. Cancer Research, 3 (1918), No. 3, pp. 279–300, pl. 1, figs. 2*).—This is a report of studies of a lethal tumor arising in embryonic cells near the posterior end of the larva of *Drosophila melanogaster* (*ampelophila*).

On a parasitic Drosophila from Trinidad, C. G. Lamb (*Bul. Ent. Research, 9 (1918), No. 2, pp. 157–162, figs. 4*).—*Drosophila paradoxa*, which is parasitic on a cercopid of the genus Clastoptera found attacking cacao trees in Trinidad, is described as new.

A short summary of our knowledge of the frit fly, J. E. Collin (*Ann. Appl. Biol., 5 (1918), No. 2, pp. 81–96*).—A brief reference to the extensive damage to grains by this pest in northern and central Europe is followed by an account of its occurrence in Great Britain, its biology, natural enemies, and control measures. The species is a source of considerable injury in the whole south of England and it has been recorded as doing damage in Ireland and Scotland.

A list of 33 references to the literature is given.

The mechanism of evolution in Leptinotarsa, W. L. Tower (*Carnegie Inst. Washington Pub. 263 (1918), pp. VIII+384, pls. 19, figs. 161*).—A detailed report of investigations conducted by the author over an extended period. The Relation of Water to the Behavior of the Potato Beetle in a Desert, by J. K. Breitenbecher, is given in an appendix (pp. 341–384), which includes a bibliography.

Influence of Cerotoma trifurcata on the nitrogen-gathering functions of the cowpea, L. T. Leonard and C. F. Turner (*Jour. Amer. Soc. Agron., 10 (1918), No. 6, pp. 256–261, pl. 1*).—Experimental work conducted by the Bureau of Entomology, U. S. Department of Agriculture, at Arlington, Va., during 1914 and 1915, and at Greenwood and Grenada, Miss., during 1916, is described, in which observations were made of the effect of the bean-leaf beetle (*C. trifurcata*) upon cowpeas. Danger of extensive damage from the beetles or their larvæ in the vicinity of Washington, D. C., was found to be slight. Injury to the nitrogen-fixing functions of the cowpea plant may be caused by the larvæ without superficial indications except for the presence of the beetles and leaf injury. The damage is said to range from practically nothing to the entire destruction of the plant, while the injury to the nitrogen content of the cowpea roots was found to be roughly proportional to the number of larvæ present.

Time of planting and preseason conditions are deemed important factors in lessening the extent of damage. Planting between May 1 and 15 is recommended for the latitude of Greenwood. Crop rotation, fall plowing, and clean culture are also expected to prove beneficial.

Injury to casuarina trees in southern Florida by the mangrove borer, T. E. Snyder (*Jour. Agr. Research [U. S.], 16 (1919), No. 6, pp. 155–163, pls. 4, figs. 2*).—This is a report of studies of *Chrysobothris tranquebarica*, by an agent of the Bureau of Entomology of the U. S. Department of Agriculture, conducted on the east coast of southern Florida where *Casuarina equisetifolia* trees, known as casuarina or "Australian pine," have been and are being planted for shade and ornament along roads and avenues, on reclaimed swamp land, on golf courses, along the seashore, and as windbreaks for fruit trees.

The investigations by the author led to the discovery that this buprestid is a common and destructive enemy of the red mangrove (*Rhizophora mangle*), found in swamps along the coast, from which it spreads to infest casuarinas.

It was found that this borer attacks only living red mangrove and casuarina, the trees attacked ranging from 2 to 6 in. in diameter; those over five years old usually are not attacked, except high in the tops or branches. Small casuarina trees are attacked near the base as a rule. In case of small trees the trunk may be girdled before the larvæ attain their growth, and in most cases the damage is done before the presence of the insect is noticed. Many red mangrove trees in the swamp along Biscayne Bay were found in 1916 to have been killed by the borer.

But one year is required for the development of this borer from egg to adult. In addition to several predatory enemies, mention is made of two hymenopterous parasites, namely, *Atanycolus rugosiventris* which was found to be fairly common at Miami Beach in 1917 and 1918, and *A. labena* n. sp.

Investigations have shown that many trees can be saved by a method described by the author, which consists of cutting and burning all badly damaged casuarina trees between September and March to kill the insects before they emerge. The trees may be entirely removed, cut off near the ground, or merely topped so that they will sprout from the stump and make new growth. Since the borer usually attacks the young tree near the base, care should be exercised that no infested stumps remain. Trees only slightly damaged and showing evidence in the rapidly healing wounds of recovery should not be cut, since the wounds will soon heal. Casuarina trees between 1.5 and 6 in. in diameter growing in proximity to mangrove swamps or near other infested casuarina trees should be examined carefully in September and March and the young larvæ killed by spraying the affected part of the trunks with poisoned kerosene emulsion, made in accordance with the following formula devised by Craighead (E. S. R., 34, p. 652): Standard miscible oil 1 pint, water 5 gal., and sodium arsenate ½ lb. From April to June, when large numbers of the adult beetles are flying and feeding on the bark, they should be killed by spraying the tree trunks with the poisoned kerosene emulsion. No pruning of casuarina trees should be attempted between April and August, since the consequent flow of sap will attract the flying beetles to the trees.

The poplar borer (Saperda calcarata), R. N. Chrystal (*Agr. Gaz. Canada, 6 (1919), No. 4, pp. 333–337, figs. 4*).—This is a report of studies of *S. calcarata* in southern Alberta, where it is a source of serious damage to cottonwoods.

An annotated list of the Cerambycidæ of California, R. T. Garnett (*Canad. Ent., 50 (1918), Nos. 5, pp. 172–177; 6, pp. 205–213; 7, pp. 248–252; 8, pp. 281–284*).—In these parts 226 species are listed.

Conserving corn from weevils in the Gulf Coast States, E. A. Back (*U. S. Dept. Agr., Farmers' Bul. 1029 (1919), pp. 36, figs. 21*).—This is a summary of information on two insects that do more injury to corn in storage than all others combined, namely the rice weevil or so-called "black weevil" and the Angoumois grain moth or so-called "fly weevil," including their life history and habits, injury caused, and means of control. Detailed instructions are given for the prevention of injury through proper fumigation in air-tight bins, etc., emphasis being placed upon the financial gain resulting. As illustrative of this saving and the manner in which it may be accomplished, descriptions are given of the way in which three farmers saved their corn from loss.

Pea and bean weevils, S. H. Skaife (*Union So. Africa, Dept. Agr. Bul. 12 (1918), pp. 32, figs. 17*).—This is a discussion of the five species of weevils belonging to the family Bruchidæ known to infest peas and beans in South Africa, all of which have been introduced from overseas.

Studies in Rhynchophora.—VI, "The New York weevil," D. Sharp (*Jour. N. Y. Ent. Soc., 26 (1918), No. 3–4, pp. 215–218, pl. 1*).—This relates to morphological studies of *Ithycerus noveboracensis*.

Life history observations on four recently described parasites of Bruchophagus funebris, T. D. Urbahns (*Jour. Agr. Research* [*U. S.*], *16* (*1919*), *No. 6, pp. 165–173, pls. 2, figs. 8*).—This is a report of studies by an agent of the Bureau of Entomology of the U. S. Department of Agriculture of four parasites of the clover seed chalcid fly in the seed of alfalfa and red clover, namely, *Liodontomerus perplexus*, *L. secundus*, *Eutelus bruchophagi*, and *Timeromicrus maculatus*. An account of the host insect *B. funebris* has previously been noted (E. S. R., 32, p. 454), as have studies of its important parasite *Habrocytus medicaginis* (E. S. R., 36, p. 259).

L. perplexus is primarily parasitic upon the larva stages of the clover seed chalcid fly, feeding externally upon its host and frequently destroying the entire host larva with the exception of the head. In exceptional cases it has been found to be parasitic upon the pupal stage. This species is of considerable economic importance in helping to reduce the injury caused by the clover seed chalcid fly in alfalfa seed throughout the western Arizona seed-growing districts. It is not present in sufficient numbers throughout the California, Idaho, and Utah seed-growing sections to be of value in reducing the injury.

L. secundus, first collected at Albany, Oreg., in 1914, ovipositing in the green ovaries of florets on red clover heads, has been reared from infested red clover seed at Caldwell, Idaho, and Albany, Oreg., and was present among chalcids reared from red clover in 1915 at Elk Point, S. Dak.

E. bruchophagi was reared from alfalfa seed infested by *B. funebris* at several points in Idaho and Utah, and at Susanville, Cal. *T. maculatus* has been reared from infested alfalfa seed taken at Yuma, Ariz., and at a number of points in California and also at other points in Arizona, New Mexico, Kansas, California, South Dakota, and Utah. It is apparently well established in Yuma Valley, where it was found to destroy about 7 per cent of the larvæ of the clover seed chalcid fly, and it also appears to be well established in the Honey Lake Valley of northeastern California.

Additions and corrections to "The Type Species of the Genera of the Cynipoidea or the Gall Wasps and Parasitic Cynipoids," S. A. Rohwer and M. M. Fagan (*Proc. U. S. Nat. Mus.*, *55* (*1919*), *pp. 237–240*).—This consists of additions and corrections to the paper previously noted (E. S. R., 38, p. 63).

Contributions to our knowledge of the British Braconidæ.—III, Microgasteridæ, G. T. Lyle (*Entomologist*, *49* (*1916*), *Nos. 637, pp. 121–125, figs. 7; 638, pp. 160–163; 639, pp. 185–187; 640, pp. 206–208; 641, pp. 228–232; 642, pp. 251–254; 643, pp. 268–272; 50* (*1917*), *Nos. 646, pp. 51–53; 652, pp. 193–201, figs. 6; 51* (*1918*), *Nos. 660, pp. 104–111; 661, pp. 129–137, figs. 8*).—This third paper (E. S. R., 32, p. 454) deals with the Microgasteridæ, many of which are of considerable economic importance.

FOODS—HUMAN NUTRITION.

A new food mammal (*Jour. Heredity*, *8* (*1917*), *No. 8, pp. 339–345, figs. 5*).—The domestication and utilization as food of the Florida manatee is discussed. The meat of this mammal, the author claims, is remarkable for its whiteness, delicacy, and flavor. When cured it resembles bacon. The oil from the blubber which surrounds the entire body is believed, the author states, to be equal therapeutically to codliver oil. It is odorless, practically tasteless, contains no iodin, and has good keeping qualities.

The article includes an analysis of manatee grass (*Cymodocea manatorum*), an aquatic plant on which the manatee feeds.

Some observations on fish poisoning in the British Virgin Islands, T. L. E. CLARKE (*West Indian Bul., 17 (1918), No. 1, pp. 56–67*).—The poisonous fish of these islands are described and the local plants used as remedies listed.

Studies of use of milk by families having little children (*Washington: U. S. Dept. Labor, Children's Bur., 1919, pp. 12*).—Three articles are presented.

I. *Baltimore* (pp. 4).—This information was secured by school nurses of the Baltimore Department of Health and by nurses of the Instructive Visiting Nurses' Association and the Babies' Milk Fund of Baltimore. It was found that out of 756 children between 2 and 7 years of age only 29 per cent in 1918 were having fresh milk to drink as against 60 per cent in 1917. Less than 3 per cent of the children studied were having as much as 3 cups per day. Of 108 babies under 2 years who were not being nursed 68 per cent were having some fresh milk to drink every day.

II. *Washington* (pp. 4).—Statistics gathered by the public health nurses of Washington show that out of 482 children between 2 and 7 years of age, 39.6 per cent were receiving, in 1917, no fresh milk to drink. In 1918 this number increased to 52.7 per cent. Of 271 babies under 2 years that were studied, 7.2 per cent of those who were not breast-fed were drinking no milk.

III. *New Orleans* (pp. 4.)—This study was made by the nurses of the Child Welfare Association of New Orleans, under the direction of the Children's Bureau. Of the 589 children under 8 years of age in 211 families, 70 per cent of the 483 who were not breast-fed were getting, in 1918, no fresh milk, while only 31.7 per cent were getting as much as 3 cups daily.

Fats and oils (*Iowa State Col. Agr., Ext. Dept., Home Econ. Short Course Class Notes, No. 26 (1917–18), pp. 10*).—The composition, sources, and characteristics of various fats and oils are discussed. Recipes and menus illustrating their use are included.

Siebel's manual and record book for bakers and millers (*Chicago: Siebel Inst. Technol., 1917, pp. XIII+190+XXXII, pls. 10*).—This book discourses on modern milling and baking technology, discusses baking material and formulas for bread and cake, and presents, in addition, much scientific and technical data pertaining to milling and baking operations.

Flour trade in Foochow District, A. W. PONTIUS (*U. S. Dept. Com., Com. Rpts., No. 12 (1918), p. 179*).—The annual consumption of flour in this district in a good year totals 700,000 bags of 50 lbs. each. The prevailing prices ranged from $1.33 to $1.88 per bag. The flour is used entirely in making cakes and vermicelli.

On the control of rope in bread, E. J. COHN, S. B. WOLBACH, L. J. HENDERSON, and P. H. CATHCART (*Jour. Gen. Physiol., 1 (1918), No. 2, pp. 221–230, fig. 1*).—This is a more detailed account of investigations previously noted from another source (E. S. R., 40, p. 66).

Report on the preparation and uses of meals, particularly as flour substitutes, W. G. FREEMAN (*Bul. Dept. Agr. Trinidad and Tobago, 16 (1917), No. 2, pp. 70–78*).—This report includes Notes on the Preparation of Flour Substitutes, by R. O. Williams, and Meals, Etc., from Local Vegetables.—Their Preparation and Uses, by H. Meaden.

Bread substitutes (*Ber. Norges Landbr. Höiskoles Virks., 1916–17, App., pp. 23–28*).—Experiments are recorded in which oats and potato have been used in bread making to replace to a certain extent wheat and rye flours. The chemical composition of the resulting products is given, as well as score cards describing the physical characteristics of the bread.

Banana flour and other flours from tropical starchy products with notes on banana cultivation, B. J. EATON (*Agr. Bul. Fed. Malay States, 6 (1918), No. 10, pp. 430–436*).—A discussion of banana flour, its composition, its dietetic value, and its preparation, with notes on the cultivation of bananas, constitutes the larger part of this paper. A recipe for the preparation of potato bread is included, as well as directions for the storage of sweet potatoes, vegetables, fruits, etc.

An old-time method of yeast making, K. S. Spencer (*Amer. Cookery, 23 (1919), No. 7, pp. 520, 521*).—A comparison of the old-fashioned method of yeast making with the modern factory method of making dry yeast.

Turnip salad (*Amer. Cookery, 23 (1919), No. 7, p. 523*).—The old-fashioned use of young turnip shoots in salads is briefly commented upon.

Avocado tea recipe, Mrs. G. W. Beck (*Ann. Rpt. Cal. Avocado Assoc., 1917, p. 104*).—According to the author a tea can be made from avocado leaves, thoroughly dried in the shade, the test reported being made with leaves of the Northrup avocado. The infusion was made in the usual way, using 25 grains of the dried leaves to a quart of water and allowing it to stand for 5 minutes.

Lupin-containing coffee substitutes, H. Eckenroth (*Ztschr. Untersuch. Nahr. u. Genussmtl., 35 (1918), No. 6, pp. 240–242*).—The author is of the opinion that lupins, on account of the bitter principle which can not be completely removed, should not be used as coffee substitutes.

How to utilize our fruits without sugar, A. Truelle (*L'Utilisation Ménagère des Fruits sans Sucre. Paris: Masson & Co., 1918, pp. 96, figs. 28*).—This is a reprint of a series of articles from *La Nature* on the household utilization and preservation of fruits without sugar.

The substitution of saccharin for sugar, W. E. Burge (*Science, n. ser., 48 (1918), No. 1248, pp. 549, 550, fig. 1*).—From results of experiments on laboratory animals (dogs) the author draws conclusions favorable to the use of saccharin.

Dehydrated foods.—A list of references to material in the New York public library (*Bul. N. Y. Pub. Libr., 21 (1917), No. 10, pp. 645–655*).—A bibliography.

Practical aspects of dehydrated foods, L. P. Brown (*Amer. Jour. Pub. Health, 8 (1918), No. 5, pp. 372, 373*).—This article briefly summarizes advantages to be derived from development of dehydration in the United States.

The drying and preservation of vegetables, Balland (*Compt. Rend. Acad. Agr. France, 4 (1918), No. 32, pp. 902–907*).—Analyses of dried and canned vegetables sent from the United States to France at the beginning of the year 1915 are given. A table showing the water content of the canned vegetables is also included.

