

BULLETIN No. 393.

DECEMBER, 1914.

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New York Agricultural Experiment Station.

GENEVA, N. Y.

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DIRECTOR'S REPORT FOR 1914.

W. H. JORDAN.



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PUBLISHED BY THE DEPARTMENT OF AGRICULTURE.

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Address all correspondence, not to individual members of the staff, but to the NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.

The Bulletins published by the Station will be sent free to any farmer applying for them.

§ Connected with Grape Culture Investigations, \*\* Connected with Hop Culture Investigations.

BULLETIN No. 393.

DIRECTOR'S REPORT FOR 1914.

*To the Honorable Board of Control of the New York Agricultural Experiment Station :*

*Gentlemen.*—I respectfully submit herewith the report of the operations of this institution for the calendar year 1914, together with a statement of our needs for maintenance and for additional equipment. The past year has not been marked by any unusual development in the work of the Station. The work of the various departments has proceeded along the usual lines. Doubtless our constituency has already learned that the development of knowledge and of its application to practical affairs is accomplished with great slowness if the conclusions reached are to be sound and calculated to stand the test of experience. It is fair to say, however, that the institution has made progress both in its equipment and in its studies in matters important to agriculture.

ADMINISTRATION.

STATION STAFF.

The usual number of changes have occurred in the Station Staff. Mr. E. L. Baker, Associate Chemist, who had been with the institution since May 8, 1905, resigned in April to accept a commercial position. This change was greatly to his financial advantage and the situation could not reasonably be met by the institution. Mr. Baker had had immediate charge for some time of the inspection of fertilizers and feeding stuffs and had occupied that position with satisfaction both to the institution and to the constituency which he served.

Mr. A. K. Burke, B.S., a graduate of the University of Maine, who had had previous experience in experiment station work, served the institution during a portion of 1913, and after an absence

was reinstated in March. He resigned this position in December to accept a commercial opportunity, much to my regret, as he had shown himself to be an efficient analytical chemist.

Mr. F. N. Crawford, A.B., was appointed Assistant Chemist on May first. Mr. Crawford is a graduate of Wesleyan University, Middletown, Conn., and had had previous experience in experiment station work at the Pennsylvania State College.

Mr. C. D. Parker, B.S., graduate of Cornell University, accepted a position of Assistant Chemist in February, and in November received an appointment in the United States Geological Survey.

Mr. Everett P. Reed, B.S.A., a graduate of Ohio State University, entered upon the duties of Assistant Agronomist in July.

#### METHOD OF APPOINTING MEMBERS OF SCIENTIFIC STAFF.

With the exception of the Associate and Assistant Chemists, the members of the scientific staff of the Station are classified in the non-competitive civil service list and are subject to appointment under the regulations applying to non-competitive positions. This is a very fortunate arrangement for the institution. Moreover, appointments are not restricted to residents of the State of New York. This is not only a fortunate regulation but one essential to the greatest efficiency in investigation. A scientific institution should not have placed upon it any limitations that prevent the securing of men of the highest possible grade. In view of the fact that similar institutions outside of New York State draw freely upon the staff of this institution for appointments to more advanced positions, the New York Station should have the privilege of selection from men of the whole country. Indeed, the number of men who have been efficiently trained for scientific investigation along agricultural lines is so limited that any restrictions whatever on the opportunity to secure well-trained men would be a serious handicap. Besides all this, no civil service scheme has yet been devised whereby men may be wisely selected by competitive examination for scientific positions. The management of the Station appreciates very highly the wisdom of the Civil Service Commission in authorizing the arrangement that exists. It is to be hoped that the time will come when the Associate and Assistant Chemists will also be placed in the non-competitive list.

## MAINTENANCE FUND.

The legislative appropriations for the maintenance of the Station during the fiscal year ending September 30, 1914, were as follows:

Salaries.....	\$52,000
Labor.....	16,000
For meeting the general expense of the Station departments.....	24,000
General expenses including heat, light, water, repairs, etc.....	5,500
For special grape investigations.....	7,500
For field, orchard and sanitary milk investigations.....	15,500
For special investigation in hop culture.....	5,000
Total.....	<u>\$123,500</u>

For the analyses of samples of fertilizers, feeding stuffs, fungicides, insecticides and agricultural seeds submitted by the State Commissioner of Agriculture, and for the examination of Babcock glassware.....	<u>\$16,000</u>
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The following are the appropriations available for the current fiscal year:

Salaries for scientific staff.....	\$52,000
Labor.....	17,000
Necessary expenses of Station departments.....	23,000
General expense including heat, light and water.....	5,500
Investigations in grape culture.....	7,500
For field, orchard, truck, garden crops and sanitary milk investigations..	14,500
Repairs, Dairy and Biological Building and forcing houses.....	1,500
Total.....	<u>\$121,000</u>

For the analyses of samples of fertilizers, feeding stuffs, fungicides, insecticides and agricultural seeds submitted by the State Commissioner of Agriculture, and for the examination of Babcock glassware.....	<u>\$16,000</u>
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The appropriations which your Board has requested from the Legislature for the fiscal year beginning October 1, 1914, are as follows:

General salaries of members of scientific and clerical staffs.....	\$56,560
Necessary expenses of investigations, excluding salaries, but including chemicals, scientific apparatus, machinery, fertilizers, cattle foods, maintenance of working animals, traveling expenses and other necessary expenses, in conducting researches at the institution, and throughout the State in soils, plant nutrition, horticulture, diseases of plants, injurious insects, bacteriology, animal nutrition, dairy practice and poultry keeping.....	23,000
Services of laborers, including janitors, poultryman, engineer, herdsman, dairy helper, foreman of orchards, florist and gardener, general mechanic, watchman, teamsters, farm and other common labor.....	18,340
General expenses, including heat, light, water, general equipment and general repairs.....	<u>5,500</u>

Investigations of the conditions of grape growing in Chautauqua County and other grape-growing sections of the State, including cultivation, methods of management, fungus and insect depredations and varieties:

Salaries.....	\$3,800
Labor and general expenses.....	3,700
Total.....	<u>\$7,500</u>

For conducting field, orchard and truck and garden crop investigations and demonstrations and investigating and demonstrating the means and methods of producing sanitary milk:

Salaries.....	\$10,400
Labor and general expenses.....	4,500
Total.....	<u>\$14,900</u>

For the enforcing of the provisions of the law in relation to commercial fertilizers, concentrated feeding stuffs, fungicides and insecticides, agricultural seeds and the testing and marking of Babcock glassware, pursuant to sections two hundred and twenty-four, one hundred and sixty-four and one hundred and forty-three of chapter nine of the laws of nineteen hundred and nine, section thirty-four and section fifteen, chapter two hundred and ninety-seven of the laws of nineteen hundred and twelve:

Salaries.....	\$13,570
For general expenses.....	2,700
Total.....	<u>\$16,270</u>

Grand total for maintenace.....	<u>\$142,070</u>
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The budget as given above is in the one filed with the Commission of Efficiency and Economy and the Comptroller's office, excepting that in all cases outside of common labor the salaries of the various positions in the scientific, clerical and labor staffs are individualized.

The appropriations requested for the fiscal year 1915-16, are in total \$5,000 more than the appropriations that were made for the fiscal year 1914-15. This is due to the fact that previous to January 1, 1914, the proceeds from the farm were directly applied to Station expenses. Since January 1, 1914, all farm products have been turned into cash and the proceeds forwarded to the Comptroller's office. The amount of such proceeds is not far from \$4,000 per year.

For various reasons, I have in addition submitted a substitute schedule of expenses consisting of but four items, as follows:

#### SALARIES OF SCIENTIFIC AND CLERICAL FORCE.

For the payment of the salaries of director, agronomists, bacteriologists, botanists, chemists, dairy experts, editor and librarian, entomologists, horticulturists, field agents, stenographers, clerks and other scientific and clerical help necessary to the carrying out of the purposes of the institution through investigations and experiments at the institution and throughout the State.....	\$70,000
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## SERVICES OF LABORERS.

For the payment of labor, including janitors, poultryman, engineer, herdsman, dairy helper, foreman of orchards, florist and gardener, general mechanic, watchman, teamsters, farm and other common labor. . . . .	\$20,000
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## EXPENSES OF INVESTIGATIONS.

For necessary expenses, excluding salaries and labor, but including chemicals, scientific apparatus, machinery, fertilizers, cattle foods, traveling expenses, maintenance of farm teams, heat, light, water, general repairs, general equipment, care of grounds and other expenses necessary to maintaining the institution and to conducting researches and experiments at the institution and throughout the State in soils, plant nutrition, horticulture, diseases of plants, injurious insects, bacteriology, animal nutrition, dairy practice and poultry keeping, including special investigations in the conditions of grape growing, hop growing, the production of orchard, truck and garden crops and the means and methods of sanitary milk production. . . . .	36,000
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## INSPECTION OF FERTILIZERS, FEEDING STUFFS, ET CETERA.

For the New York State Agricultural Experiment Station for enforcing the provisions of the law in relation to commercial fertilizers, concentrated feeding stuffs, fungicides and insecticides, agricultural seeds and the testing and marking of Babcock glassware, pursuant to sections two hundred and twenty-four, one hundred and sixty-four and one hundred and forty-three of chapter nine of the laws of nineteen hundred and nine, section thirty-four and section fifteen, chapter two hundred and ninety-seven of the laws of nineteen hundred and twelve, for the payment of salaries of chemists, botanists and laboratory assistants. . . . .	12,070
For janitor service and other labor. . . . .	1,500
For the purchase of scientific apparatus, chemical and laboratory supplies, expressage, traveling expenses and other necessary expenses. . . . .	2,700
Grand total for maintenance. . . . .	<u>\$142,270</u>

It is especially important that the amount necessary for salaries should be appropriated in a lump sum. Up to the fiscal year 1914-15, during the thirty or more years of existence of the Station, salaries have not been individualized, and there has been no intimation that the lump-sum method of appropriation has been in any way abused. As a matter of fact, a list of salaried positions with the salaries paid has been for several years annually filed in the Comptroller's office and this information has been at all times available to the Legislature.

There are some serious objections to the individualizing of salaries under the conditions which prevail at an institution of this character.

It is not possible to wisely state the salaried positions and salaries which should be paid in an institution of investigation with our

varied work and shifting problems one year in advance of the time at which the money is to be used. Again, with fixed salaries for fixed positions, we are unable to exercise discretion in retaining a man when he is called to another institution and it is wise to increase his salary to hold him. In fact, the whole system is so fixed and mechanical that it very seriously limits the autonomy of the institution in handling its salary fund in an efficient and adaptable manner. No more money is spent under the lump sum than under the individualized salary plan. It is simply a question of giving the authorities of the institution the opportunity to exercise judgment in the application of these funds to the work of the institution.

The labor item includes not only the labor necessary at this Station but also in various localities outside in the State for carrying on the experimental work in hand and is therefore an increase of about \$3,000 over the labor item for 1914-15, which did not include outside labor. In the past our labor appropriations have been more scanty in proportion to the need than any other appropriation.

The expense of investigations and maintenance of the institution should be lumped because the general expenses of the institution are related to all our work. The whole purpose of the institution is investigation and it simplifies bookkeeping and renders more elastic and efficient the application of the funds where they may be adjusted from year to year to somewhat varying distribution of funds among the various objects.

In general, it may be said because of more or less interchangeability of men between various lines of work, because of the changes necessary to adapt the work to the problems which come to us and because of the relation of expense to all of our work, it is simpler and more rational to appropriate to the institution in those lump sums rather than in a mechanical division which is often embarrassing and which greatly adds to the work of administration of funds.