[Foods and drugs] (*Amer. Jour. Pub. Health, 8 (1918), No. 3, pp. 185–228*).—This issue contains material presented before the Food and Drugs Section of the American Public Health Association in October, 1917. It includes among others the following papers relating to food and nutrition: Production and Conservation of Food Supplies, by P. H. Bryce; Influence of Heat on Growth-promoting Properties of Food, by E. V. McCollum; Present Status of the Preservation of Food by Canning and Possibilities of Increase, by H. Burden; Municipal Food Departments in Modern War, by O. Salthe; The Fish Canning Industry, by C. M. Hilliard; Fruit and Vegetable Dehydration From a Technical Standpoint, by C. V. Ekroth; Problems of Canning Operations, by W. D. Bigelow; The Bacteriology of Swelled Canned Sardines, by W. Sadler; Cold Storage—Its Capabilities and How to Best Utilize and Extend Them, by F. A. Horne; and Milk Standards, by C. E. North.

[Food reports], A. T. Charron (*Dept. Agr. [Prov. Quebec], Rpt. Dir. Off. Lab., 1917, pp. 1–12*).—The standards fixed and promulgated in Canada for maple sirup and maple sugar are given, and results of analyses of these products reported. The use of homogenized cream in cheese making is discussed. Analyses of samples of Cheddar cheese are included.

Sketch of the Food Ministry's work in 1918 (*Nat. Food Jour.* [*London*], *2* (*1918*), *No. 32*, *pp. 224*, *255*).—This is a brief report of the year's work.

Food surveys (*U. S. Dept. Agr.*, *Food Surveys*, *2* (*1919*), *Nos. 22*, *pp. 8*, *figs. 5*; *23*, *pp. 12*, *figs. 7*; *24*, *pp. 8*).—These numbers contain respectively special reports of commercial stocks in the United States on January 1, 1919, of (No. 22) canned goods, potatoes, onions, and cabbage, and (No. 23) beans and peas, grain sorghums, miscellaneous cereal products, dried fruits, nuts, and peanuts; and (No. 24) on March 1, 1919, of grain, flour, and miscellaneous food products (beans, rice, rolled oats, canned salmon, canned tomatoes, canned corn, sugar, and condensed and evaporated milk).

Food wastes.—Some causes and remedies, L. P. BROWN (*Jour. Franklin Inst.* *185* (*1918*), *No. 5*, *pp. 585–610*, *figs. 16*).—The food wastes which occur in harvesting, in manufacture, in transport and distribution, and in the kitchen are analyzed and discussed. Statistics showing the kinds and amounts of foods condemned by the Department of Health, New York City, in 1917, are included. Certain remedies are suggested.

Low temperature cooking (*Hotel Mo.*, *27* (*1919*), *No. 310*, *pp. 64*, *65*, *figs. 2*).—An oven is described in which meats are cooked in air saturated with water vapor at 170° F. This method of cooking is said to be slower than the usual way, but is claimed to have many advantages. Among those mentioned is a reduction of shrinkage (9 to 14 per cent) and retention of flavor.

Oriental recipes that are worth the making, A. FARRAR (*Amer. Cookery*, *23* (*1919*), *No. 7*, *pp. 518–520*).—Specific directions for characteristic Chinese dishes are given.

The international economical food chart, A. T. DODSON (*Spokane: C. W. Hill Printing Co.*, *1918*, *pp. 10*, *figs. 18*).—An illustrated chart with text showing the composition of common food materials. The diagrammatic method of showing the composition and energy value of foods is in general a conventional one. In addition to data from the usual sources, the text includes material and generalizations not in accord with what seems to be the consensus of opinion of physiologists and physiological chemists.

Diet and health, with key to the calories, L. H. PETERS (*Chicago: The Reilly and Britton Co.*, *1918*, *pp. 105*, *illus.*).—This book, which is written in a popular style, has for its keynote "watch your weight." The information contained therein relates chiefly to the nutrition problems of the under and overfed.

The principles involved in the economic readjustment of dietaries, J. J. R. MACLEOD (*Jour. Lab. and Clin. Med.*, *2* (*1917*), *No. 11*, *pp. 743–760*).—A discussion of the fundamental principles of dietetics.

Standards for growth and nutrition, L. E. HOLT (*Amer. Jour. Diseases Children*, *16* (*1918*), *No. 6*, *pp. 359–375*, *figs. 7*).—The purpose of this paper is to show that the weight-to-age and height-to-age relationships are of comparatively little value in estimating the nutrition of the body. The author believes that the relation of weight to height is the one which is most reliable for study of the growth of children. Many statistics collected both in the United tSates and abroad are included.

Investigation of workers' food and suggestions as to dietary, L. E. HILL (*Min. Munitions* [*Gt. Brit.*], *Health Munition Workers Committee Memo.*, *19* (*1917*), *pp. 12*).—Specimen meals were obtained from canteens attached to munition works, the amounts of protein, fat, and carbohydrate estimated, and the fuel value calculated. The results showed that the average canteen dinner furnished about 1,000 calories. Investigation indicated that the meals brought from their own homes by the workers compared favorably with the canteen meals. An examination of the food of women workers showed diverse results, one restaurant dinner furnishing 397 and another 687 calories. The fuel value of meals brought from home varied from 295 to 1,143 calories.

The daily dietaries of munition workers were investigated at various hostels catering to both men and women. The dietaries of three of these were found deficient, but the author concludes that on the whole the hostel inmates are not undernourished. He believes the immediate remedy "for a threatened scarcity is not a reduction of food needed for the performance of work, but a saving of all waste, a complete utilization of all food fit for human consumption by human beings, an increase in the home production of food, and thus an extension of the food supply."

A proposed basis for a dietary for hospitals for the insane to meet war conditions, H. J. Sommer and P. Saha (*Hollidaysburg, Pa.: Directors Blair County Hosp. Insane, 1918, pp. 57*).—Dietaries are given illustrating the old and the new methods of issuing rations to the various types of patients and the employees. War bread formulas are included.

More recipes for fifty, F. L. Smith (*Boston: Whitcomb & Barrows, 1918, pp. VII+225*).—The recipes included in this volume are designed, according to the author, to simplify for institutions the problem of providing satisfactory meals at minimum expense with less sugar, less fat, and less wheat.

Military hospital mess management, R. G. Hoskins (*Jour. Amer. Med. Assoc., 72 (1919), No. 11, pp. 784–788*).—The following problems of mess management in military hospitals are discussed: Purchasing, mess personnel, and kitchen management, diet for the individual, preparation of menus, methods of serving and elimination of waste, and ward service.

Our diet, G. Junge (*Unsere Ernährung. Berlin: Otto Salle, 1917, pp. VIII+94, figs. 25*).—The author gives in a simple manner information relating to foods and nutrition designed to assist the German people in utilizing to the best possible advantage the foods available during the war and the years of scarcity which he anticipates after the war.

The food question, V. Kienböck (*Die Ernährungsfrage. Vienna: Victor Pimmer, 1918, pp. 16*).—A discussion of the food situation in Germany in 1918 and its relation to the war.

Home and community hygiene, J. Broadhurst (*Philadelphia: J. B. Lippincott Co., 1918, pp. XIII+428, pls. 4, figs. 113*).—This volume contains, in addition to much other material relating to personal and public health, chapters dealing with food, milk, and water.

The dynamic action of foodstuffs, C. Oppenheimer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 36 (1918), No. 3–4, pp. 60–63*).—A discussion based on Rubner's conception of the specific dynamic action of protein.

Deaminization and urea formation in the animal body, W. Löffler (*Biochem. Ztschr., 85 (1918), No. 3–4, pp. 230–294, figs. 3*).—The surviving livers of dogs and rabbits were perfused with Ringer's solution mixed with defibrinated blood, and the urea was determined by the urease method before and after perfusion. Various substances were added to the perfusion liquid, and their effect upon urea formation was noted.

It was found that there was an increase in the urea after perfusion, even when no nitrogen compound had been added. The addition of ammonium salts caused a considerable increase in the urea after perfusion, even when the perfusion liquid was distinctly acid. Acids inhibited somewhat the formation of urea. The amino groups of primary amins were converted into urea on perfusion, and the deamidized residues more or less completely oxidized. No substituted or asymmetrical ureas could be detected. Trimethylamin was completely demethylated, and the ammonia formed converted into urea.

Contributions to the physiology of the stomach.—XLI, The alleged influence of the removal of the salivary glands on the secretion of gastric juice, A. M. Swanson (*Amer. Jour. Physiol., 43 (1917), No. 2, pp. 205–211, figs. 3*).—Experiments carried out to determine whether or not a hormone exists in the salivary glands affecting the secretion of gastric juice by way of the blood are reported. The conclusions reached are as follows:

". . . [The] results contradict the theory of a hormone in the salivary glands stimulating the secretion of gastric juice. Extirpation of the salivary glands in the dog does not decrease the gastric juice secretion (appetite and secretagogue juice).

"Extirpation of the salivary glands causes a distinct rise in the acidity of the gastric juice. This increase in acidity is greater than can be accounted for by the slight increase in the rate of secretion. The slight increase in quantity may be due to the absence of the alkaline saliva.

"After extirpation of the salivary glands, the maximum secretion rate after a meal appears slightly retarded. This may be due to the absence of the water of the saliva, and to decreased psychic secretion, owing to the drying of the mouth and consequent impaired taste."

Other work by Carlson has been noted (E. S. R. 34, p. 463; 40, p. 270).

The regulation of the intestinal flora of dogs through diet, J. C. Torrey (*Jour. Med. Research, 39 (1919), No. 3, pp. 415–447*).—The study reported is an attempt to demonstrate by experiments with dogs the transforming influence of various food materials on the intestinal flora. The investigation includes determinations of the comparative transforming influence of various sugars and starches and of animal and vegetable proteins on the bacteria within the intestinal tract and of the influence of fat in the diet on the number and types of bacteria.

The results in general demonstrate that not all carbohydrates have an equal tendency to establish a purely fermentative intestinal flora, and not all protein foods encourage putrefactive conditions in a like degree. Fat seemed to play no part in determining the development of bacterial types in the intestine, the only effect of large amounts of fat of animal origin apparently being a reduction in the relative number of certain bacteria.

Lactose and dextrin, when added to a meat and rice diet, caused a marked development of aciduric bacteria of the *Bacillus acidophilus* type to the almost complete suppression of proteolytic types. Glucose and maltose exercised no transforming influence on the types of bacteria present in the intestinal tract. Sucrose, when fed in large amounts, caused a moderate increase in the numbers of obligate fermentative bacteria and a partial suppression of proteolytic types, but to a much less extent than lactose or dextrin.

With commercially pasteurized milk (grade C) the results obtained varied, depending upon whether the milk was fed boiled or unboiled. With unboiled milk, *B. coli* and streptococci predominated, while with boiled milk streptococci and B. *acidophilus* predominated. Starchy foods all tended to simplify the intestinal flora with the elimination of obligate putrefactive bacteria. Rice proved less effective than bread, potatoes, or beans as an antiputrefactive agent.

The proteins of the mammalian tissues were the only ones which encouraged to any extent the growth and activity of the obligate putrefactive bacteria within the intestinal tract. A diet of fish brought about a predominance of bacteria of *B. coli* and *B. proteus* groups, while the *B. welchii* types predominant with a meat diet, were absent. Milk casein and vegetable proteins showed far less tendency to give rise to intestinal putrefaction than did meat proteins.

The author concludes that under normal physiological conditions the fundamental factor controlling the types of bacteria originating in the intestinal tract is the chemical character of the food ingested, while secondary controlling factors of almost equal weight are the rate and degree of the digestion and absorption of the food and the character of the end products of the digestive process.

Clinical calorimetry.—XXVI–XXVIII (*Arch. Int. Med., 21 (1918), No. 5, pp. 613–658, figs. 14*).—Three papers are presented in continuation of earlier work (E. S. R., 37, p. 266).

XXVI. *The effect of a small breakfast on heat production*, G. F. Soderstrom, D. P. Barr, and E. F. DuBois (pp. 613–620).—Ten experiments were made on five subjects to determine the extent of the rise in metabolism following a small meal. The standard breakfast used in all observations consisted of 30 gm. bread, 8 gm. butter, 10 gm. sugar, and 60 cc. milk, equivalent to 4.7 gm. protein, 9.0 gm. fat, and 28.9 gm. carbohydrate, or 222 calories. It was found that the heat production increased on an average of 7 per cent in the first hour and 2 per cent in the second and third hours, while in the sixth, seventh, and eighth hours the metabolism was slightly lower than before breakfast.

XXVII. *Metabolism of boys 12 and 14 years old*, H. W. Olmstead, D. P. Barr, and E. F. DuBois (pp. 621–626).—The effect of age on heat production was observed in 1915 in the case of 8 Boy Scouts, averaging from 12 to 13 years of age. In 1917 these same boys were studied under experimental conditions which were practically unchanged. A comparison of these studies shows an average decrease with increasing age of 13 per cent in metabolism. At the age of 14 and 15 the average metabolism was 44.1 calories per square meter of body surface per hour. This is 11 per cent above the average for men between the ages of 20 and 40 years.

XXVIII. *The metabolism in malarial fever*, D. P. Barr and E. F. DuBois (pp. 627–658).—Both direct and indirect calorimetry were used and the following conclusions deduced:

Increased heat production on the part of the body is responsible for the rise of the pyrexial temperature. Heat elimination is slightly increased, and increased heat eliminaton causes the body temperature to fall. Heat producton is slightly hypernormal, but aside from increased protein metabolism no abnormal processes of metabolism are present in malarial fever. The percentage of heat lost in the vaporization of water bears a proportion to heat elimination in malarial paroxysms.

The distribution among foodstuffs (especially those suitable for the rationing of armies) of the substances required for the prevention of (a) beri-beri and (b) scurvy, H. Chick and E. M. Hume (*Jour. Roy. Army Med. Corps, 29 (1917), No. 2, pp. 121–159, figs. 6*).—The distribution of the antiberi-beri vitamin was investigated by a study of experimental polyneuritis in pigeons. The presence and relative amount of the vitamin contained in various foodstuffs was determined by means of curative experiments and by preventive trials with specially selected diets. The authors claim that this vitamin was found in almost every natural foodstuff examined, the most important sources being the seeds of plants, such as cereal grains, where it was found mainly in the germ or embryo, the eggs of animals and yeast and yeast extracts. The antiberi-beri vitamin was found to be resistant to drying, since dried foods could be used to combat beri-beri.

The authors also studied the effect of various foodstuffs in preventing scurvy when added to a scurvy-producing diet (cereals and water or sterilized milk). The beneficial effect derived from the addition of fresh fruits and vegetables they ascribed to the presence of an antiscorbutic vitamin. Fresh animal tissue has this antiscorbutic property to a much smaller extent, and it seems to be lacking in dried foods. However, they found that dried cereals when allowed to germinate acquire this property.

Infantile scurvy: The antiscorbutic factor of lemon juice in treatment, A. HARDEN, S. S. ZILVA, and G. F. STILL (*Lancet [London], 1919, I, No. 1, pp. 17, 18*).—Four case reports are given in which the residue from lemon juice after removal of citric and other acids, as previously noted (E. S. R., 40, p. 364) was used with marked success in the treatment of infantile scurvy. It was found possible to give this antiscorbutic factor in amounts equivalent to the juice of 6 to 12 lemons daily without any gastrointestinal disturbance. It is pointed out that as these results confirm those previously obtained experimentally in animals there can now be little doubt as to the bearing on human scurvy of results obtained in experimental scurvy with monkeys and guinea pigs.

Monophagism, pellagra, and scurvy, G. VOLPINO (*Ann. Ig. [Rome], 28 (1918), Nos. 5, pp. 213–225; 6, pp. 280–290; 7, pp. 346–358; 8, pp. 422–432; 9, pp. 482–497; abs. in Jour. Amer. Med. Assoc., 72 (1919), No. 7, p. 528*).—The author has summarized the results of investigations extending over several years on scurvy, pellagra, and monophagism. A few of the earlier studies of pellagra have been previously noted (E. S. R., 31, p. 858).

It is stated that the active immunization of pellagrins has been accomplished by injection of progressively increasing doses of an aqueous extract of maize. An extract of spoiled maize is said to induce a severe and complex reaction in pellagrins, which is thought to indicate that pellagrins are in a state of hypersensitization. The sera of pellagrins and of maize-fed guinea pigs contain ferments which digest the proteins of maize.

Pellagra and scurvy are considered on the basis of these invesigations to be due to monophagy, or a continued use of a one-sided diet, and the name monophagism is given to the pathological conditions thus induced. Monophagism is thought to differ essentially from starvation and from avitaminosis, in that it is due to the presence in the foods of certain elements which in time develop a toxic sensitizing action.

Is the amount of calcium usually given in dilution of cow's milk injurious to infants? A. W. BOSWORTH, H. I. BOWDITCH, and L. A. GIBLIN (*Amer. Jour. Diseases Children, 16 (1918), No. 4, pp. 265–267*).—A reply to an article of the same title (E. S. R., 40, p. 661).

John R. Young, pioneer American physiologist, H. A. KELLY (*Bul. Johns Hopkins Hosp., 29 (1918), No. 330, pp. 186–189, pls. 2*).—This article, in addition to biographical notes, describes the experimental methods used by Young which led to the discovery in 1803 that the gastric juice was an acid with solvent antiputrefactive properties. So far as is known it is the first American report of experimental studies of digestion.

International catalogue of scientific literature. Q.—Physiology. QR.—Serum physiology (*Internat. Cat. Sci. Lit., 12 (1917), pp. VIII+890+111+35*).—This catalogue continues the references previously noted (E. S. R., 34, p. 658).

ANIMAL PRODUCTION.

Color inheritance in mammals.—VI–XI, S. WRIGHT (*Jour. Heredity, 8 (1917), Nos. 11, pp. 521–527; 12, pp. 561–564; 9 (1918), Nos. 1, pp. 33–38; 2, pp.*

87–90; 3, pp. 139–144; 5, pp. 227–240, fig. 1).—These six papers complete a series of reviews, the earlier installments of which have been noted (E. S. R., 37, p. 866; 38, p. 776.)

VI. *Cattle.*—In considering the inheritance of roan color, it is held that the data furnishd by Wentworth (E. S. R., 30, p. 469) do not support the two-factor hypothesis of that author, but rather the idea of a single factor without dominance, the exceptions being accounted for on subsidiary hypotheses. The results of Lloyd-Jones and Evvard (E. S. R., 36, p. 168), showing that white is independent of red and black, are held to disprove the theory of "polygamous factors" (multiple allelomorphs) advanced by Wilson (E. S. R., 38, p. 367) to explain the roan condition.

Contrary to Wilson (E. S. R., 21, p. 470), the author holds that dun coloration is due to a diluting factor added to black. The same factor added to red produces yellow or cream. Brindle coloration has not been satisfactorily analyzed. Piebald conditions are independent of color, but no factorial interpretations of the several patterns can be attempted with the scanty data available.

VII. *The horse.*—Seven independent pairs of allelomorphs are recognized in the horse. In general the work of different investigators fits together harmoniously. The author is unable to explain certain facts associated with horse hybrids, especially the occurrence of chestnut mules when this color is never seen in jacks and is recessive in horses.

VIII. *Swine.*—The fragmentary published data on color inheritance in swine are collected. The white of Yorkshires is dominant to red and black, as was shown by Smith (E. S. R., 30, p. 69), but is distinguished from the dominant white of other mammals by the fact that this breed never transmits red in crosses with black nor black in crosses with red. It is suggested that the white in this case is an extreme dilution of red accompanied by the complete lack of black extension. The absence of the dilution factor and the presence of partial black extension results in the black with white (i. e., dilute red) points of Berkshires and Poland Chinas. By changes in minor factors causing intensity of red and restriction of black this pattern is, it is suggested, transformed into the solid red of Duroc Jerseys and Tamworths. The replacement of partial black extension by total extension results in solid black coloration, such as shown by the Essex, while the addition of factors for white-belt results in the Hampshire pattern.

IX. *The dog.*—Five pairs of unit characters for coat color of dogs are held to be more or less clearly indicated.

X. *The cat.*—The subject which has attracted chief attention to color inheritance in cats is the fact that the tortoise-shell pattern rarely occurs in males. The theories advanced to explain this require that an orange male mated to a black female should give rise to black males and tortoise females only. Mated to tortoise females he should produce black males and equal numbers of tortoise and orange females. In both crosses black females and tortoise males have been recorded. The author points out that these discrepancies are much more numerous among female offspring than among males, and that therefore the aberrant cases can scarcely be dismissed as faulty records.

Seven pairs of allelomorphs seem to be fairly well indicated for the coat color of cats.

XI. *Man.*—The available information concerning inheritance of hair color, eye color, premature grayness, albinism, and spotting is briefly summarized.

The correlation between a component and between the sum of two or more components, and the sum of the remaining components of a variable, J. A.

HARRIS (*Quart. Pubs. Amer. Statis. Assoc., n. ser., 15 (1917), No. 120, pp. 854–859*).—Formulas are derived to facilitate the computation of such coefficients of correlations as that between egg production of hens for a year and the production in a particular month of that year.

The physiological conditioning of the secondary sexual characters in birds. On the endocrine rôle of the genital glands, A. PEZARD (*Bul. Biol. France et Belg., 52 (1918), No. 1–2, pp. 176, pl. 1, figs. 79*).—The researches reported here, began in 1909 and brought to a sudden end by the mobilization of 1914, consist mainly of studies of the development of secondary sexual characteristics in caponized and spayed domestic fowl and pheasants. The results were similar to those of previous investigators, but an unusual effort has been made to give the data quantitative treatment. In the chicken experiments there were used 31 males and 10 females of various breeds, but all with single combs. For each individual a table gives the body weight and the length of comb, wattles, and spurs at frequent intervals for a year or more after the operation, together with notes on the development of hackle, saddle feathers, and sickle, the changes in color of comb and wattles, the crowing habits, and the sexual instincts. The weights of the liver, the peritoneal fat, and, in the case of controls, the gonads were determined by autopsy.

The linear measurements are considered in relation to the cube root of the body weight. In the case of comb length of males castrated at an early age, this relation remained constant throughout life. In normal males, the comb developed twice as rapidly as the body during the first year. Essentially the same results were found with wattle length. Spurs and plumage were not influenced by castration. The combs of cocks castrated after puberty decreased in size until a definite lower limit was reached, and the difference between the size of comb at any period during retrogression and this lower limit was found to be almost exactly proportional to the square of the time yet to elapse. In the case of two cocks in which mutilated pieces of testicular tissue were inserted in the peritoneal cavity at the time of castration, the comb and other erectile organs showed retrogression for about 3 weeks and then became normal again. For from 4 to 8 months three capons were given frequent injections of a suspension made from the testes of a cryptorchid boar. The combs began to enlarge immediately but retrogressed as soon as the injections ceased.

Ovariotomy caused immediate growth of spurs on pullets, and after the next molt the assumption of male plumage. The changes in their combs were variable; in some cases the head resembled that of a capon. Descriptions are given of a few gynandromorphs, both natural and experimentally produced.

Confirming the observations respectively of Maignon (E. S. R., 24, p. 175) and of Daniel-Brunet and Rolland (E. S. R., 26, p. 873), the author found that the percentage of glycogen in the pectoral muscles was higher in castrated than in uncastrated cocks, but that the glycogen content of the liver of the two groups was about equal. Data are given showing the relation between body weight, amount of fat, and the ratio of liver weight to estimated body surface in the normal and castrated males. It is concluded that the capon has no abnormal tendency to store fat but has lost the power of utilizing it. Data on body weight, body surface, and weight of liver of growing rats are presented for comparison.

Three silver pheasants and two golden pheasants were castrated. The plumage did not undergo modification but the sexual instincts were not developed. The comb- and wattle-like carunculations characteristic of silver pheasants remained small. Descriptions are given of the plumage of three wild pheasants (*Phasianus colchicus*) that showed a mixture of the characters of the two sexes, and also notes on a hen of the same species that developed masculine traits.

The experimental results were supplemented by histological observations on the gonads. Interstitial tissue was found in young male pheasants and chickens. In the latter it disappeared at puberty. In adult phesants the tissue was present during periods of sexual inactivity only.

The paper contains numerous references to experimental studies of the secondary sexual characters in other animals.

The growth of the body in man: The relationship between the body-weight and the body-length (stem-length), E. W. A. WALKER (*Proc. Roy. Soc. [London], Ser. B, 89 (1916), No. B 612, pp. 157–173*).—The purpose of this investigation was to determine to what extent the body length is proportional to the cube root of the body weight. The subjects used were human beings, but the body dimension selected for measurement was the joint length of head, neck, and trunk, so as to facilitate comparison with the results of measuring the head to pin-bone length of other mammals. In making the observations the inaccuracies of the ordinary sitting height measurement were avoided by causing the subject to sit on the floor with his back against the wall and his knees flexed. He thus rests upon the ischial tuberosities and not on the contracted muscles of the thigh. The subjects were English, of both sexes, and ranged from infants to university undergraduates.

The data were treated by plotting the logarithm of length (l) against the logarithm of weight (W), assuming that the two variables are connected by the formula $\log l = \log k + n \log W$. The arbitrary constants k and n were then determined by the position and slope of the "best" fitting straight line (as determined by inspection) passing through the plotted points.

The value of k is of no general interest since it varies with the units of measurement, but, whatever the units, if there is direct proportionality between the length and the cube root of the weight, n should be equal to $\frac{1}{3}$. In the data at hand the best value of n for males was found to be 0.329 and for females 0.323. These are considered very close approaches to the expected value.

Cattle calipers, A. C. MCCANDLISH (*Jour. Dairy Sci., 2 (1919), No. 1, pp. 28–31, figs. 2*).—Diagram and specifications are given for sliding arm calipers suitable for measuring the body dimensions of cattle. The novel feature is a spiral spring which aids in the release of the clamp on the movable arm. They were devised at the Iowa Experiment Station.

Report of progress on animal husbandry investigation in 1917, J. W. GOWEN (*Maine Sta. Bul. 274 (1918), pp. 205–228, pls. 2, fig. 1*).—This continues the annual reports (E. S. R., 38, p. 175) on the cattle investigation projects of the station. The following topics are treated:

Analyses of milk records.—The numerical factors required to correct for influence of age on milk and fat yield in the Guernsey breed have been computed from Advanced Registry Records—thus completing these determinations for the major dairy breeds. The figures are not published. One of their uses is illustrated in a comparison of the herd-improving abilities of 37 Guernsey sires each with at least 7 advanced registry daughters from advanced registry dams.

Variations and mode of secretion of milk solids.—This is an abstract of a paper previously noted (E. S. R., 40, p. 672).

Cattle judging as a means of selecting cows for the herd.—A group of 672 Jersey cows whose score card totals as determined by competent judges are given in the Register of Merit of Jersey Cattle were classified according to age at test, and the coefficients of correlation between score and annual milk production for each age are computed. As tabled these coefficients are all negative except for the 9-year-old class, but only in the two youngest classes are they sensibly different from zero considering the probable errors. The correlation for heifers between 1.5 and 2.5 years is about —0.21, and for those between 2.5 and 3.5 years —0.31. In each case the probable error is approximately 0.05. The author interprets these data as indicating a certain success on the part of the judges in picking high-producing 2-year-olds.

Breeding experiments.—A previous account (E. S. R., 40, p. 73) of some results of the experimental cattle crosses is summarized and information given as to the ancestry of 14 crossbred calves not hitherto listed. Seven unpublished photographs, four of them colored, are given of the experimental animals to show the segregation of black and fawn after a Jersey-Holstein cross.

Inheritance of twinning and problems connected therewith.—This is a new project, and data are being accumulated by the questionnaire method. The form sent out is reproduced. It is stated that a freemartin in the crossbred herd came into heat when about 20 months old and took the bull normally, although autopsy later showed lack of ovaries.

Cooperative cattle breeding records.—Collection of these records has ended and the study of the data is under way, some of the results being summarized. The average birth weights (with probable errors) of eight breeds are tabulated. The average length of normal gestation shown by 1,197 records is 281 days, 15.75 hours. Half of the records are included between 277 and 286 days, and all of them between 215 and 315 days.

Of 21 twin births recorded 3 pairs were both males, 14 bisexual, and 4 both females. Adding these data to those of Lillie (E. S. R., 40, p. 466) makes 37 pairs of the same sex and 38 of opposite sexes, a result which, combined with unpublished studies on the resemblance of bovine twins, is held to indicate absence of identical twins in cattle. In man, where identical twins do occur, the available data show 1.7 pairs of the same sex to one of opposite sex.

Earlier studies[1] on the interval between observation of heat and time of service are augmented and tabulation is made showing the relation between this interval and conception. Unsuccessful services occurred most frequently very early or very late in heat, and it is concluded that the most successful time was between 5 and 10 hours after heat was observed. The choice of time had no influence on the sex of offspring. Records of 1,801 births are tabulated with respect to the number of services required before pregnancy ensued. Less than 2 per cent of the conceptions took place after four or more services.

A comparison of concentrates for fattening steers in the South, W. F. WARD, S. S. JERDAN, and E. R. LLOYD (*U. S. Dept. Agr. Bul. 761 (1919), pp. 16*).—Results of two years' steer feeding experiments in the cooperative series (E. S. R., 40, p. 665) conducted by the Bureau of Animal Industry of the U. S. Department of Agriculture and the Mississippi Station are presented. Three lots of 25 steers, grades of the various beef breeds, were fed each winter for the purpose of studying the value of cottonseed products when fed as sole concentrates or combined with some form of grain corn. The roughages the first year were corn silage and cowpea hay; in the second year corn silage

[1] Maine Sta. Doc. 519 (1915), pp. 16–18.

and oat straw, with Johnson grass substituted for the latter toward the end of the period. The more pertinent data are assembled in the following table:

Comparison of concentrates for fattening steers.

Year and lot.	Concentrates fed.	Duration of test.	Initial weight per head.	Average daily gain per head.	Feed consumed per pound of gain.				Feed cost per pound of gain.
					Cottonseed product.	Corn grain.	Corn silage.	Hay or straw.	
1914–15.		*Days.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cts.*
1	Cottonseed meal	123	863	2.04	3.25	....	19.7	0.71	7.0
2	Cold-pressed cake	123	860	2.01	5.02	....	15.4	.73	6.8
3	Cottonseed meal; corn-and-cob meal	123	865	2.05	2.49	1.25	19.3	.75	7.8
1915–16.									
1	Cottonseed meal	141	834	1.56	3.66	....	25.0	3.10	9.5
2	Cottonseed meal; ear corn	141	824	1.66	1.81	4.57	22.4	1.73	10.8
3	Cottonseed meal; shelled corn	141	826	1.70	1.77	3.55	22.6	2.05	10.7

Cold-pressed cottonseed cake was charged at $16.50, and cottonseed meal the first year at $22.50 and the second year at $27 per ton. The charge for corn was 70 cents per bushel, and for silage $8, for cowpea hay $10, and for oat straw $5 per ton.

Three lbs. of cottonseed meal proved to be equal in feeding value to 4 lbs. of cold-pressed cottonseed cake. The meal was 40.4 per cent protein and the cake 27.6 per cent. The cake was much relished. Note is made of an earlier study (E. S. R., 25, p. 73) of cold-pressed cake fed to steers fattened on pasture in the South.

In the first year cottonseed meal and corn-and-cob meal (2:1) did not prove economical. In the second year, however, it is concluded that if the lots receiving cottonseed meal and ear corn (1:2) and cottonseed meal and shelled corn (1:2), respectively, are each credited with $8 worth of pork, they paid for the corn and then made about as much profit as the lot receiving cottonseed meal alone.

In both years all lots were well finished and very uniform. Data on shrinkage and dressing weights are given.

"This test clearly establishes the fact that the farmer having a surplus of corn and farm roughages can market them at a handsome price through steers of good quality, when properly purchased, and at the same time retain the fertilizing elements of the feeds on the farm in the form of manure."

Corn supplements and substitutes for fattening lambs, R. Dunn and J. M. Evvard (*Iowa Sta. Bul. 185* (*1919*), *pp. 3–14*).—From a group of 172 range lambs, 5 lots of 30 each were selected and fed for 82 days, beginning November 16, 1917, for the purpose (1) of testing linseed meal, velvet bean feed meal, and peanut meal as protein supplements to a basal ration of shelled corn, corn silage, and alfalfa hay, and (2) of determining the value of corn gluten feed as a partial substitute for corn in such a basal ration without supplement.

The main results from the control lot and the three lots fed supplements are given in the subjoined table. The supplements were fed scattered over the silage in amounts so adjusted that each of the latter lots received equal amounts of protein from this source. The other feeds were given according to appetite.

Comparative value of protein supplements in fattening lambs.