#### NEW EQUIPMENT.

The Experiment Station was established in 1882, and since that time it has been growing slowly but continuously. This growth has not been forced but has been the result of demands made by agricultural people for the solution of important problems. During the eighteen years in which I have been connected with the institution, the scientific and clerical staff has increased from fourteen



persons to approximately forty. The building equipment has also increased, but not at all in proportion to the demands made upon the Station. For several years an effort has been made to secure a building which would serve at the same time to accommodate the administrative offices, give space for the visualizing of results which we have reached and provide an auditorium. During this time other needs have become very apparent and by direction of your Board what may seem to many a liberal sum of money is now being asked for additional equipment. The coming Legislature is to be asked for appropriations for three buildings — an administration, demonstration and library building, new forcing houses and a building providing cold storage facilities.

The reasons why we ask for the larger building have been stated many times, but are here again summarized:

The Station has no audience room where agricultural societies and other bodies of farmers may meet for the discussion of our work. During the summer season, large bodies of farmers come to the Station and in case of rain (which frequently occurs) it is not possible for an audience to assemble. More visitations would be made if we had an audience room. Agricultural societies would meet with us if an audience room was available. No other agricultural institution, of which I know is placed in so awkward a situation.

At least three existing departments of the Station need more space and the new department for the investigation of soils must be provided with quarters much larger than it now possesses. The new building would relieve space in two other buildings in order to give needed rooms for the department mentioned.

The Station is seriously in need of a generous amount of space, not now provided, for setting up objective demonstrations of its work in dairying, plant diseases, injurious insects, horticulture, fertilizers and feeding stuffs in order that the visitors, who come to us by hundreds, may gain an intelligent idea of what the Station has done. Such demonstrations are also needed if agricultural bodies are to meet with us.

The Station has now come to possess a valuable library of several thousand volumes, and space in fireproof quarters should be provided for this library. It is now located in the old mansion house bought with the Station farm.

The old mansion house, now occupied by the administrative offices and library, is needed as a place where the members of the staff and other employees can get meals, and where living rooms can be furnished to those persons who should be on the Station grounds. The Station is a mile and a half from the city where board can be obtained and it is time-consuming and wasteful for members of the Station staff to travel so far in order to get a midday meal. It is important that such accommodations exist as the mansion house would furnish if the administrative offices and library could be moved into another building.

In the thirty years' existence of the Station, there has been appropriated to it for buildings in all only \$155,450. Twenty-seven buildings now exist on the Station property, and it is fair to claim that no other State institution has a better record for economy of expenditure in the way of building equipment.

The time has come when in order to carry on its work with the desired efficiency new and greatly enlarged plant houses should be provided. The present plant houses of the Station were erected about twenty-five years ago. They have exceeded the usual life of such structures, and are now neither adequate nor efficient. There is a large amount of work in agricultural investigation which should be carried on in such houses, if carried on at all, and includes plant breeding, plant nutrition and studies of plant diseases and injurious insects, to all of which lines the Station is obliged to give much attention.

The small cold-storage house, established chiefly for the storing of fruits, was erected at the Station something more than twenty years ago. The preservation of fruits, of which the Station has several thousand varieties, requires cold storage facilities in order that such materials may be used for study and exhibition purposes. The present cold-storage plant is inadequate in size and construction and if retained will need enlargement and extensive repairs. A new building should be erected.

#### PUBLICATIONS.

The publications of the Station during the year 1914 consist of 21 regular bulletins, 8 technical bulletins and 7 circulars. Of the regular or complete bulletins, 14 have been popularized in a brief

and more condensed form. The number of bulletins issued from each of the departments of the institution has been as follows:

	Agronomy.	Bacteriology.	Botany.	Chemistry.	Entomology.	Horticulture.	Inspection.
Complete bulletins.....		2	3	.....	4	6	5
Technical bulletins.....		2	.....	6	.....	.....	.....
Circulars.....	2	.....	.....	.....	1	4	.....

These bulletins are issued chiefly to residents of New York. So far no reasonable requests to have bulletins sent to residents of other States have been denied. The number of names of residents of other States now on our mailing list approaches 2,500, and as this institution is supported very largely by State funds it may at no distant date become necessary to consider whether residents of other States should not be required to pay at least the cost of publication of the bulletins they desire from this institution. The number of names now on our mailing list with their distribution is as follows:

#### POPULAR BULLETINS.

Residents of New York.....	37,330
Residents of other States.....	2,309
Newspapers.....	750
Experiment stations and their staffs.....	2,210
Miscellaneous.....	100
Total.....	<u>42,699</u>

#### COMPLETE BULLETINS.

Experiment stations and their staffs.....	2,210
Libraries, scientists, etc.....	330
Foreign list.....	344
Individuals.....	3,652
Miscellaneous.....	100
Total.....	<u>6,636</u>

There will be presented to the Legislature for publication the manuscript of a volume to be known as the "Cherries of New York," which will constitute Part 2 of the Report of the Station for 1914. This is the fourth fruit monograph. A fifth volume is now under preparation, to be known as the "Peaches of New York," which

latter will doubtless be presented for publication in the report either for 1915 or 1916. It is quite probable that in time other volumes of similar character will follow.

As was stated in the last report, the Legislature of 1913 authorized the printing of an edition of five thousand copies of the "Apples of New York" to be sold at cost, not only to residents of the State but to anyone making application and paying the required sum. The cost of publication has been set at \$2.25 per set of two volumes and already a large number of copies have been sold. Application for the "Apples of New York" should now be made to the Commissioner of Agriculture, Albany, N. Y.; and checks or other means of payment should be drawn in favor of the Treasurer of the State of New York.

#### INSPECTION WORK.

The chemical work involved in the analysis of samples of fertilizers, feeding stuffs, fungicides and insecticides collected by the Commissioner of Agriculture and forwarded to this institution in accordance with the requirements of law has reached large proportions. The examination of the samples of agricultural seeds received from the same source now consumes a large amount of time. Besides this the law requires that all Babcock glassware that is used in New York by creameries and cheese factories which purchase milk on the basis of the fat content shall be tested for accuracy and marked by the Experiment Station.