Lot.	Supplement.	Initial weight per head.	Average daily gain per head.	Feed consumed per pound of gain.				Feed saved by pound of supplement.		
				Supplement.	Shelled corn.	Corn silage.	Alfalfa hay.	Shelled corn.	Corn silage.	Alfalfa hay.
		Lbs.	*Lb.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lb.*	*Lbs.*	*Lb*
1	None	65.7	0.26	....	3.80	9.50	2.11	....	....	....
2	Linseed meal	65.4	.29	0.52	3.31	8.36	1.86	0.94	2.16	0.48
3	Velvet bean meal	65.8	.28	1.03	3.38	8.38	1.75	.41	1.09	.35
4	Peanut meal	65.9	.28	.50	3.38	8.24	1.85	.86	2.54	.53

The feeding of supplements, although increasing the grain required per pound of gain, enhanced the selling value of the lambs from 5 to 20 cts. per 100 lbs. and made a more favorable margin per lamb. Taking into account all the factors, it is computed that $118.60 per ton could have been paid for the linseed meal, $67.20 for the velvet bean feed meal, and $143 for the peanut meal without reducing the margin per lamb below that of the control lot. The actual purchase prices were $60, $45, and $55 per ton, respectively.

The fifth lot received corn gluten feed exclusively instead of shelled corn during the first 60 days, and a mixture of corn gluten feed, shelled corn, and linseed meal (6:1:1) during the final 3 weeks. The average daily gain per head was 0.26 lb. It is estimated that the corn gluten feed was 97.7 per cent as efficient as shelled corn when fed with silage and alfalfa. There was a small saving of corn silage and hay, but the total grain required for a pound of gain was considerably increased.

The dressing percentages varied from 52.9 for lot 5 to 54.2 for the lot receiving peanut meal. The carcasses of the velvet meal lot graded first in color, covering of fat, and firmness, with the peanut meal lot a close second. The control and gluten feed lots graded last in these respects.

Block salt was given freely to each lot, the amounts consumed being recorded. Proximate analyses of all feeding stuffs used are published, as well as the feed records by monthly periods and financial statements.

The wool industry, P. T. Cherington (*Chicago: A. W. Shaw Co., 1916, pp. XVI+261*).—While most of this volume deals with the marketing of wool, the "life history" of clothing styles, and the problems of the manufacturer of woolen goods, several chapters are devoted to the economic factors of production, the domestic wool supply, and the influence of trade demands and the tariff on wool growing.

Wool, F. Ormerod (*London: Constable & Co., Ltd., 1918, pp. XII+218, pls. 12; rev. in Nature* [*London*], *102* (*1919*), *No. 2567, pp. 362, 363*).—The importance of wool in English history, the development of breeds of sheep, the world's wool supply, wool and sheep in Australia, marketing of wool, shearing, sorting, and the various processes used in the manufacture of cloth, are discussed briefly in this volume, which is the first of a series entitled Staple Trades and Industries, edited by G. D. Knox. A considerable amount of statistical information on production and prices is provided.

Feeding horses, G. A. Bell and J. O. Williams (*U. S. Dept. Agr., Farmers' Bul. 1030* (*1919*), *pp. 24*).—A consideration of the selection of feeds for horses, directions for computing rations, a discussion of the uses of common feeding stuffs, and some sample rations are presented. Armsby's table (E. S. R., 36, p. 469) showing the digestible crude protein and net energy of different feeding stuffs, as determined by experiments with cattle and sheep, is reprinted with a few additions, mainly rice, sorghum, and potato products. It is held that the data have sufficient general application to be used in horse feeding.

Illustrated poultry primer, H. M. Lamon and J. W. Kinghorne (*U. S. Dept. Agr., Farmers' Bul. 1040* (*1919*), *pp. 29, figs. 53*).—This handbook for the beginner in poultry raising provides condensed information about breeds, incubation, brooding, poultry houses, feeding, marketing eggs, caponizing, and diseases and parasites.

The growth of chickens in confinement, T. B. Osborne, L. B. Mendel, et al. (*Jour. Biol. Chem., 33* (*1918*), *No. 3, pp. 433–438, pls. 3*).—The procedure used by the authors in rearing chickens in small cages under laboratory conditions (E. S. R., 36, p. 872) has been modified by the addition of moist paper pulp or filter paper to the diet as a substitute for the complex roughages ordinarily fed by poultrymen, the necessary fat-soluble vitamin being furnished by butter fat incorporated in the feed. A considerable proportion of the young chicks developed to normal adult size, the cockerels crowing and the pullets laying eggs. The others developed "weakness of legs," but continued to gain in weight.

"The success already achieved in the absence of dietary factors hitherto assumed to be essential for the growth of chickens, and also under supposedly adverse conditions of housing, encourages us to believe that all of the essentials for the nutrition and adequate growth of chickens under laboratory conditions can be ascertained, and that these will be controllable in much the same way as has proved possible in the case of other animals. The question of 'roughage,' suitable salts, proteins, and food hormones needs to be approached from new angles in the case of species that have characteristics of digestion and metabolism and structural requirements somewhat different from those of most mammals."

The correlation between egg production during various periods of the year in the domestic fowl, J. A. Harris, A. F. Blakeslee, and W. F. Kirkpatrick (*Genetics, 3* (*1918*), *No. 1, pp. 27–72, figs. 11*).—A preliminary discussion of these data, accumulated in the course of the egg-laying contests at the Connecticut Storrs Experiment Station has been noted (E. S. R., 38, p. 171) and a treatment of the more practical aspects has since appeared in bulletin form (E. S. R., 39, p. 480).

Breeding poultry for standard and utility values, R. R. Slocum (*Rel. Poultry Jour., 26* (*1919*), *No. 1, pp. 57, 103, 104, figs. 4*).—As a result of breeding work at the experimental farm of the Bureau of Animal Industry of the U. S. Department of Agriculture at Beltsville, Md., it is stated that in Single Comb White Leghorns at least it is perfectly feasible to combine utility with the qualities called for by the standard of perfection.

A practical farm flock egg-laying contest in Missouri, T. S. Townsley (*Rel. Poultry Jour., 26* (*1919*), *No. 2, pp. 219, 257, 258, figs. 2*).—A brief statement is made of the operation of a system of egg-laying contests conducted on 24 demonstration farms in Missouri. Records of egg production, feed cost and other expenses, and income are submitted monthly by these farms to the poultry department of the College of Agriculture. The college also sends agents to inspect the farms three times a year. For the year ended October 31, 1918, 3,580 hens were included and the average record was 140 eggs.

Runner ducks as farm layers, A. T. Johnson (*Jour. Bd. Agr.* [*London*], *25* (*1917*), *No. 7, pp. 748–750*).—Brief directions for the management of Indian Runner ducks are given. It is stated that laying ducks of good strains are very profitable as egg producers for the average farmer. "A good duck will lay all the year round, with brief intervals, commencing in her first autumn at the age of six months, and continuing in profit until she attains her fourth or fifth year. In individual cases the ducks will often lay longer than that."

DAIRY FARMING—DAIRYING.

Some factors influencing the rate of growth and the size of dairy heifers at maturity, C. H. Eckles and W. W. Swett (*Missouri Sta. Research Bul. 31 (1918), pp. 3–56, pl. 1, figs. 15*).—To serve as standards of growth for Holsteins and Jerseys, data are published of the body weight and height at withers by months of a group of heifers of each breed that were kept under "normal" conditions, that is, fed on skim milk from 2 weeks to 6 months of age, with alfalfa, silage, and a small amount of grain in winter, and good blue grass pasture in summer. The plan was to keep the animals in a good thrifty condition but not fat. The use of height at withers to measure skeletal growth is justified by computations showing that the percentage increments in height at hips, heart girth, and distance from shoulder point to pin bone in successive ages maintain an approximately uniform ratio to the corresponding increments in height at withers. As was expected, the ratios for hip width increased with age.

The weights at birth and the mature heights of 30 Holstein and 32 Jersey heifers are tabulated individually, the heights at intermediate ages being also given for some of the animals. Little or no influence of birth weight on adult height was discovered.

Note is made of a Jersey heifer which at the age of 6 months was put on a diet as low in calcium and phosphorus as could be secured from feeding stuffs likely to be used in practice. The growth in weight and height was normal for 13 months thereafter, when a physical breakdown ensued.

The rest of this bulletin—the major part—is devoted to the presentation of the complete results of a study, previously reported in its more practical aspects (E. S. R., 34, p. 378), of the influence of quantity of feed on the changes in weight and height of dairy heifers from birth to maturity, and the effect of early calving on their subsequent body development. The promised evidence is produced for the previously expressed view that the check in growth of young animals following parturition is a result of the physiological drain, not of pregnancy, but of lactation.

Dairy cattle breeding experiments (*Hoard's Dairyman, 57 (1919), No. 11, pp. 544, 545, figs. 3*).—An outline is presented of a cattle breeding project undertaken by the Dairy Division of the U. S. Department of Agriculture, which involves experimental crosses between Jerseys and Holsteins and a study of inbreeding and line breeding. This account was written by one of the editors of *Hoard's Dairyman* after a visit to the Department's experimental farm at Beltsville, Md.

The feeding of concentrated food to dairy cows on pasture (*Jour. Bd. Agr. [London], 25 (1918), No. 1, pp. 11–17*).—This article reviews five experiments conducted in recent years by various agencies (Armstrong College, Southeastern Agricultural College, Leeds University, and the West of Scotland Agricultural College), which provide information as to whether a decreased milk yield was to be expected as a result of the adoption of the war time policy of the British Board of Agriculture and Ministry of Food that milch cows on pasture are not to be fed "cake" before the beginning of August.

"It is rarely in agricultural experimental work that the results obtained in different experiments carried out at such widely-scattered centers are so uniformly concordant as in the experiments dealt with above. They all agree in indicating that, so far as milk production is concerned, the feeding of concentrated food to milch cows on pasture is only required in the later half of the season, say, from mid-July onwards. In the earlier half of the season, cows receiving concentrated food gave no more milk than others that received none."

The influence of barley on the milk secretion of cows, F. W. WOLL and E. C. VOORHIES (*California Sta. Bul. 305 (1919), pp. 325–334*).—This bulletin furnishes complete records of amounts and kind of feeds consumed by, the body weights of, and the quantity of milk and butter fat produced by (1) a grade Holstein cow during three lactations in which the only grain fed was barley, and two in which mixed grains were fed; (2) a pure-bred Jersey during four lactations, in one of which barley was the sole grain; and (3) another pure-bred Jersey during two lactations in which mixed grain and one in which barley was fed. It also compares the production records of 15 other cows, mostly used previously in a similar study (E. S. R., 33, p. 575), during short periods (generally 5 weeks) of barley feeding with their records during the intervening periods of mixed grain feeding.

An increased milk flow generally accompanied barley feeding, but this is not attributed to the barley as such but to the accident that a larger quantity of grain was frequently fed. These are admittedly not critical experiments, and are only cited by the authors to show that barley feeding has no deleterious effect on milk secretion, and to disprove the contention of some dairymen that barley tends to dry up milch cows.

Heat period and milk production, J. J. HOOPER and P. E. BACON (*Breeder's Gaz., 75 (1919), No. 15, pp. 844, 845*).—It is stated that many dairymen believe that cows in milk increase their butter fat yield during periods of heat, but the records of 29 Jerseys at the Kentucky Experiment Station are cited in which there was an average decline of 0.1 lb. of fat and 1.5 lbs. of milk on the day of most evident heat.

The cost of milk production computed on the year basis, F. A. PEARSON (*Illinois Sta. Bul. 216 (1919), pp. 343–364*).—These studies were undertaken to derive workable formulas that would express the cost of producing fluid milk for the Chicago market in terms of amounts of feed and labor used, and not of the monetary value of the expenses incurred.

A study of the herd cost is based upon the records during the fiscal years 1914–15 and 1915–16 of 36 farms on which there were 878 milch cows, 225 calves (and heifers not in milk), and 35 bulls, and where 6,511 lbs. of milk and 235 lbs. of butter fat were sold per cow during the period. Production in the six winter months was 56 per cent of the yearly total. The gross cost of producing 100 lbs. of milk was found to average $2.25, the percentage of the several items being: Feed other than pasture 60.7, pasture 5.8, man labor 17, horse labor 3.4, interest on herd 4.9, building charges 3.6, equipment 1.3, and miscellaneous 3.8. A managerial charge was not included. The cost other than for feed (excluding pasture) and man labor totaled 50.16 cts. which almost exactly balanced the 49.69 cts. credit from appreciation of stock, manure, hides, beef, and other miscellaneous returns. The production cost on these farms can thus be expressed in terms of feed and labor. The amounts per 100 lbs. of milk were approximately 44 lbs. of grain, 188 lbs. of silage, and other succulent feed, 50 lbs. of hay, 39 lbs. of other roughage and bedding, and 2.42 hours of man labor. This is the formula for "year cost." To correct for seasonal variations in cost of production it is suggested that the price for any month be that percentage of the year cost which represents the average variation of that month from the average year price during the years 1907 to 1916. A table showing these monthly percentages is given. It is noted that only 61.8 per cent of the grain fed was purchased, whereas in farms providing milk for New York City (E. S. R., 34, p. 771) the purchased grain was about 98 per cent of the total.

In 16 of the above farms, embracing 428 cows, the records permitted the separation of the cost of rearing young stock from the herd cost, the difference being the "cow cost." The net cost of producing 100 lbs. of milk on this basis was $1.70, which is 125.6 per cent of the cost of feed (excluding pasture) and man labor. The amounts of feed and labor were approximately: Grain 35 lbs., silage 140 lbs., hay 36 lbs., other roughage 29 lbs., and man labor 2.36 hours. To find the year cost on this basis it is necessary to increase the total of these items by 25.6 per cent. Corrections for seasonal variation may be made as before.

A short discussion of some data from 680 dairy farms in Kane and McHenry Counties in Illinois is given, mainly to show that the "farm cost," obtained by deducting from the total farm expenses the receipts derived from all sources except the dairy, is a misleading measure of milk production costs.

Producers' and consumers' price for milk, R. PEARL (*Hoard's Dairyman, 57 (1919), No. 4, p. 148*).—Tabulations are presented showing the prices received by farmers furnishing milk to each of 9 cities in the United States during the years 1913 to 1918, the prices received by the producers of 11 other farm products in the United States during 1913, 1917, and 1918, and a comparison of producers' and retailers' prices of milk in these three years in each of the 9 cities.

Averaging the data from the 9 municipal areas, it appears that the prices which producers received for milk in the first half of 1918 were 78.4 per cent higher than the 1913 price. This increase is greater than the percentage increase in potatoes, butter, eggs, cattle, and onions, and less than the increase in wheat, corn, hogs, sheep, lambs, and beans. The percentage increase of milk in the first half of 1918 over the first half of 1917 was greater than that of any of the other commodities, three of which suffered a decrease. Except in Chicago and Buffalo, the producer received a definitely higher percentage of the price the consumers paid in 1918 than in 1913.

The apparent willingness of the public to pay more for milk since 1917 is attributed partly to the publicity which the U. S. Food Administration gave to the researches of McCollum and others on the importance of milk in the diet.

Report of the Milk Committee appointed by the Food Controller for Canada to investigate milk supplies for urban municipalities, P. B. TUSTIN ET AL. (*Ottawa: Food Controller Canada, 1917, pp. 20, figs. 8*).—This report deals mainly with the causes of the "spread" between the prices paid to producers and those charged to consumers. A local zone delivery system is recommended. A statement by W. A. Wilson detailing the experiences of Regina, Saskatchewan, in the organization and consolidation of the milk business is appended.

History of milk trade, milk adulterations, milk prices, L. DIJKSTRA (*Milk Dealer, 8 (1918), No. 1, pp. 62, 63, 66*).—Some historical notes are given as to the status of the milk industry in medieval Europe and its subsequent progress.

Operation of the cream receiving station, N. W. HEPBURN and H. A. RUEHE (*Illinois Sta. Circ. 234 (1919), pp. 3–19, figs. 15*).—This publication was prepared for the use of the large body of untrained workers necessarily placed in charge of receiving stations in Illinois as the result of a rapid extension of the centralizer system. Illustrated directions for making the fat test of cream are given. Care in washing and shipping the cans is emphasized as a means of securing a better grade of cream.

Small-holder's cheese, skim-milk cheese, cottage cheese, R. H. LEITCH (*West of Scot. Agr. Col. Bul. 87 (1918), pp. 55–80, figs. 13*).—Brief directions are given for making small-holder's cheese, skim-milk cheese, and cottage cheese on the farm. The first named is of two types, one in which the curd after cutting is scalded by mixture with a heated portion of the whey, and the other in which the curd is merely ladled into the draining cloth after being cut.

The manufacture of Cheddar cheese, R. H. Leitch (*West of Scot. Agr. Col. Bul. 88 (1918), pp. 81–100*).—The British method of making Cheddar cheese is outlined.

VETERINARY MEDICINE.

Report division of veterinary, W. Moore (*Bul. N. C. Dept. Agr., 39 (1918), No. 12, pp. 32–37*).—This is a report for the biennial period December 1, 1916, to December 1, 1918, on tick eradication work, hog cholera, tuberculosis, glanders, etc.

Researches on the serum of the sea eel (Muraena helena), W. Kopaczewski (*Ann. Inst. Pasteur, 32 (1918), No. 12, pp. 584–612, figs. 10*).—This is a more detailed treatment of the subject previously noted (E. S. R., 38, p. 582).

Hematic phenomena in anaphylaxis and antianaphylaxis (hemo-anaphylactic crisis), C. Richet, P. Brodin, and F. Saint-Girons (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 8, pp. 369–383, figs. 4*).—Anaphylaxis experiments with dogs are reported which indicate that in anaphylaxis the blood undergoes profound changes, including an increase in concentration, the appearance of nucleated hematin, and the disappearance of polynuclear cells.

A blood-destroying substance in Ascaris lumbricoides, B. Schwartz (*Jour. Agr. Research [U. S.], 16 (1919), No. 9, pp. 253–258*).—This is a preliminary report of investigations conducted by an agent of the Zoological Division of the U. S. Department of Agriculture. The author's investigations are said to have resulted in the accumulation of sufficient data to warrant the following conclusions:

"The body fluid of *A. lumbricoides* taken from worms shortly after their removal from the host is not hemolytic to the washed erythrocytes of swine, cattle, sheep, rabbits, guinea pigs, and rats. The fluid from worms which after removal from their host are kept alive in salt solution for a few days acquires hemolytic properties. Fluid from worms kept in vitro for 24 hours is only slightly hemolytic if at all, but fluid from worms kept under similar conditions from six to eight days is decidedly destructive to the red blood corpuscles of swine and sheep. The hemolytic property of the fluid is thermostabile and is not destroyed by boiling.

"There appears to be an inverse relation between the hemolytic property of the fluid and the presence of oxyhemoglobin in it. Fluid from fresh worms contains oxyhemoglobin and is nonhemolytic. When, however, the worms are kept alive in vitro, the oxyhemoglobin disappears from the fluid and can no longer be detected by spectroscopic examination one week after the worms have been removed from the host. Meanwhile, the fluid becomes hemolytic. Whether oxyhemoglobin in itself is the sole factor in the inhibition of hemolysis or whether other substances are involved which are associated with the oxyhemoglobin and disappear simultaneously with it has not been determined.

"Salt solution extracts of the worms made by grinding up 4 to 10 gm. of the fresh body substance of the parasites and suspending it in 100 cc. of an 0.85 per cent solution of sodium chlorid are hemolytic to the washed erythrocytes of swine and other mammals, the hemolytic potency of the extracts varying directly within certain limits with the duration of the extraction. The reaction is independent of the acidity of the solution, since it is not impaired by neutralization. Extracts of dried worms in an 0.85 per cent solution of sodium chlorid are decidedly hemolytic to the red corpuscles of various animals.

"Salt solution extracts of the intestine of the worm are more destructive to blood corpuscles than extracts of the body wall, of the reproductive organs, or of the entire worm. The various salt solution extracts also do not lose their hemolytic properties on boiling. The addition of blood serum to tubes containing a mixture of red blood corpuscles and body fluid or extract of the worms usually inhibits hemolysis. The hemolytic property of the fluid and of extracts of the worms can also be destroyed by the addition of a small quantity of laked blood. Excretions of the worms absorbed by the solution of sodium chlorid in which the parasites are kept in vitro are not hemolytic."

The causes of death among horses immunized with killed bacteria or bacterial extracts, E. DEBAINS and E. NICOLAS (*Compt. Rend. Acad. Sci.* [*Paris*], *168* (*1919*), *No. 6, pp. 324–327*).—The authors state that in the course of immunization of horses to obtain antimicrobial and antitoxic sera several deaths have occurred in a few minutes after intravenous injection of the bacteria or bacterial extracts. The theories are discussed as to whether this phenomenon is due to hypersensitiveness to bacterial proteins or to the bacterial toxins, the evidence apparently being in favor of the latter.

The effect of acids on the growth of Bacillus coli, F. J. S. WYETH (*Biochem. Jour.*, *12* (*1918*), *No. 4, pp. 382–401, figs. 7*).—Experimental data on the effect of acids on the growth of human and bovine strains of *B. coli* are reported from which the following conclusions are drawn:

All strains of *B. coli*, whether of human or bovine origin, behave similarly when exposed to similar conditions. The degree of acidity of the final reaction produced by a culture of *B. coli* can not be used for diagnostic purposes as this value is not a "physiological constant," but depends upon the initial H-ion concentration of the medium in which fermentation occurs, the composition of the medium, and the nature of the acid used to produce the initial reaction of the medium. Each acid appears to have a specific effect in inhibiting the growth of *B. coli* in a given medium, highly dissociated acids being more strongly inhibitory than less highly dissociated. For a mixture of any given medium and acid there appears to be a definite critical point beyond which the slightest rise in the degree of acidity results in a complete inhibition of the growth of *B. coli*.

The use of blood agar for the study of streptococci, J. H. BROWN (*Monographs Rockefeller Inst. Med. Research, No. 9* (*1919*), *pp. IV+122+*[*76*], *pls. 34*).—This monograph includes a detailed study of the appearances produced by the growth of streptococci in blood agar made with defibrinated horse blood; and of the influence upon the growth of the streptococci of age and kind of blood, composition of the agar, anaerobiosis, and the presence of other types of streptococci. This is followed by a discussion, based upon the author's studies and the literature of the subject, of the causes of various appearances in blood agar, the permanence of cultural characteristics, and the occurrence and classification of the various types of streptococci. A tabular description is given of the principal strains referred to in this work and of streptococci with reference to type of appearance in blood agar and fermentation reactions. A system of notes for preserving the genealogy and other details in the study of bacterial cultures and a method of making photographic records of growth on agar and blood agar plates are described.

In addition to a bibliography, an extensive review of literature on streptococci and streptococcus infections is presented in tabular form under the following topics: The use of blood agar, the use of blood bouillon and other fluid media, fermentation reactions, pathogenicity and virulence, mutations and variability, and general conclusions with reference to the correlation of source, pathogenicity, hemolysis, fermentation reactions, etc.

Bacteriological notes, P. [B.] HADLEY, D. W. CALDWELL, and B. M. HEATH (*Jour. Bact.*, *4* (*1919*), *No. 1, pp. 65–69*).—In the course of bacteriological studies on avian diseases at the Rhode Island Experiment Station, the following observations were made:

I. *Gas production by Bacterium pullorum* (pp. 65, 66).—Gas production by *B. pullorum* was shown to depend upon whether the cultures are grown in glucose extract or in glucose infusion broth, more being formed in the latter medium. Propagating cultures for many years on artificial media has not been found to cause a loss in their gas-producing ability.

II. *B. pullorum infections in adult stock* (pp. 66, 67).—Anaerogenic strains of *B. pullorum* have been isolated from adult fowls experiencing acute or subacute infections simulating fowl typhoid in both clinical symptoms and pathological alterations in the tissues (E. S. R., 38, p. 889). It is proposed to classify two subspecies of *B. pullorum* as follows: (1) *B. pullorum* α, aerogenic and pathogenic for chicks, and (2) *B. pullorum* β, anaerogenic and pathogenic for adult stock only.

III. *Correlation between sucrose fermentation and immunizing power of Bacillus avisepticus* (pp. 68, 69).—Strain 52 of *B. avisepticus*, described in an earlier bulletin (E. S. R., 27, p. 583), has been found to be unlike other strains of the organism in that it produces no acid with sucrose. As this is correlated with the ability to produce in rabbits resistance to powerful infection with virulent cultures, an ability possessed by no other strain, the question is raised as to the possible significance of the fermentative reaction in relation to immunity production.

Immunization products and indications for their use, C. Murray (*Jour. Amer. Vet. Med. Assoc., 55 (1919), No. 1, pp. 68–76*).—This is a general discussion of active and passive immunity and the means of acquiring immunity to certain diseases.

The germicidal power of antiseptic oils and of substances dissolved in oil, P. D. McMaster (*Jour. Infect. Diseases, 24 (1919), No. 4, pp. 378–385*).—The following method has been developed to determine quantitatively the germicidal power of antiseptic oils and substances dissolved in oils:

Agar slants, well drained of the water of condensation, are inoculated with *Bacillus typhosus* over an area of not more than 1 cm. and well above the middle of the tube. After incubating for 24 hours, the tubes are filled with the oil to be tested and incubated for 24 hours at 37.5° C., after which the oils are poured off and the tubes washed twice with sterile salt solution. A transplant of the organism is then made to a tube containing 8 cc. standard broth, and readings of this tube are made after 24 hours' incubation. Phenol dissolved in mineral oil was found to have a germicidal value approaching that of its value in water, and thus to be suitable as an arbitrary standard for comparison when testing the activity of other oils and oil-soluble substances.

The coefficients of certain disinfectants in oils as determined by this method are reported as follows: Phenol in paraffin oil 1, iodin in paraffin oil 1, phenol in cottonseed oil 0.16, paracresol in paraffin oil 1.55, guaiacol in paraffin oil 0.44, dichloramin-T in 10 per cent chlorinated eucalyptol in chlorinated paraffin oil 8, and dichloramin-T in plain paraffin oil 1.

The author considers the method as so far developed satisfactory, except that any advantage which a substance might possess in the shape of rapidity of action is largely masked by the 24-hour period of exposure used.

Proflavin oleate in the treatment of open wounds, C. Berkeley and V. Bonney (*Brit. Med. Jour., No. 3032 (1919), pp. 152, 153*).—Attention is called to the value of proflavin oleate in the treatment of wounds in which an exceedingly tender, raw surface of considerable extent exists. The oleate ointment can be applied directly to the wound and covered with a single layer of gauze, no bandage being required to keep it in contact with the wound.

A note by C. H. Browning on the chemical and antiseptic properties of proflavin oleate is appended. Although comparatively insoluble in water, it dissolves sufficiently in serum to cause the latter to acquire marked antiseptic properties.

Dichloramin-T and petrolatum dressing for burns, T. SOLLMANN (*Jour. Amer. Med. Assoc.*, *72* (*1919*), *No. 14*, *pp. 992, 993*).—Solutions of dichloramin-T in carbon tetrachlorid were found to be very stable; in chlorcosan and liquid petrolatum, comparatively stable; and in kerosene, olive oil, and ordinary petrolatum, very unstable. An ointment of three parts of surgical paraffin and seven parts of liquid petrolatum was found to have relatively little destructive action on dichloramin-T, and to be practical as a protective dressing for wounds or burns treated with dichloramin-T-chlorcosan solution or as a basis for a dichloramin-T ointment.

The action of chlorinated antiseptics on blood clot, H. D. TAYLOR and M. G. STEBBINS (*Jour. Expt. Med.*, *29* (*1919*), *No. 1*, *pp. 125–131*).—By means of experiments upon clotted rabbit blood, the authors have demonstrated that the chlorinated antiseptics have no power to penetrate blood clots and destroy the bacteria contained therein. It is considered probable that the fibrin of the blood clot is the resistant substance, as plasma and red and white cells are easily dissolved by these antiseptics. The results indicate that blood clots may protect virulent bacteria for a long time, and that the organisms properly planted will be able to proliferate in a normal manner.

Notes on Dakin's solution, K. P. A. TAYLOR (*Ther. Gaz.*, *42* (*1918*), *No. 10*, *pp. 687–690*).—Observations are reported on the deterioration of Dakin's solution on exposure to light and in contact with the rubber of the connecting tubes, on the burns resulting from incorrect use of the solution, and on the comparative action of salt solution, dichloramin-T, and Dakin's solution on blood clots. Suggestions are given for improvement of the technique on the use of Dakin's solution. It is stated that Dakin's solution below strength can be raised several points by the addition of salt, 1 teaspoonful to the pint, or by slow steaming, and can be lowered, if above strength, by exposure to sunlight or by quick boiling.

Pyotherapy; its use in war, FRANC (*Bul. Soc. Cent. Méd. Vét.*, *94* (*1918*), *No. 22*, *pp. 469–481*).—This is a general discussion, based on clinical observations, of pyotherapy, including the preparation of the pus, doses employed, general and individual reactions, and the probable action of injections of pus upon the organism. Several case reports are appended.

Treatment of war wounds by autovaccines, L. JULIEN and DE LARDINTY-THOLOZAN (*Presse Méd.* [*Paris*], *No. 7* (*1919*), *pp. 60, 61*, *figs. 2*; *abs. in Jour. Amer. Med. Assoc.*, *72* (*1919*), *No. 13*, *p. 967*).—The following technique is employed:

A loopful of pus is taken from the depths of the wound, plated on agar, and allowed to incubate for 48 hours, at the end of which time colonies which have developed are scraped off and suspended in 5 cc. of polyvalent serum. The emulsion is incubated at 37° C. for at least one and one-half hours, centrifuged, the sediment rinsed twice with physiologic serum, and then heated twice to 50 or 60° for one hour each. A dilution is made with physiologic serum to 50,000,000 organisms per cubic centimeter, and 1 cc. of this dilution is injected subcutaneously.

This method is said to combine the best features of vaccine therapy and serotherapy.

The results of the treatment of gas gangrene by multivalent serum, H. Vincent and G. Stodel (*Compt. Rend. Acad. Sci.* [*Paris*], *168* (*1919*), *No. 3, pp. 188–190*).—Additional reports (E. S. R., 40, p. 84) are given of the remarkable results obtained in the use of multivalent serum in the treatment of gangrenous wounds.

On the antiseptic action of benzyl alcohol, D. I. Macht and D. E. Nelson (*Proc. Soc. Expt. Biol. and Med.*, *16* (*1918*), *No. 2, pp. 25, 26*).—Bacteriological studies are reported of the antiseptic action of water solutions of benzyl alcohol. A 0.5 per cent solution was able to kill cultures of Friedländer bacillus in 19 hours, *Bacillus pyocyaneus* cultures in 24 hours, and growth of *B. coli communis* in 72 hours.

The antiseptic properties of benzyl alcohol have also been confirmed by clinical results on its use as a local anesthetic. In the strengths in which it was used as an anesthetic (0.5 to 4 per cent), it does not appear to be noticeably virulent to the tissues.

On the treatment of giardiasis in rats with arsenobenzol, C. A. Kofoid, W. C. Boeck, D. E. Minnich, and J. H. Rogers (*Jour. Med. Research*, *39* (*1919*), *No. 3, pp. 293–299*).—This relates to *Giardia muris*, a flagellate found in house mice and field mice (Peromyscus) which is less pathogenic to its hosts than is the virulent organism of trench diarrhea (*G. intestinalis*) found in man in Gallipoli and Flanders. "The morphological evidence supports the view that the rat and not the mouse is the normal carrier of the organism most resembling that of trench diarrhea. The meadow mouse must also be viewed with suspicion as a carrier until culture determines the distinctness from or identity of its Giardia with that of the rat."

The investigation indicates that culture rats successfully withstand treatment with arsenobenzol by injection in the femoral vein in doses of four and eight times the human dose prorated to body weight of the rat. "Spontaneous cure or continuous absence of cysts from the feces has occurred in rats under our inspection. The fact that this disappearance after treatment was immediate and coincident in practically all rats receiving the heavy dose of arsenobenzol, and that light doses are sometimes followed by reductions in the number of cysts in the cycles, seems to exclude the possibility of spontaneous cure in the case of the rats of this experiment and to justify the inference that arsenobenzol may be a specific for giardiasis."

Blackleg toxin, T. P. Haslam and J. W. Lumb (*Jour. Infect. Diseases*, *24* (*1919*), *No. 4, pp. 362–365*).—Blackleg filtrates made by four different laboratories were found to be nontoxic to guinea pigs and to possess marked immunizing properties in calves, thus indicating that, contrary to the conclusions of Kelser (E. S. R., 39, p. 682), the immunizing power of blackleg filtrates is not dependent on toxicity.