Following is a summary of the work performed by the Station along these lines during the year 1914:

Fertilizers.....	1,004 samples
Feeding stuffs.....	604 samples
Agricultural seeds, official.....	302 samples
Agricultural seeds, from farmers.....	1,155 samples
Total.....	<u>3,065 samples</u>
Milk bottles.....	23,104
Cream bottles.....	6,591
Pipettes.....	452
Total.....	<u><u>30,147</u></u>

#### INVESTIGATIONS RELATIVE TO HOP CULTURE.

For two years the Experiment Station has been carrying on investigations relative to the control of mildew on hops, in the hop-growing

region in Otsego County and vicinity. The results show that a good degree of control of this hop pest is secured by a thorough dusting with sulphur. It now remains for the hop growers to apply the remedy and it is not felt that it is wise to make further expenditure of money along this line. Practically no work has been done on the culture of the hop and for that reason a new field has been started on the farm of P. R. Bennett, of Milford, where experiments in methods of culture and fertilization will be carried on. It is felt that by starting a new field the results of the experiments will be more significant than if these experiments are carried on in an old field.

#### INVESTIGATIONS RELATIVE TO GRAPE CULTURE.

The studies which are being carried on in Chautauqua County, largely in the vineyard rented of Mr. H. B. Benjamin, which will be continued for at least ten years, have already produced fruitful results. Experiments are also being conducted in the control of insect and fungus pests in various places in Chautauqua County, and the outcome of this work is very encouraging. As intimated in my last report, similar work has been taken up in the Keuka Lake region at Urbana. As the experiments in this locality have only been carried on for one year, nothing of any definite character can be said concerning the outcome.

#### INVESTIGATIONS RELATIVE TO TOBACCO CULTURE.

The fertilizer experiments located with the Minier Brothers at Big Flats have been discontinued and the results will be published at the earliest opportunity. Experimental work is being continued at Baldwinsville in cooperation with the United States Department of Agriculture, Mr. George W. Harris, representing the Department, having the immediate supervision of the work.

#### SOIL INVESTIGATIONS.

The equipment of the Department of Agronomy for reliable investigation of soils has been greatly augmented by the construction of a battery of lysimeter tanks by means of which it will be possible to study certain soil problems in a much more exact manner than could be done in field work. Studies with such an apparatus must be continued for a long time before conclusions are reached.

It is well to bear in mind that while field experiments for the purpose of studying fertilizer needs, methods of culture and so on are useful, they very seldom and perhaps never answer any fundamental questions. Such experiments must be regarded as tests of business methods. They do not generally furnish information which is useful for general application, as the results have at the best only a regional applicability. As a matter of fact, each farm is an individual business proposition and the methods of culture and of fertilization should be adapted to it in accordance with conditions which may be unlike those of any other farm. What we should seek for are general principles which may be incorporated into farm practice according to prevailing conditions.

EXPERIMENTAL WORK CONDUCTED OUTSIDE OF THE STATION  
LABORATORIES AND GROUNDS.

There are many lines of investigation and experimental effort where the conclusions reached are of general application. This is particularly true of conclusions concerning the control of injurious insects and fungus pests. It is fair to conclude that any method which proves efficacious in controlling apple scab in Ontario County will have practically equal value in Niagara County. The same may be said of the use of an insecticide. There do not enter into experimental work of this kind, conditions as complex or as indefinite as is the case with cultural or fertilizer experiments.

The experimental work which the Station is carrying on in various parts of the State should not be regarded as mere demonstrations. While it partakes of this character in a certain sense, such work is instituted primarily for the purpose of acquiring information. It is fortunate, however, that it may also furnish object lessons to those farmers or others who take the trouble to observe it carefully.

During 1914 the Experiment Station has carried on experimental work of various kinds touching 30 problems with 109 cooperators on as many farms in various parts of the State. Below may be seen a statement of the subjects under investigation with the name of the cooperator and the location of the experimental work. Not only the Station but the farmers of the State are under obligation to these cooperators for the opportunity given to the Station for studying important problems.

## DEPARTMENT OF AGRONOMY.

Alfalfa culture on Volusia soils . . .	L. Gallager ( $\frac{1}{2}$ acre) . . . . .	Oxford.
Alfalfa culture on Volusia soils . . .	C. G. Baker (1 acre) . . . . .	Chenango Forks.
Alfalfa culture on Volusia soils . . .	H. G. Skinner, Jr. ( $\frac{1}{2}$ acre) . . .	Prattsburg.
Alfalfa culture on Volusia soils . . .	A. S. Matherny ( $\frac{1}{2}$ acre) . . . . .	Binghamton.
Alfalfa culture on Volusia soils . . .	L. W. Rorapaugh ( $\frac{1}{2}$ acre) . . .	Cortland.
Alfalfa culture on Voldsia soils . . .	H. W. Cornell ( $\frac{1}{2}$ acre) . . . . .	Elmira.
Alfalfa culture on Volusia soils . . .	F. A. Wigsten ( $\frac{1}{2}$ acre) . . . . .	Volusia.
Alfalfa culture on Volusia soils . . .	F. D. Swezey ( $\frac{1}{2}$ acre) . . . . .	Sherman.
Alfalfa culture on Volusia soils . . .	J. S. Carnes ( $\frac{1}{2}$ acre) . . . . .	Great Valley.
Alfalfa culture on Volusia soils . . .	F. C. Gibbs ( $\frac{1}{2}$ acre) . . . . .	Fillmore.
Alfalfa culture on Volusia soils . . .	H. B. Adams ( $\frac{1}{2}$ acre) . . . . .	Wellsville.
Alfalfa culture on Volusia soils . . .	General Lyon ( $\frac{1}{2}$ acre) . . . . .	Binghamton.
Alfalfa culture on Volusia soils . . .	L. E. Hooker ( $\frac{1}{2}$ acre) . . . . .	Watkins.
Alfalfa culture on Volusia soils . . .	F. D. Rice ( $\frac{1}{2}$ acre) . . . . .	Homer.
Alfalfa culture on Volusia soils . . .	W. P. Mead & Son (4 acres) . . .	Jamestown.
Alfalfa culture on Volusia soils . . .	Bolt & Huey (4 acres) . . . . .	Portville.
Alfalfa culture on Volusia soils . . .	B. L. Winters (4 acres) . . . . .	Smithboro.
Alfalfa culture on Volusia soils . . .	A. R. Chappel (2 acres) . . . . .	Sidney.
Alfalfa culture on Volusia soils . . .	W. N. Tarbell (1 acre) . . . . .	East Freetown.
Apple orchards: Fertilizer, cultivation and cover-crop tests . . .	Great Bear Springs Co. (8 acres) . . . . .	Fulton.
Apple orchards: Fertilizer, cultivation and cover-crop tests . . .	R. B. Densmore (8 acres) . . . . .	Albion.
Apple nursery: Fertilizer and cultivation tests . . . . .	W. & T. Smith Co. (2 acres) . . .	Geneva.
Cherry orchard: Fertilizer, cultivation and cover-crop tests . . .	P. F. O'Neil (3 acres) . . . . .	Geneva.
Peach orchard: Fertilizer, cultivation and cover-crop tests . . .	T. H. King ( $3\frac{1}{2}$ acres) . . . . .	Trumansburg.
Pear orchard: Fertilizer and cover-crop tests . . . . .	L. L. Morrell (4 acres) . . . . .	Kinderhook.
Pear orchard: Cultivation and cover-crop tests . . . . .	Lawrence Howard (3 acres) . . . . .	Kinderhook.
Vineyards: Fertilizer and deep-plowing tests . . . . .	F. E. Stone (4 acres) . . . . .	Fredonia.
Vineyards: Fertilizer and deep-plowing tests . . . . .	D. W. Blood (2 acres) . . . . .	Dunkirk.
Vineyard: Tile-drainage experiments . . . . .	D. W. Blood (4 acres) . . . . .	Dunkirk.
Tobacco-culture experiments . . . . .	F. A. Tuerk . . . . .	Baldwinsville.
Tobacco-culture experiments . . . . .	F. J. Patchet . . . . .	Baldwinsville.
Hop-culture experiments . . . . .	P. R. Bennett . . . . .	Milford.
Hop-culture experiments . . . . .	Patrick King . . . . .	Cooperstown.

## BOTANICAL DEPARTMENT.

Potato spraying experiments . . . . .	E. B. Keyes . . . . .	Rush.
Cause of poor potato stands . . . . .	F. A. Sirrinc . . . . .	Riverhead.
Spraying currants for the control of cane blight and anthracnose . . .	J. R. Clarke & Son . . . . .	Milton.
Control of hop mildew . . . . .	W. P. King and F. X. King . . . . .	Hartwick.
Control of hop mildew . . . . .	Charles Lehman . . . . .	Sharon Springs.
Control of hop mildew . . . . .	Isaac Russel . . . . .	Milford.
Control of hop mildew . . . . .	E. Wilsey . . . . .	Cooperstown.
Control of hop mildew . . . . .	J. Wedderspoon . . . . .	Cooperstown.
Control of hop mildew . . . . .	L. Utter . . . . .	Cherry Valley.
Clematis stem rot . . . . .	Jackson & Perkins Co. . . . .	Newark.

## ENTOMOLOGICAL DEPARTMENT.

Control of cranberry toad-bug . . . . .	Cranberry Growers' Assoc'n.	Riverhead.
Control of pear thrips . . . . .	Ashley and Rockefeller . . . . .	Germantown.
Control of pear thrips . . . . .	A. W. Hover & Bro . . . . .	Germantown.
Control of pear thrips . . . . .	Clarence Snyder . . . . .	North Germantown.
Control of pear thrips . . . . .	Spencer Bros. . . . .	Hudson.
Experiments with apple aphides . . . . .	John Beckwith . . . . .	New Haven.
Experiments with apple aphides . . . . .	George Simpson . . . . .	Carlton.
Experiments with apple aphides . . . . .	Harris Freeman . . . . .	Albion.
Experiments with apple aphides . . . . .	Albert Wood Estate . . . . .	Carlton.
Experiments with apple aphides . . . . .	Thomas Mack . . . . .	Holley.
Experiments with apple aphides . . . . .	George Smith . . . . .	Lyndonville.
Experiments with apple aphides . . . . .	J. Bayne . . . . .	Lyndonville.
Experiments with apple aphides . . . . .	A. J. Skinner . . . . .	Knowlesville.
Experiments with apple aphides . . . . .	E. J. Kelly . . . . .	North Rose.
Experiments with apple aphides . . . . .	J. A. McAuley . . . . .	Lockport.
Experiments with apple aphides . . . . .	Floyd Cothran . . . . .	Lockport.
Experiments with apple aphides . . . . .	Richard Taylor . . . . .	Lockport.
Experiments with apple aphides . . . . .	W. E. Wiseman . . . . .	Lockport.
Experiments with apple aphides . . . . .	Fred Zimmerman . . . . .	Lockport.
Experiments with apple aphides . . . . .	Ralph E. Heard . . . . .	Lockport.
Experiments with apple aphides . . . . .	A. A. Fonner . . . . .	Lockport.
Experiments with apple aphides . . . . .	H. J. Treichler . . . . .	Sanborn.
Experiments with apple aphides . . . . .	H. B. Treichler & Son . . . . .	Sanborn.
Experiments with apple aphides . . . . .	A. H. Ernest . . . . .	Lockport.
Experiments on pear psylla . . . . .	E. E. Barnum . . . . .	Albion.
Experiments on pear psylla . . . . .	Frank Gibson . . . . .	Albion.
Experiments on pear psylla . . . . .	F. E. Hanlon . . . . .	Medina.
Experiments on pear psylla . . . . .	H. E. Wellman . . . . .	Kendall.
Experiments on pear psylla . . . . .	Frank S. Hayden . . . . .	Wyoming.
Experiments on pear psylla . . . . .	Frank Bacon . . . . .	Albion.
Experiments on pear psylla . . . . .	F. P. Hazleton . . . . .	Le Roy.
Experiments on pear psylla . . . . .	S. S. Hopkins . . . . .	Youngstown.
Experiments on pear psylla . . . . .	S. W. McCollum . . . . .	Lockport.
Experiments on pear psylla . . . . .	E. Moody & Son . . . . .	Lockport.
Experiments on pear psylla . . . . .	C. G. & R. L. Oaks . . . . .	North Rose.
Experiments on pear psylla . . . . .	A. C. Pease . . . . .	Oswego.
Experiments on pear psylla . . . . .	Ira Pease . . . . .	Oswego.
Experiments on pear psylla . . . . .	R. L. Rogers . . . . .	Albion.
Experiments on pear psylla . . . . .	David Smith . . . . .	Middleport.
Experiments on pear psylla . . . . .	F. M. Tenny . . . . .	Hilton.
Experiments on pear psylla . . . . .	Albert Wood Estate . . . . .	Carlton.
Experiments on pear psylla . . . . .	F. M. Woolworth . . . . .	Youngstown.
Experiments on pear psylla . . . . .	Lawrence Wright . . . . .	Hilton.
Experiments on pear psylla . . . . .	Jay Allis . . . . .	Medina.
Experiments on pear psylla . . . . .	Frank Bacon . . . . .	Albion.
Experiments on pear psylla . . . . .	Spencer Brownell . . . . .	Oswego.
Experiments on pear psylla . . . . .	John Cramer . . . . .	Middleport.
Experiments on pear psylla . . . . .	Frank Curtis . . . . .	Hilton.
Experiments on pear psylla . . . . .	C. E. Ernest . . . . .	Gasport.
Experiments on pear psylla . . . . .	Harris Freeman . . . . .	Albion.
Studies on grape root-worm . . . . .	Henry Barnes (5 acres) . . . . .	Fredonia.
Studies on grape root-worm . . . . .	F. G. Spoden (6 acres) . . . . .	Fredonia.
Studies on grape root-worm . . . . .	Mrs. C. M. Benjamin	
	(3 acres) . . . . .	Fredonia.
Studies on grape root-worm . . . . .	N. G. & G. T. Merritt	
	(4 acres) . . . . .	Sheridan (P. O. Dun-
		kirk.)