In checking the purity and identity of blackleg cultures, the authors make use of the following reaction: In peptone liver broth with cooked brain tissue a vigorous evolution of gas occurs within 24 hours and the medium becomes cloudy until the evolution of gas ceases after several days, when the liquid part of the medium again clears. There is no blackening of the medium or formation of putrid odor and the cultures remain permanently acid. Emulsion of a 24-hour culture in a dose of 1 cc. will usually kill guinea pigs. Smears made from the diaphragmatic surface of the liver after death with blackleg show slender rods, singly or in pairs, differing from the long chains of serous membranes produced by *Bacillus edematis maligni*. As a final test of the identity of the strain under examination, three guinea pigs each receive 0.6 cc. of blackleg serum from another laboratory. Twenty-four hours later these animals and three check guinea pigs receive 0.5 cc. each of an emulsion of the culture to be tested. If those receiving the serum live and the checks die, the identity of the blackleg strain is considered established.

Preliminary report on the value of the blood tests in the control of contagious abortion, C. P. FITCH, W. L. BOYD, and W. A. BILLINGS (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 7, pp. 681–702*).—In this paper, presented at the fifty-fifth annual meeting of the American Veterinary Medical Association, held at Philadelphia in 1918, the authors discuss the relative value of the complement fixation and agglutination tests for the control of contagious abortion, and present data of the results of the agglutination test as applied to nine representative herds from the Northwest, from which the following conclusions are drawn:

"The complement-fixation test seems to have no advantage over the agglutination test in the diagnosis of contagious abortion. The technique of the agglutination test is simpler than that of complement fixation, and the results of the agglutination test are not influenced by as many factors (conglutinin, etc.). The results of the agglutination test show the relative amount of herd infection. The test can not be relied on to pick out individual aborters. The blood of calves may have the same agglutination titer as that of their dams. Many, however, react differently. The agglutination test of animals from 8 to 10 months of age usually shows that agglutinating antibodies are not present in their blood. Herd bulls often react positively to the agglutination test. At present the results of the agglutination test can not be utilized as a basis for control measures for abortion disease."

An extensive list of references is appended.

The present status of specific treatment for contagious abortion, H. P. HOSKINS (*Jour. Amer. Vet. Med. Assoc., 54 (1919), No. 7, pp. 727–737*).—The author reviews and comments on recent publications on specific treatment for contagious abortion. Several references to the literature on the subject are appended.

The ophthalmic and intradermic tests for glanders (*U. S. Dept. Agr., Bur. Anim. Indus., 1919, pp. 13, figs. 5*).—A description is given of the methods of application of the ophthalmic and intradermic mallein tests for glanders, and of the principles to be observed in judging the results of these two tests. Both methods are recognized by the Bureau of Animal Industry for official testing for glanders in horses and mules offered for interstate shipment.

The ophthalmic test is considered to have the advantage of being simple in application, but the disadvantage that the most prominent evidence of reaction, a discharge from the eye, may be obliterated accidentally by the animal or purposely by an unscrupulous attendant. The intradermic test has the advantage of producing a reaction that can not be obliterated but the technique of its application is more difficult.

[Statistics on the mallein and blood test for glanders], E. FRÖHNER (*Monatsh. Prakt. Tierheilk., 29 (1917), No. 1–2, pp. 86–96*).—Statistics are reported on the examination for glanders of 4,181 horses from Poland and Roumania. Of the 80 animals proved on autopsy to have glanders, 55 had reacted positively with both the mallein and blood tests. The eye test failed 14 times and the blood test 13 times.

Infection, sensitization, and immunity in epizootic lymphangitis, BOQUET and L. NEGRE (*Compt. Rend. Acad. Sci. [Paris], 168 (1919), No. 8, pp. 421–423*).—Successful attempts at reproducing epizootic lymphangitis in horses by subcutaneous inoculation of cultures of cryptococci are reported. The disease under such conditions is not at first generalized but appears as a suppurating lesion at the point of inoculation. Extension and generalization of the lesions are brought about by reinoculation, the incubation period in an animal sensitized by a previous inoculation being much shorter. Animals affected with natural or experimental lymphangitis acquire after about 50 days an immunity to the disease to the extent of contracting on infection only a benign form of the disease which heals spontaneously.

Treatment of ulcerative lymphangitis by vaccines made from the Preisz-Nocard bacillus prepared with ethyl chlorid, R. H. Knowles (*Jour. Compar. Path. and Ther., 31 (1918), No. 4, pp. 262–272*).—For the treatment of ulcerative lymphangitis the author recommends the use of a vaccine made from the Preiz-Nocard bacillus, but in which ethyl chlorid is employed in place of alcohol and ether, as recommended by Truche (E. S. R., 37, p. 583).

The technique of the preparation of the vaccine is given in detail and results of its use in varying doses are reported. The vaccine is considered by the author to be superior to other vaccines. Whether it produces any immunity against a natural attack or against a recurrence of the disease has not yet been determined.

A glycerin "extract" of tubercle bacilli as an antigen in complement fixation, S. A. Petroff (*Amer. Rev. Tuberculosis, 2 (1918), No. 9, pp. 523, 524*).—The following antigen is recommended as giving the most reliable results of any single antigen: Tubercle bacilli are grown in 4 per cent glycerin-beef broth for from four to six weeks, after which the cultures are filtered through several thicknesses of filter paper, washed clear of broth with sterile water, dried in a desiccator over sulphuric acid, and pulverized for several weeks in a ball mill. One gm. of the pulverized bacilli is triturated in a mortar with 100 cc. of a 25 per cent solution of glycerin, and boiled slowly for one hour in a flask having a return condenser. After the clumps have settled, the supernatant solution is removed and used as the antigen, 0.1 cc. of a 1:20 dilution representing one-sixth of the anticomplementary point.

The advantages claimed for this antigen are that it is easy to prepare, there is no danger of infection in handling it, and it is less anticomplementary than antigen which has not been boiled.

The clinical value of complement fixation in pulmonary tuberculosis based on a study of 540 cases, L. Brown and S. A. Petroff (*Amer. Rev. Tuberculosis, 2 (1918), No. 9, pp. 525–540, figs. 9*).—A report is given of the value of the complement fixation test in the diagnosis of pulmonary tuberculosis, as based upon the results obtained in a study of 540 cases.

Of the 478 in which a positive diagnosis of tuberculosis was made, a positive complement fixation test occurred in 72 per cent. Positive tests were obtained in 51 per cent of the incipient, 78 per cent of the moderately advanced, and 81 per cent of the far advanced cases. The complement fixation test did not run a parallel course with the intradermic and subcutaneous tuberculin reactions. Many patients reacted to the tuberculin and had a negative complement fixation test, and the opposite also occurred.

A comparative study of the "potato-filtrate" and sodium hydroxid antigens and the glycerin extract described above led to the conclusion that while the glycerin extract gives the greatest number of positive results it should not be used to replace the others exclusively, but that it is safer to use all three as each in turn has failed to give a positive test in some cases in which one of the others did so.

The complement fixation test for tuberculosis, L. B. Lange (*Amer. Rev. Tuberculosis, 2 (1918), No. 9, pp. 541–545*).—A study is reported of the complement fixation test on a total of 856 sera, using four different antigens, the bacillary suspension of Miller and the sodium hydroxid extract, the methyl alcohol extract, and the potato broth culture filtrate of Petroff.

Tuberculous sera gave 51.5 per cent of fixations of any degree, while nontuberculous sera gave 13.6 per cent. The proportion of higher fixations was greater with sera from clinically tuberculous cases. The alcoholic antigen gave the highest percentage of strong fixations in clinically tuberculous cases, and the sodium hydroxid antigen the lowest. With the sera from nontuberculous cases, the greatest proportion of strong fixations was obtained with the sodium hydroxid antigen and the smallest with the potato-filtrate antigen. All tended to give a greater percentage of strong fixations with the sera of more advanced pulmonary cases than with those of the less advanced.

The complement fixation test in the diagnosis of tuberculosis.—A clinical and laboratory study, H. F. Stoll and L. Neuman (*Jour. Amer. Med. Assoc., 72 (1919), No. 15, pp. 1043–1046*).—Results obtained with the complement fixation test for tuberculosis (human) using the Wilson antigen, previously noted (E. S. R., 40, p. 481), are reported. The conclusions are drawn that the practical utility of the test in the diagnosis of tuberculosis is limited by the fact that the highest percentage of results is obtained in obvious cases of the disease. The authors are, however, of the opinion that in case of suspicious symptoms a negative fixation test would increase to a considerable degree the probability of the nontuberculous nature of a given case.

The value of tuberculosis complement fixation in clinical tuberculosis, B. Stivelman (*Amer. Rev. Tuberculosis, 2 (1918), No. 9, pp. 546–550*).—The complement fixation test with the antigen of Miller and Zinsser (E. S. R., 36, p. 81) in a series of 205 cases, 22 of which were clinically nontuberculous, gave positive results in 51.4 per cent of active and 40 per cent of inactive cases, and negative results in 48.6 per cent active and 47.4 per cent inactive cases. In early cases the percentage of positive reactions obtained was exceedingly low, increasing as the disease progressed. The author considers the test to be of no greater value than the subcutaneous tuberculin test.

Influence of Roentgen rays on tubercle bacilli, K. Seifert (*Monatsh. Prakt. Tierheilk., 29 (1917), No. 1–2, pp. 62–86, pl. 1*).—This article contains a survey of the literature on the subject and the report of a series of investigations on the influence of Roentgen rays on pure cultures of tubercle bacilli and on guinea pigs inoculated with the bacilli.

The results of the study indicate that in vitro the rays exert a marked influence on the bacilli, which is shown by inhibition of growth, lessening of virulence, and more intensive colorability. Smaller doses increase the growth as well as the virulence of the bacilli. In vivo, the rays of such strength as to have no effect upon normal tissue were found to decrease the virulence of the tubercle bacilli and to have an influence upon the affected tissue.

Infection of newborn calves and seroprophylaxis, P. Stazzi (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 41 (1918), No. 16–17, pp. 414–425; abs. in Vet. Rev., 3 (1919), No. 1, pp. 29, 30*).—An infection is described which is said to occur widely among newborn calves in Italy, manifesting itself in three forms, diarrhea or dysentery, polyarthritis with serous effusion into the joint cavity, and broncho-pneumonia. The first two forms generally appear on the first day after birth and are of the nature of a colibacillosis of septicemic character. Broncho-pneumonia appears in from 15 to 20 days after birth and is a localized colibacillosis. This form, which is the least frequent of the three, has been described previously by Cominotti (E. S. R., 39, p. 290).

As a means of prophylaxis, the author has employed for several years, with considerable success, a polyvalent serum prepared by using the greatest possible number of strains of *Bacillus coli* isolated from cases of the disease. In the more common cases of extra-uterine infection, one or two injections of

20 cc. of the serum are given subcutaneously, intramuscularly, or intraperitoneally. In the rare cases of intra-uterine infection, it is necessary to inoculate the mother several days before parturition with from 40 to 80 cc. of the serum and later to inoculate the calf as usual. In epidemics in which the calves protected by the serum from the first form of the disease are not protected from the form which develops later, the ordinary inoculation should be followed in two or three days by an injection of an autogenous vaccine. The serum is said to give the best results when it is prepared from the same strains as those which cause the disease.

In conclusion the author points out that seroprophylaxis of the disease must always be associated with sanitary measures to prevent the spread of infection.

The prophylaxis and cure of exudative pleuropneumonia in goats, N. Mori (*R. Ist. Incoragg. Napoli, Ann. Staz. Sper. Malattie Infett. Bestiame, 3 (1916), No. 2, pp. 73–78*).—The causative organism and mode of infection of exudative pleuropneumonia of goats are discussed, and a method for the prophylaxis and cure of the disease is suggested which consists of the inoculation of the animals with a serum prepared from the pleural exudate of diseased animals received under aseptic conditions and treated with toluol and ether. The author reports that a group of goats thus treated remained immune, while a control group, not inoculated, contracted the disease.

An official experiment on the prevention and cure of exudative pleuropneumonia in goats by means of a serum obtained from the specific pleural exudate, N. Mori (*R. Ist. Incoragg. Napoli, Ann. Staz. Sper. Malattie Infett. Bestiame, 4 (1917), No. 1, pp. 51–71*).—Further details are given of the use of the serum noted above for the prevention and cure of exudative pleuropneumonia.

From the reports presented the conclusions are drawn that the disease can be prevented by the subcutaneous inoculation of the specific serum in doses of 1.5 to 2 cc. for suckling goats and 2.5 to 3.5 cc. for adult animals, depending upon the condition, state of nutrition, and state of gestation. The curative dose ranges from 3.5 to 4.5 cc. A second injection should not be made, as it is without curative effect and may produce anaphylactic phenomena.

An official experiment on the prevention and cure of exudative pleuropneumonia in goats by means of a serum obtained from the specific pleural exudate, N. Mori (*Mod. Zooiatro, Parte Sci., [29] (1918), No. 9, pp. 193–200*).—This is a summary of the article noted above.

Important points in determining the presence of hog cholera in the herd, G. W. Koiner (*Va. Dept. Agr. and Immigr. Bul. 126 (1918), pp. 90–102, figs. 6*).—This is a general discussion of hog cholera, including a description of symptoms and post-mortem findings, instructions in regard to the value and use of antihog cholera serums, and suggestions for the prevention of the spread of the disease.

RURAL ENGINEERING.

Brick pavements in the Middle West, A. T. Goldbeck and F. H. Jackson (*U. S. Dept. Agr., Public Roads, 1 (1919), No. 10, pp. 3–18, figs. 14*).—The results of an inspection and study, by the authors, of a large number of brick roads throughout the Middle Western States are reported. The following conclusions are drawn:

"The type and thickness of base for any brick pavement should depend upon (1) the maximum weight of the loads to be carried, and (2) the bearing value, under all weather conditions, of the underlying soil. In all cases where the traffic to be carried is likely to be heavy or where the underlying soil is of such a nature that its bearing value is not sufficient to support the pavement under all conditions, a concrete base of sufficient thickness to properly distribute the loads should be provided. Where the maximum weight of the loads to be carried is not excessive and the subsoil is of a porous well-drained nature, the thickness of the concrete base may be decreased or, under very favorable conditions, it may even be omitted altogether.

"Other things being equal, a somewhat lighter construction may be permitted in the case of the the 'monolithic' and 'semimonolithic' types than where the ordinary sand cushion type is provided, on account of the increased slab strength which these types appear to possess. A concrete curb or edging is not necessary when monolithic or semimonolithic construction is used.

"Paving brick with well-formed contact lugs are to be preferred to brick without lugs. Paving brick with square edges are to be preferred to brick with rounded edges.

"Given the requisite care in construction, satisfactory results may be obtained with either cement grout or bituminous filler. Vertical fiber lug brick with bituminous filler have given good service in those cities west of the Mississippi where they were inspected, possibly due to the protecting action of the asphalt mat which prevents wear from coming upon the brick direct.

"Expansion joints in grout filled pavements would seem advisable at street intersections and at points of tangency on curves, and longitudinal joints should be used against all rigid curbs or structures."

Public Roads (*U. S. Dept. Agr., Public Roads, 1 (1919), No. 10, pp. 103, figs. 43*).—This number of this periodical contains an article on Brick Pavements in the Middle West, by A. T. Goldbeck and F. H. Jackson, noted above, and five other articles of direct highway engineering interest.

Care and repair of farm implements.—V, Grain separators, E. Johnson (*U. S. Dept. Agr., Farmers' Bul. 1036 (1919), pp. 20, figs. 3*).—This gives instructions for overhauling and adjusting grain separators, with a view to reducing to the minimum the losses and delays due to breakdowns during the operating season.

RURAL ECONOMICS.

The farmer and the new day, K. L. Butterfield (*New York: The Macmillan Co., 1919, pp. [9]+311*).—The author arranges his discussion under three topics, the rural problem, rural organization, and a rural democracy. He analyzes the rural problem as one of determining and meeting the needs of the world for agricultural products, of improving farm methods, farm business, and farm life, and of assuring to the farmer a place at all councils designed to discuss and provide for social reconstruction. He urges the formulation of a national rural policy by a permanent conferring group representative of Government and farmers.

In the appendixes are included, among other items, a statement of what some Massachusetts communities are doing, taken from a bulletin recently noted (E. S. R., 40, p. 486), an extract from the program for food production and conservation prepared at the conference of the Secretary of Agriculture and representatives from 32 States, held at St. Louis, Mo., April 9–10, 1917, a summary of opinions of 60 or more agricultural leaders expressed in answering a questionnaire concerning an American agricultural policy, and a tentative outline of such a policy.

The awakening of England, F. E. Green (*London and New York: Thomas Nelson & Sons, Ltd. [1918], 2. ed., pp. XV+361, pls. 8*).—Personal impressions of the success and failure of the small-holdings system gained by the author on walking tours about England, Ireland, and the Channel Islands are here recorded. This is a second edition of an earlier work, to which chapters have been added giving the author's views as to reconstruction after the war.