ENTOMOLOGICAL DEPARTMENT (*continued*).

Studies on grape root-worm.....	L. M. Cary (2 acres).....	Sheridan (P. O. Dunkirk.)
Studies on grape root-worm.....	W. E. Skinner (2 acres)....	Portland.
Studies on grape root-worm.....	E. L. Day (3 acres).....	Dunkirk.
Studies on grape root-worm.....	Experiment Vineyard (Sec. 6) (2 acres).....	Fredonia.
Studies on grape-berry moth.....	Mrs. C. M. Benjamin (3 acres).....	Fredonia.
Studies on grape-berry moth.....	D. K. Faldey (6 acres).....	Westfield.
Studies on grape-berry moth.....	Louis Bourne (4 acres).....	Westfield.
Studies on rose chafer.....	Louis Bourne (4 acres).....	Westfield.
Studies on rose chafer.....	O. T. Little (2 acres).....	Ripley.

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HORTICULTURAL DEPARTMENT.

Comparison of sod mulch and tillage.....	James Vick's Sons.....	Elmgrove.
Comparison of sod mulch and tillage.....	Grant Hitchings.....	South Onondaga.
Tests of stocks for apples.....	F. E. Dawley.....	Fayetteville.
Tests of stocks for apples.....	Edward van Alstyne.....	Kinderhook.
Fertilizer, culture and pruning experiments with grapes.....	H. B. Benjamin.....	Fredonia.

## THE RELATION OF THE STATION TO EXTENSION WORK.

Perhaps the most pronounced effort in the interests of agriculture at the present time is directed toward the extension of knowledge. This effort has more or less overshadowed and to some extent has handicapped efforts for the acquisition of knowledge. While the law establishing this institution explicitly declares that it shall give itself to investigation and experimentation concerning agricultural problems, it has been found necessary to give considerable time and effort to the mere extension of knowledge. This has been done through the attendance of members of the staff upon the meetings of the State agricultural organizations, through work at farmers' institutes, through extensive correspondence in reply to inquiries and through exhibits at the meetings of various societies and at the State Fair. The amount of time that has been required for this work and the extent to which it has interfered with the primary work of the Station has hardly been appreciated outside of the Station staff. Doubtless these extension efforts have been productive of good results. No one who appreciates the relations of an experiment station would desire to have it isolated and fail to have a sympathetic touch with its constituents. On the other hand, scientific investigation, to be successfully carried on, must have the continuous unbroken attention of those who are attempting

to carry it on. It demands a concentration and momentum of mind which should be applied with unbroken continuity.

It is recognized, of course, that through some agencies the knowledge acquired through investigation should reach the people in an available form. It is clear, however, that the same body of men in an experiment station cannot be both investigators and extension teachers, and it seems equally clear that the extension work should be carried on through the agricultural teaching agencies of the State. It now appears as if the organization and funds provided through recent federal legislation, namely the Lever-Smith bill, would tend to relieve the experiment stations of some of the extension work which they have felt obliged to do and would allow a fuller concentration upon the work of inquiry. One of the problems which this institution is now called upon to solve is its adjustment to the extension service. Certainly, in some way its conclusions should be freely available to extension teachers. To accomplish this will be greatly in the interest not only of the agricultural public but of the Station itself.

It is certain that the growth of the extension effort, made possible by federal legislation, will greatly increase the demand not only for the knowledge which we already possess but for the study of problems which still remain unsolved. For this reason it is essential that the development of the agencies devoted to investigation and teaching shall proceed symmetrically. A proper balance should be maintained between the effort of investigation and the effort of teaching, both that in colleges and schools and through popular demonstrations. In view of the popularity of the extension effort, investigation seems liable to receive less attention than it should, and those who understand the situation should most insistently urge that funds applied to investigation should meet existing demands as fully as those applied to the various forms of teaching. It is for this reason, therefore, that the management of the Station respectfully urges that the Legislature not only maintain the institution on its existing basis but provide also for such progress in equipment as the enlarging demands make necessary.

## INVESTIGATION.

## ANIMAL HUSBANDRY.

*Developing the Station herd of dairy cows.*—The Station is now in possession of a herd of Jersey cows, practically all full-blood and registered, that is highly productive and for nine years has not developed a single case of tuberculosis. There have been some cases of contagious abortion, especially with the heifers, but this trouble has grown less and less and is now not much in evidence.

The development of a sound herd of this type should be a matter of general interest, especially as the foundation stock consisted in part of tuberculous mothers.

Two phases of this matter should be considered:

- (1) The maintenance of the animals in health.
- (2) The development of highly productive animals.

Between December, 1900, and March, 1901, fifteen out of the twenty-eight animals owned by the Station were found to be tuberculous. At the latter date the herd was separated into sound and unsound animals, these two groups being located in separate stables, each group under the care of its own attendants. This separation continued, with constant supervision of both herds, until May, 1905, when the six remaining unsound animals were killed.

In November, 1905, thirty animals in the herd were tested with tuberculin and no reaction found, and since that time no case of tuberculosis has appeared. It should be borne in mind in this connection that the nine animals in the Millie Darling family now constituting a part of the Station herd are nearly all descendants of daughters of Millie D., dropped after she reacted and during the time she was with the diseased section of the herd after separation in March, 1901. In brief, part of the Station herd had a diseased mother as foundation stock.

The evolution of a sound herd out of one partially diseased and the maintenance of the herd in a condition of health during nine years have been accomplished in a comparatively simple way.

The following have been the essential factors in the process:

- (1) In the beginning, separation at once from their mothers of the calves of diseased cows and feeding them on the milk from sound cows or milk that has been pasteurized.

- (2) The maintenance of the herd by raising its heifer calves.

(3) Quarantining the herd against outside dairy wastes and animals coming from infected herds. Pasteurized dairy wastes from outside might have been used safely.

It has been intimated that a highly productive herd has been developed. This is shown to be the case by the following statement of averages made up from records of 1906-8 and 1913-14.

Year.	Number of cows.	Number periods of lactation.	Average yield per cow per period of lactation.	Average percentage of fat.	Average annual yield of fat per lactation period.
			<i>Lbs.</i>	<i>Per ct.</i>	<i>Lbs.</i>
1906-1908.....	27	63	6,435	5.16	334
1913-1914.....	23	23	6,546	5.91	387
Carey family, 1913-1914...	14	14	6,139	6.01	369
Millie family, 1913-1914...	9	9	6,921	5.82	403

The guiding principles in building up this herd have been:

(1) A standard of selection that includes size and vigor as well as productiveness.

(2) The importation of males from a line of vigorous and productive ancestry.

(3) Avoidance of the forcing system in feeding animals used as breeders. Eight pounds of grain has been the maximum daily ration used in this herd.

(4) Retention of the most promising heifers and turning off of the poorest.

#### BACTERIOLOGICAL DEPARTMENT.

##### *Microscopical investigations of the bacteria and tissue cells in milk.*—

The use of the microscope as a means of determining milk quality has been advocated for more than three-quarters of a century, but it is only with the recent development of the sanitary control of milk supplies that the microscopical methods of milk examination have become of practical importance to the milk dealer and dairyman. Because of the great need for a simple method of determining quickly the condition of a given sample of milk relative to bacteria and tissue cells the Station has tested out a new method of making such examinations by means of the microscope and has secured

sufficiently favorable results to justify the publication of two preliminary bulletins which are numbered 373 and 380 respectively.

*Microscopical examination of milk for bacteria.*— Bulletin No. 373 discusses the usefulness of the microscope as a means of determining the number and the general character of the bacteria present. This bulletin likewise gives a comparison between the results secured with the new method and those secured with the older, and more generally used, cultural methods. The new method promises to be of great value as it is scarcely more difficult to carry out than the well known Babcock test for butter-fat and apparently gives fully as accurate and as usable information in the case of raw milk as do the cultural methods. It likewise has a practical advantage over any cultural method in that the results are almost instantly available so that, if desired, the bacterial quality of a given sample of milk can be determined before it is used. Cultural methods of determining milk quality require from several hours to five days before results are available. By the use of the microscope, raw milk can be readily separated into as many as three grades, and the cost of making the test is so small that it should find general use in the hands of milk dealers. They can use it in this way to control the bacterial quality of the milk which they handle as readily as they can control its butter-fat.

*Cells in milk derived from the udder.*— Bulletin No. 380 gives the results of studies on the tissue cells in milk which have been made by the use of the technique discussed above. These results have a bearing upon some of the problems involved in the control of garget and have been useful in determining the normal condition of milk. It has been shown that the number of cells present in the milk of apparently normal cows is much larger than has been generally supposed, an average of 868,000 cells per cubic centimeter having been found in the milk of 122 supposedly normal cows. Only 59 of these cows gave milk containing less than 500,000 cells per cubic centimeter, the number which has been frequently used as the border line between normal and abnormal milk. Wide fluctuations in numbers occurred both in the milk of the same cow from day to day and in the milk of the various quarters of the same udder. The number of cells in the strippings was invariably higher than that in the milk from the major portion of the milking. A study of the number of cells in the milk and of the bacteria in the udder

of 43 Guernsey cows failed to show the close relationship between infections of the udder with streptococci and the discharge of large numbers of cells which has been claimed by some previous investigators. The contradictory nature of the results obtained make it increasingly probable that the discharge of these cells is not due to a simple cause.