Introductory manual for the study and reading of agrarian history, W. Trimble (*Fargo, N. Dak.: Author, 1917, pp. 47*).—A list of references on and suggestions for the study of ancient and modern agriculture, the agriculture of the principal foreign countries and the United States, and various phases of agriculture.

International yearbook of agricultural legislation (*Inst. Internat. Agr. [Rome], Ann. Internat. Lég. Agr., 7 (1917), pp. LXXIV+1220*).—This yearbook supplements information previously noted (E. S. R., 38, p. 493), adding laws and decrees of 1917.

Address of D. F. Houston, Secretary of Agriculture, before the joint conference of the agricultural commission of the American Bankers' Association and the agricultural committees of the State Bankers' Associations, Washington, D. C., February 26, 1919 (*U. S. Dept. Agr., Off. Sec. Circ. 131 (1919), pp. 11*).—This address discusses the wide scope of the Government's work for agriculture, the interest taken in agriculture by bankers of the country, the aid furnished by farmers in winning the war, and measures necessary for the improvement of agriculture, including hastening the process from tenancy to ownership, Government assurance of the wheat price guaranty, good-road building, and others.

Cooperative plan of national rural research, C. J. Galpin et al. (*Amer. Jour. Sociol., 24 (1918), No. 3, pp. 303–310*).—In this article the committee on standardization appointed by an informal conference at the time of the annual meeting of the American Sociological Society in Philadelphia in 1917 presents definitions of terms to be used and outlines a national program of rural research. Suggestions are made for the scope and method of study of two standardized general problems, determining and analyzing the population group which approximates the community in agricultural sections, and an investigation of the social aspects of tenancy, with special reference to advantageous and detrimental conditions growing out of this form of landholding rather than out of farm life in general. Recommendations for making a State-wide directory of rural organizations and a map of all high-school districts in the State, and for codifying State laws relating to the social welfare of farm population and village population, are included.

Report of committee appointed by the Secretary of Agriculture to consider plan of organization, scope of work, and projects for the Office of Farm Management, and methods of procedure in making cost of production studies, G. F. Warren, A. Boss, H. C. Taylor, J. A. Foord, J. I. Falconer, R. L. Adams, and G. I. Christie (*U. S. Dept. Agr., Off. Sec. Circ. 132 (1919), pp. 15*).—Research projects for the attention of a proposed Bureau of Farm Management and Farm Economics are outlined here, under heads of cost of production, farm organization, farm finance, farm labor, agricultural history and geography, land utilization, and farm life studies. There are included explanatory notes on methods of investigation, items to be considered, and interpretation of results of cost-of-production studies.

Rural organization, R. G. Córdova (*Rev. Agr. Puerto Rico, 2 (1919), Nos. 2, pp. 1–9; 3, pp. 6–19*).—A plan of rural organization to benefit small agriculturists of Porto Rico socially and economically is here outlined.

Project for a national agricultural institute, F. Cambó (*Prog. Agr. y Pecuario, 24 (1918), No. 1069, pp. 302–304*).—This gives the text of a decree of July 18, 1918, previously referred to (E. S. R., 40, p. 389), proposing the establishment of the National Agricultural Institute in Spain and regulating and controlling the granaries in the interest of extended rural credit.

Rural administration and administrators, F. CONVERT (*Ann. Sci. Agron.*, *4. ser.*, *7* (*1918*), *No. 7–9*, *pp. 269–283*).—The author outlines the functions of administrators on French estates, and urges their organization for the study of their problems and the furthering of their interests professionally.

A review of the Prussian boards of agriculture, W. ASMIS (*Ztschr. Deut. Landwirtschaftsrats*, *16* (*1918*), *No. 11*, *pp. 255–269*).—This article reviews the establishment and development of the Prussian boards of agriculture and their functions and importance during a quarter of a century.

A proposal for a study of the potential productivity of Italian agriculture and of the possibility of satisfying in the future the needs of the people, G. VALENTI ET AL. (*Pub. R. Accad. Lincei, Comitato Sci. Aliment.* [*Rome*], *No. 7* (*1919*), *pp. 7*).—This is the outline submitted by a committee of Italian scientists for increasing the food supply. It provides for the administration of the plan, and the publication of reports to be submitted with regard to special inquiries into the improvement of agriculture, collecting of agricultural statistics, etc.

The encouragement of the Alp industry, one method of increasing the stocks of our native animals, E. GROLL (*Die Hebung der Alpwirtschaft, ein Mittel zur Erhaltung und Mehrung Unserer Heimischen Tierbestände. Traunstein: Verband für Reinzucht des Pinzgauer Rindes in Oberbavern, 1917, pp. 67, pls. 10*).—This article is descriptive of the live-stock industry in the Bavarian Alps, its history, and suggested methods of developing it. Under the last head are included forestry operations, road building, map making, destruction of weeds and introduction of nutritive grasses, and the encouragement by the State of cooperative organization among those engaged in the industry.

The cheapest source of increased food supplies, E. G. NOURSE (*Sci. Mo.*, *6* (*1918*), *No. 2*, *pp. 116–123*).—This article discusses the economy of following specially adapted lines of farming on those areas having marginal productivity as a result of poverty of soil, topography, or climate. Drought-resistant crops, water-tolerant crops, and plants adapted to sandy and alkali soils and hill lands are considered.

The tariff union and agricultural policy, H. KRANOLD (*Zollunion und Agrarpolitik. Dresden: "Globus," 1917, pp. [6]+135*).—The author has studied German demands for agricultural products and the extent to which they can be supplied at home and from Austria-Hungary and the Balkan States. He considers the inclusion of these countries with Germany in a tariff union and concludes that no danger to German agriculture can arise from such a policy. He further maintains that tariffs on agricultural products, with the possible exception of feed for live stock, together with certain state measures such as recolonization on small holdings, legislation against entail inheritance, etc., will intensify German agriculture and make the nation self-sufficing.

The minimum wage as applied to agriculture, R. H. REW (*Jour. Farmers' Club* [*London*], *1919, Feb., pp. 20*).—An address on the subject of Part II of the Corn Production Act, previously noted (E. S. R., 38, p. 594), discussing its application to agriculture.

Women workers in agriculture, E. N. THOMAS (In *Industry and Finance, edited by A. W. Kirkaldy. London and New York: Sir Isaac Pitman & Sons, Ltd., 1917, pp. 146–159*).—This report, prepared for the section of economic science and statistics of the British Association, reviews data relating to the number of women employed on the land, describes two methods of training, namely, apprenticeship and practice training under the supervision of the Board of Agriculture, and briefly discusses training and wages.

Rural children in selected counties of North Carolina, F. S. BRADLEY and M. A. WILLIAMSON (*U. S. Dept. Labor, Children's Bur. Pub. 33 (1918), pp. 118, pls. 16*).—The plan of the survey includes children's health conferences conducted at the county seat and in rural communities, together with investigations into the economic status of families, home conditions, maternity care, infant care, physical condition of children from 1 to 15 years of age, education, children's farm and other work, and recreation and social life. This study was carried on in a certain typical lowland county of the State, while in three smaller rural townships of a typical mountain county a similar investigtion was carried on from house to house.

In the appendix are included a report of the activities of the North Carolina State Board of Health in relation to child welfare, the work of various organizations stimulating an interest in farming and farm life, the State laws relating to child labor and school attendance, the child-caring institutions and agencies of the State, and copies of schedules used in visiting families during this survey.

The little town, especially in its rural relationships, H. P. DOUGLASS (*New York: The Macmillan Co., 1919, pp. XIII+258, pls. 12, figs. 2*).—The author discusses the socio-economic aspects of little towns in the United States, their distribution and economic classification, the country and the industry upon which they may be dependent, their evolution, their people, structural fundamentals, institutions, ideals, and a program for organized service and progress.

The value of land in France, P. CAZIOT (*La Valeur de la Terre en France. Paris: J. B. Baillière & Sons, 1914, pp. VIII+450, figs. 102*).—This is one of a series constituting the agricultural encyclopedia published under the direction of G. Wery. It includes a history of farm land values in France, a review of factors influencing fluctuations in price, and detailed descriptions of conditions in all sections of the country.

The results and the progress of the redivision of lands [in Japan] admitting of cultivation (*Internat. Inst. Agr. [Rome], Internat. Rev. Agr. Econ., 9 (1918), No. 5, pp. 409–431*).—The laws relating to, and the cost, advantages, and progress of, redivision of the lands of Japan which can be cultivated are reviewed here. Statistical information relating to progress under this process is included.

Land credit, J. GASTLAVER (*Crédito Territorial. Seville [Spain]: La "Guia Oficial," 1916, pp. 135*).—The author discusses the fundamental principles of rural credit, means of acquiring it, the mortgage as the instrument of rural credit, a historical survey, the mortgage as security, new forms of land mortgage, and the valuation of land. He describes the Federal land bank system of the United States and the adaptations which would make it practicable in Spain.

Rural land credit in Switzerland, H. BILLETER (*Le Crédit Foncier Rural en Suisse. Neuchatal: Attinger Bros., 1917, pp. 190*).—This is the third part of a collection of commercial and economic studies published under the direction of P. E. Bonjour and G. Paillard. It describes in detail the rural credit institutions of Germany and France, and particularly Swiss institutions offering mortgage credit, conditions of the business in each canton, and methods of Swiss mortgage banks.

The author questions the efficiency of the many cantonal banks, from the point of view of interest rate, exigibility of loans, credit for improvements, etc., but advocates, instead of a national land bank, a central clearing house for affiliated land banks.

Farm tenancy: An analysis of the occupancy of 500 farms, C. J. GALPIN and E. F. HOAG (*Wisconsin Sta. Research Bul. 44 (1919), pp. 18, figs. 2*).—This study was carried on in September, 1918, in accordance with plans of the national committee on standardization of research in country life appointed at the annual meeting of the American Sociological Society in 1917 for a field study of farm tenancy. It includes all farms belonging in the business community of Sun Prairie, Wis. Tabulations are made to show farms occupied by owners and tenants and by related and unrelated tenants; status of farm purchasers, present status of farm tenants, and sizes of farms rented and purchased; general status, occupancy of farms, residence, and employment of retiring farmers; and number of tenant shifts, of farms on which shifts occur, of shifting tenants, and index number of tenant shifting.

Collective farms (*Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Agr. Econ.*, *9* (*1918*), *Nos. 5, pp. 366–382; 8, pp. 617–630*).—This review includes a description of a system in Italy which has been noted (E. S. R., 40, p. 389), and gives particular information on the collective farms in the Provinces of Reggio Emilia, Ravenna, Parma, Bologna, Modena, Mantua, and Sicily, together with a summary of results obtained under this system.

Act creating farmers' cooperative societies with forms governing incorporation (*Austin, Tex.: State, 1917, pp. 17*).—This volume contains the text of an act of the Texas Legislature providing for the incorporation of farmers' cooperative societies, approved April 4, 1917, together with suggested forms of charter, by-laws, annual report, etc., which may be varied to fit individual circumstances.

Report on the working of cooperative societies in Bihar and Orissa for the years 1916–17 and 1917–18 (*Rpt. Work. Coop. Socs. Bihar and Orissa, 1916–17 pp. [3]+33+8+3, pl. 1; 1917–18, pp. [3]+27+8+3, pl. 1*).—These reports continue to date information previously noted (E. S. R., 36, p. 689).

Operating a cooperative motor truck route, H. S. YOHE (*U. S. Dept. Agr., Farmers' Bul. 1032* (*1919*), *pp. 24, figs. 3*).—This publication describes the membership and management of a successful cooperative motor truck route in Maryland, as illustrated by The Farmers' Cooperative Co. of Hartford County, Inc. Some of the problems in operation discussed include selection of equipment, securing operators, cost of service or rates, management of receiving stations, and accounting methods.

It is concluded that farmers' motor truck associations can be operated successfully in sections which produce in sufficient quantity to warrant daily operation of trucks and which are not more than 30 or 40 miles distant from consuming centers. A survey should be made to determine the adequacy of present transportation facilities, the reasonableness of rates charged, the approximate daily tonnage, the character of roads, the general sentiment of the community, and the amount of cash that would be available for purchasing equipment. The provisions of the charter should be made broad and liberal, and the capitalization should be large enough to permit issuing enough stock to pay for the trucks in cash, obtain working capital, and still have a sufficient amount of stock unissued to provide for future sound extension of the business. Rates should be based on a careful analysis of complete, adequate, and accurate information regarding costs. If one terminus of the route is in a large city, during the early days of the association it will be found more economical to rent limited space rather than to attempt to operate a receiving station.

Cellar societies (*Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Agr. Econ.*, *9* (*1918*), *No. 7, pp. 540–550*).—This is a summary of the information to be gained from Italian literature on the subject of these cooperative associations among viticulturists and from reports of certain of these societies and their by-laws and rules.

The development of insurance against hail (*Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Agr. Econ.*, *9* (*1918*), *Nos. 1, pp. 22–36; 2, pp. 134–149; 3, pp. 215–226; 4, pp. 295–319*).—This article, which is based on a study of this subject by W. Rohrbeck, gives statistics covering frequency and intensity of hail, distribution of losses over kinds of crops, and the business of many German stock companies and mutual societies insuring against hail. The information given is comprehensive for all Germany and, to a certain extent, applies for a period of more than 30 years.

Monthly Crop Reporter (*U. S. Dept. Agr., Mo. Crop Rptr., 5* (*1919*), *No. 4, pp. 37–44, fig. 1*).—This number contains, as usual, data relating to estimated farm value of important products, average of prices received by producers of the United States, and range of prices of agricultural products at important markets. It also gives information as to the production of important crops in the five leading States for 1916, 1917, and 1918; beet sugar production, 1918 (revised figures), making comparisons with that of 1917; farm labor supply and demand April 1, 1918, and 1919; and number of breeding sows April 1 of the years 1914 to 1919, inclusive. A special commercial peach crop report for April, 1919, a graphic representation of the proportion of important crops produced in the five leading States in 1918, and special articles on trend of prices, April wheat and rye report, farm live stock changes in 1918 and 1919, and geographic variation in prices of articles farmers buy are included.

Annual statistics of Chile.—VII, Agriculture (*An. Estadís. Chile, 1916–17, Sect. VII, pp.* [*6*]+*113*).—This continues statistical information previously noted (E. S. R., 38, p. 695).

Agricultural statistics of Netherlands (*Dept. Landb., Nijv. en Handel* [*Netherlands*], *Verslag. en Meded. Dir. Landb., No. 3* (*1918*), *pp. LXXXIII+109*).—These statistics for the year 1917 continue information previously noted (E. S. R., 38, p. 393).

[Agricultural statistics of Spain] (*An Estadís. España, 3* (*1916*), *pp. XII+642, pls. 9; 4* (*1917*), *pp. XII+656, pls. 13*).—In these volumes the information previously noted (E. S. R., 36, p. 791) is continued for 1916 and 1917.

Quinquennial report on the average yield per acre of principal crops in India for the period ending 1916–17, G. F. Shirras (*Dept. Statis. India, Quinquen. Rpt. Av. Yield Acre Princ. Crops India, 1913–1917, pp.* [*5*]+*27*).—Tables are given for the average yield of the principal crops in the Provinces of British India and Mysore State, together with summaries of provincial reports.

Report of the Indian Wheat Committee for 1915 and 1916, F. D. Acland et al. (*Rpt. Indian Wheat Committee* [*London*], *1915–16, pp. 48*).—The reasons for the appointment of this committee, its activities, and some of the difficulties encountered in controlling the export and regulating the price of India's surplus wheat are reported.

AGRICULTURAL EDUCATION.

[Agricultural and home economics instruction at the National Education Association in 1917] (*Addresses and Proc. Nat. Ed. Assoc., 55* (*1917*), *pp. XI+864*).—Included in this report are the following papers on food production and conservation: The Imperative Necessity of a Food Conservation Program, by C. R. Van Hise (pp. 37–41); How the School May Help Increase Food Production, by R. H. Wilson (pp. 131–133); Waste of Food From the Producer to the Household, by J. A. Bexell (pp. 134–140); Food Storage and Preservation, by H. R. Daniel (pp. 140–143); Adaptation of Courses in Domestic Economy and Industrial Arts to Meet Existing Demands, by C. H. Dempsey (pp. 143–145);

Agricultural Preparedness and Food Conservation: A Study in Thrift, by A. H. Chamberlain (pp. 151–161); and War Measures of Higher Educational Institutions, by C. R. Van Hise (pp. 293–296.)

Among the papers dealing with home economics were the following: The Normal Schools and the Demand for Education in the Household Arts, by M. G. Barnum (pp. 395–399), giving notes on the development in the household arts departments of normal schools in this country, especially in California; Training of Girls and Women for Trade and Industry, by M. S. Woolman (pp. 436–438); Extension of the Field of Home Economics in the School Curriculum, by A. Ravenhill (pp. 438–443), in which the author offers suggestions for extending the field of home economics in the school curriculum. It is claimed that home economics more than any other subject in the educational program links school precept with home practice. "To utilize it, however, for this purpose two readjustments in conventional usage are necessary. Boys must no longer be debarred from their share in training for home duties, or as factors in parental obligations, as agents in industrial efficiency and civic service. Neither can the subject be isolated from the rest of the school program and too often confined to a proportion only of the girls, and then for a relatively short period of school life. That both these readjustments can be made and that the ends can be gained is demonstrated by the practical experience of 12 or 14 years in two or three districts in Great Britain." The Betterment of Homes in Urban Communities Through Extension Work in Home Economics, by M. F. Rausch (pp. 468–472), which considers the problems of the home and the rôle of the extension worker in their betterment.

The two papers presented at the meeting of the department of rural and agricultural education were The Rural People a Strong Factor in Rural Educational Problems, by W. H. Campbell (pp. 600–602), in which the author contends that the rural school should be controlled by the rural people for the welfare of rural life, and should be taught by teachers educated in rural environments and in sympathy with country life; Results Achieved in Secondary Agriculture and Methods Pursued in Actual Practice, by H. N. Goddard (603–618). In the latter a brief summary of progress in secondary agricultural instruction is followed by a discussion of two rather diverse viewpoints that have developed as to the ends to be attained by such instruction. The first looks upon agriculture as an informational or purely cultural subject, designed to furnish a practical body of subject matter which can be utilized as valuable information and also as a means of vitalizing school work, especially the science subjects. The other viewpoint looks upon agriculture as an industrial or vocational subject in which the project, involving actual farm practice under as natural conditions as possible, furnishes the central and most essential feature about which class instruction, laboratory exercises, and field work may be organized. With reference to special schools of agriculture, the author believes that while several types of such schools of a distinctly vocational nature have sprung up in the country and are doing more or less valuable work, nevertheless the tendency of the whole country has turned more and more to the high schools as the agency for providing the best kind of vocational training. Attention is called to two plans that have been developed in the high schools. The first, in operation in Michigan, Wisconsin, Minnesota, and a number of other States, organizes the vocational in close connection with the general course, giving approximately one-fourth of the time to the vocational subject and three-fourths to the academic or general subjects. The second plan requires that a distinct vocational department must be maintained in which pupils take all the work of their course and in which the vocational aim must be given chief prominence. This plan is most definitely typified in Indiana, and is to a considerable extent followed in New York and Pennsylvania. There is some effort, however, to correlate the work between the general course and the vocational department, and the tendency has been to require about one-half of the pupils' time to be devoted to distinctly vocational work. Outdoor and inside laboratory work, school plat work, school and home or individual projects, manual training or construction projects, contests and exhibits, and extension work are also discussed.

The rural school and the community: A study of the methods and application of the social survey, H. T. Lewis (*Boston: Richard G. Badger, 1918, pp. 91, figs. 3*).—The author discusses the function of the survey, the need of a social survey in every community, and the teacher's part in conducting it and in adapting the curriculum of the rural school to local conditions, methods of conducting the survey, the problem of the adult or the social center and the teacher's function in this movement, and the training of the teacher. A suggestive bibliography is included.

Plan for the administration of the Smith-Hughes Act in the State of Arizona for the school year 1918–19 (*Bul. State Bd. Control Vocat. Ed. [Ariz.], No. 2 (1919), pp. 33*).—This is an outline of the plans for vocational education for 1918–19, corresponding to that noted for the preceding year (E. S. R., 40, p. 394). The requirements for teacher training in agriculture, trades and industries, and home economics are set forth. The proposed use of the allotment of vocational funds for teacher training is 15 per cent each for agricultural and trade and industrial subjects and 25 per cent for home economics, and 45 per cent for supervision, divided equally between the three subjects.

Vocational education in Maryland (*Baltimore, Md.: State Bd. Ed., 1918, pp. 61, pls. 2*).—This outlines the plans for 1918–19 under the Smith-Hughes Act.

According to these plans, the agricultural curriculum should be organized on a 16-unit basis, half devoted to vocational agriculture and related subjects and half to liberal education. The agricultural instruction should be continuous throughout the year. It is held that teachers of vocational agriculture in high school departments should carry on two or more less distinct yet related lines of work, viz, instruction in agricultural subjects, such as animal and plant production, and instruction in subjects related to agriculture, such as biology, chemistry, and physics.

Instruction in vocational agriculture is to be given in departments of vocational agriculture attached to day high schools having a term of at least nine months a year. Two four-year type courses in vocational agriculture are outlined.

Vocational home economics instruction may be given in evening, part-time, and day schools or classes. Type courses in home economics are outlined.

A tentative budget provides 25 per cent respectively for teacher training in agricultural, trade and industrial, and home economics subjects and 25 per cent for the supervision of all these subjects. Not more than 15 per cent of the fund may be used for supervision in any one line. Vocational teachers of agriculture and home economics are to be trained in the Maryland State College of Agriculture. Agricultural and home economics education courses are outlined, and the texts of the Federal and State vocational education laws are included.

[Cooperative cheese schools in England and Wales] (*Jour. Bd. Agr. [London], 25 (1918), No. 9, pp. 1087–1089, 1091–1093*).—During the cheese-making season of 1916 the Board of Agriculture in conjunction with the Cornwall County education authorities established a cooperative cheese school at Lostwithiel. The object of the school was to demonstrate to the farmers in their own locality and with their own milk that better returns could be obtained from cheese making than from butter making and the advantages of the cooperative factory system, and to give an opportunity for instruction in cheese making under factory conditions. The success of the school led to the establishment of nine such schools in 1917 and 18 in 1918. Many of these schools have become registered societies. The schools form a suitable groundwork upon which to establish cooperative milk depots and cheese factories, and the board has devised a scheme whereby newly-formed cooperative societies can be assisted in obtaining capital. A report is given on the working of the cooperative cheese school at Marlston, near Newbury, in Berkshire, as an illustration of the beneficial results of cooperation.

The project in science teaching, J. A. STEVENSON (*School Sci. and Math., 19 (1919), No. 1, pp. 50–63*).—This is mainly a statement and discussion of the advantages and shortcomings of the project method in science teaching. The author concludes that "the project method rightly carried on develops great interest, gives training in carrying acts to completion, and provides adequate opportunity for directing, thinking and reasoning. Its shortcomings are in [not] providing for habit formation and a systematic view of subject matter."

The teaching of vocational agriculture in secondary schools, T. E. BROWNE and L. E. COOK (*State Col. [N. C.] Rec., 17 (1918), No. 6, pp. 54, figs. 5*).—This publication which has been prepared to assist teachers of agriculture in North Carolina, contains an outline of a course of study in agriculture for vocational schools, a chart showing alternation of courses, a discussion of the placement of the agricultural courses by years, the selection of subject matter and division of time, the organization of subject matter with reference to seasonal sequence, including an outline of the study of corn as an illustration, supervised practice or project work, home project study, project outlines, an outline guide to better teaching, an outline for evaluating textbooks, a list of suggested texts for vocational agriculture, equipment for teaching agriculture, and report and record forms.

First principles of agriculture, E. S. GOFF and D. D. MAYNE (*New York: American Book Co., 1918, rev. ed., pp. 272, pls. 8, figs. 158*).—This text deals with the soil, plant propagation, the rotation of crops, plant parasites, the improvement of plants, farm crops, weeds, the garden, the orchard, animal husbandry, dairying, poultry, beekeeping, the improvement of home and school yards, semitropical fruits, and irrigation and dry farming. The chapters on corn, wheat, semitropical fruits, and irrigation and dry farming, have been added in the present revision. The text has also been adapted to meet the demand for vocational instruction. Suggestions for experiments are included in the first part of the book, and at the close of each chapter a list of questions and exercises is added. An appendix contains useful information concerning quantities of seed required to the acre, directions for preparing insecticides and fungicides, digestible nutrients in common feeds, amount of nutrients for a day's feeding, fertilizing constituents in American feeding stuffs, etc.

Agriculture.—Southern edition, O. H. BENSON and G. H. BETTS (*Indianapolis: The Bobbs-Merrill Co., 1918, pp. [IX]+336, pl. 1, figs. 116*).—This is an adaptation, specifically for the South and with reference solely to the needs of southern schools and southern agriculture, of the text previously noted (E. S. R., 36, p. 394).

Agriculture for seventh year, M. C. TEX (*Taylorville, Ill.: Author, 1918, pp. 115, fig. 1*).—This text, which is adapted to the use of seventh year classes following the Illinois State course of study, is arranged by months. The subject matter deals in turn with neighborhood industries; fungi and fungus diseases; forage plants; transportation and travel, including lessons on the use, history, and care of farm implements and machinery; soil, water, and plants; and the garden and garden projects. Practical exercises are included.

Supervision of agricultural activities: A normal institute course for principals and supervising teachers, 1918 (*Manila, P. I.: Bur. Ed., 1918, pp. 52*).—Lessons, including class and field work, are outlined in the following subjects: The agricultural work of the Bureau of Education of the Philippines; gardening for primary and intermediate grades; home gardening; boys' and girls' agricultural clubs—organization and projects; garden days; Arbor Day and tree planting; civico-educational lectures; clean-up week; flowers, shrubs, and other yard improvements; gardening throughout the year; and extension work and cooperation with other Government agencies.

Some thoughts regarding the teaching of horticulture, R. J. Barnett (*Mo. Bul. Cal. Com. Hort., 7 (1918), No. 10, pp. 574–576*).—The author summarizes his discussion of ways of raising the professional standards of horticultural teaching, as follows: By more carefully planned curriculums; a series of real collegiate-grade textbooks prepared by leaders in the profession and published by either State or National agencies; improved and frequently revised lecture outlines; better organized laboratory work which may involve a system of cooperative orchards, summer terms, field camps, or a combination of these; the adoption of more adequate means to arouse the interest of the student and to provide him with proper ideals regarding the study of horticulture; intentional, intensive, and continual training of the student's ability to observe and evaluate natural phenomena; and a raised standard for teachers and teaching.

Forestry pursuits: Foresters, rangers, forest guards, S. T. Dana (*Fed. Bd. Vocat. Ed., Rehabil. Ser., No. 10 (1919), pp. 15*).—For the purpose of aiding disabled soldiers, sailors, and marines in choosing a vocation, this monograph defines forestry, and briefly explains what foresters do and where they work, what handicaps are serious in this work, what training is necessary, what opportunities are offered, and the chances for promotion. A list of the forestry schools in the United States, with brief statements of the courses offered by them, is appended.

A field and laboratory guide in biological nature study, E. R. Downing (*Chicago: Univ. Chicago Press, 1918, pp. 120, figs. 9*).—This guide is the outcome of many years' experience in preparing teachers to handle nature study in the grades and biology in the secondary schools. It is intended also for the use of teachers in service. It deals with some common insects, a study of autumn weeds, animals of pond and stream, trees, the spore bearers, animal companions, bird study, seeds and seedlings, and the garden.

An outline of the course of study in school-directed home gardening and nature study for grades four, five, six, and seven (*Atlanta, Ga.: [Atlanta Bd. Ed.] [1917], pp. 37*).—This course is submitted for the general guidance of teachers of the Atlanta, Ga., public schools.

School and home gardening: A normal institute course for teachers of primary grades, 1918 (*Manila, P. I.: Bur. Ed., 1918, pp. 56, figs. 2*).—The object of this course, consisting of 14 lesson outlines, is to furnish Filipino teachers in barrio and central schools of four grades with the actual details of primary gardening. Blank pages are included for lesson notes, planting plans, diagram lists, etc.

Science of plant life: A high school botany treating of the plant and its relation to the environment, E. N. Transeau (*Yonkers-on-Hudson, N. Y.: World Book Co., 1919, pp. IX+336, figs. 194*).—This text in botany is intended to serve as a basis for agriculture, horticulture, and forestry, and has been written to supplement laboratory and field work with plants. The central theme is the nutrition of the plant. A chapter is devoted to the relation of plants to their environment, and the final chapter treats of the evolution of plants. Attention is also called to the uses of plants and plant materials and to the applications of botanical principles in plant production. Each chapter is preceded by suggestions for laboratory and field work and is followed by a series of problems.

Domestic science and general hygiene, T. W. Gardner and I. F. Young (*London: The Normal Press, Ltd., 5. ed., pp. [III]+264, figs. 67*).—This book, for normal students, endeavors to give the fundamental principles underlying the facts of everyday life, including a study of work, rest, recreation, foods, digestion, clothing, personal hygiene, house sanitation, sickness and nursing, etc.

Food and victory: A war supplement to Textbook of Cooking, C. C. Greer (*Boston: Allyn & Bacon, 1918, pp. XIV+62, pl. 1, figs. 3*).—The object of the supplement is to serve as a guide in the wise selection and use of food substitutes and to emphasize the vital relation between success in warfare and the intelligent and unselfish use of food. It discusses the composition and characteristics of food and basic methods of cooking.

The school kitchen textbook, M. J. Lincoln (*Boston: Little, Brown & Co., 1915, pp. XI+308, pls. 2, figs. 3*).—This text discusses the human food groups, the processes of cookery, and the simpler chemical elements and their action, with special reference to elementary work in both home and school. Lessons in housekeeping and many recipes are included.

Yarn and cloth making: An economic study, M. L. Kissell (*New York: The Macmillan Co., 1918, pp. XXVII+252, pls. 2, figs. 85*).—This is a college and normal school text preliminary to fabric study. The subject matter is grouped in two sections, yarn making and cloth making, each of which is considered in an opening descriptive text, followed by a series of type studies of the distinct varieties of spinning and weaving.

NOTES.

Colorado College.—J. B. Ryan of Rocky Ford, and W. I. Gifford of Hesperus, have been appointed to the governing board, vice Charles Pearson and Dr. R. W. Corwin.

Purdue University and Station.—F. C. Lewis of the school of agriculture is to continue during the summer his studies for the station regarding the most practicable farm buildings for Indiana, and the possibilities of developing standardized farm buildings for the State. R. B. Goss has been added to the station staff to assist in a tractor testing project.

Iowa College and Station.—Dr. A. W. Dox has returned as chief of the chemistry section after nineteen months' service as captain in the Sanitary Corps, U. S. Army.

Louisiana University and Stations.—*Science* notes that A. F. Kidder has resigned as professor of agriculture in the college of agriculture to become agronomist and assistant director of the State Station at Baton Rouge.

Massachusetts Station.—The legislature has permitted the use of not more than $2,000 of the current appropriation to the college for the suppression of poultry diseases, and has authorized a fee to be charged of not more than 7 cts. per bird tested. The particular disease aimed at is the bacillary white diarrhea, and the work will be done by the veterinary department.

North Carolina College and Station.—The resignations are noted of C. L. Newman as head of the department of agronomy, to accept an appointment with the Federal Board for Vocational Education; Dr. G. A. Roberts, head of the department of veterinary medicine, to become veterinarian with the Rockefeller Foundation and to be stationed with the hygienic laboratory of the medical school at Sao Paulo, Brazil; and Dr. F. A. Wolf, as head of the department of botany of the college, but retaining his connection with the station.

Tennessee Station.—Dr. D. A. Metcalfe has been appointed veterinarian.

Washington College.—An inquiry recently made of 115 agricultural students concerning their plans for the future furnished 75 replies, 51 from students brought up in the country. Fifty-five of the students were expecting to own or control a farm within five years after completing their college course, 13 through inheritance, 5 of these being town boys. Thirty-eight students expected to rent or become managers of farms other than their own for a time after graduation, 19 were planning to teach agriculture in high schools, 11 to take up station work, 5 to teach in agricultural colleges, and the remainder to follow some occupation closely associated to farming as club work, county agent work, official testing, etc.

Roy O. Westley, assistant professor of agronomy at the Crookston substation of the University of Minnesota, has been appointed instructor in farm crops, beginning July 1.

Wisconsin University and Station.—C. M. Woodworth has resigned as instructor and assistant in genetics to take up studies of disease resistance in flax with the Bureau of Plant Industry of the U. S. Department of Agriculture.

Wyoming University and Station.—The board of trustees has authorized the erection of several steer sheds for experimental feeding and a double house for the use of the farm help at the university stock farm.