This bulletin likewise reports the results of the studies which are made to determine whether increasing the vacuum used in operating mechanical milkers would have an effect upon the number of cells discharged in the milk. The investigation was made because it has been frequently thought that increased vacuums drew blood from the interior of the udder, or at least caused an increased discharge of cells. A six weeks' test where the vacuum was increased from the normal of 14.5 inches to 19.5 inches failed to show any effect on the cell content of the milk. A comparison between the number of cells in the milk of machine-milked and hand-milked cows in the Station herd showed somewhat fewer cells in the milk of the machine-milked cows.

*Bacteria of frozen soil.*—Observations made at the Cornell University Experiment Station a few years ago by one of the present members of this Department have been confirmed and extended by work at this Station. The original observation that the number of bacteria in frozen soil is generally larger than in unfrozen soil has been confirmed, and also it has been shown that this increase is not due to the increase in soil moisture in the frozen soil nor to a migration of bacteria to the surface layers from lower depths. This makes it probable that the increase in number is due to an actual growth of bacteria in frozen soil. Further studies on the effect of seasonal changes on bacterial life are needed to explain this fact and to determine its practical value, if any. The work has been reported in Technical Bulletin No. 35.

*Cultural media for soil bacteriological work.*—One of the most serious handicaps in agricultural bacteriology is lack of precise methods of work. Much of the present technique in soil bacteriology consists of the crude methods characteristic of the earliest stages of the development of a science or of technique taken from other fields of bacteriology and applied to soil work without any careful study of its efficiency in the new field. For these reasons it has been necessary to make an extended study of the cultural methods

in use for determining the number of bacteria present in soils, which has been reported in Technical Bulletin No. 38. The chief immediate value of the work will be to other workers in agricultural bacteriology, but ultimately the use of the new media suggested in this bulletin should give us facts of practical importance in developing or controlling the fertility of the soil.

*Other bacteriological studies.*—No publications have been made during the year on the study of the barn conditions in relation to the germ content of milk, but a bulletin is in manuscript form and should go to the printer within a month. A bulletin on the lack of relationship between bacterial count and barn scores is in about the same stage. Field studies on the practical application of the microscopical technique have been made during the year both in connection with the Sheffield Farms—Slawson—Decker Co., at Hobart, and locally, but these are not completed as yet.

#### BOTANICAL DEPARTMENT.

*Currant felt-rust and whitepine blister-rust.*—These two diseases are caused by the same fungus, *Cronartium ribicola*, in different stages of its life cycle. On account of repeated outbreaks of felt-rust on currants at Geneva unaccompanied, apparently, by the occurrence of blister-rust on pines in the vicinity, it was suspected that, contrary to accepted belief, the fungus may over-winter on currants. Experiments have been made which, it is believed, clear up this matter. Rusted currant plants were transplanted (after the leaves had fallen) into greenhouses and forced into growth during the winter. Since no trace of felt-rust appeared on the new leaves of any of the 500 plants in the experiments, the conclusion has been reached that *C. ribicola* rarely, if ever, over-winters on the currant. The subsequent discovery of two white pine trees affected with blister-rust makes it possible, now, to account for the outbreaks of currant felt-rust at Geneva without assuming that the fungus over-winters on currants. Details of the experiments have been published in Bulletin No. 374.

*Seed testing.*—During the year 1913, 292 official samples of seed were analyzed. Of these, 51, or 17.5 per ct., were violations of the law; that is, although containing over three per ct. of foreign seeds by count they were not so labeled when exposed for sale. The percentage of violations was somewhat smaller than in 1912 when it

was 20.8 per ct. Analyses were made, also, of 975 unofficial samples sent in by farmers and seed dealers. The analyses were reported in Bulletin No. 378.

*Potato-spraying experiments at Rush.*— Bulletin No. 379 contains an account of an extensive series of potato-spraying experiments conducted in the vicinity of Rush during the summer of 1913. In each of 66 fields a portion of one row 290.5 feet long was very thoroughly sprayed by hand every two weeks. At digging time the yield of this row was compared with that of an adjacent row which had not received the special spraying. In 47 fields no spraying was done by the owner. In these fields the test was a comparison between very thorough spraying and no spraying. In the other 19 fields more or less spraying was done by the owner. In these, the test was a comparison between very thorough spraying and the kind of spraying done by the owner.

In the 46 unsprayed fields the spraying done by the Station increased the average yield by 17.76 bushels per acre and in the 19 sprayed fields by 15.04 bushels per acre.

The season was a very dry one and there was no potato blight.

#### CHEMICAL DEPARTMENT.

*Inspection work.*— There have been published analyses of 480 commercial feeding stuffs and 1004 commercial fertilizers. A study of the data relating to fertilizers shows that the number of samples falling seriously below guaranty is small, the average of all analyses showing an excess of plant-food constituents over guaranty. High-grade fertilizers are shown to furnish plant-food constituents at less cost than low-grade fertilizers. Some defects are pointed out in the present fertilizer law, working against the interests of the purchasers of fertilizers, especially in case of unmixed materials containing a high percentage of plant-food. •

*Studies relating to the chemistry of milk.*— During the entire history of this Station, special attention has been given to some phase of dairy chemistry. The recent work has had for its purpose the clearing up of certain points in the chemistry of milk, some of which have a special relation to the use of milk in human nutrition and some of which are intimately connected with the fundamental processes of cheese-making. In the near future a bulletin will be issued bringing together all the chemical facts which have been worked out here and



showing their relation to the chemistry of the process of cheese-making. The publications of the past year treat of the following points: (a) Sodium citrate is often added with favorable results to milk used in feeding infants and invalids in certain diseased conditions, but no satisfactory explanation of the action has been known; it has been known only that sodium citrate delays the curdling action of milk when it is treated with rennet extract (rennin) and forms a curd of softer than normal consistency, the softness increasing with the amount of sodium citrate added until finally no curdling takes place when the citrate is added at the rate of 0.400 gram per 100 cubic centimeters of milk (equal to 1.7 grains of citrate per ounce of milk). Our work shows that at the point at which rennet extract fails to curdle milk we have a chemical change in the casein of the milk, the normal calcium caseinate of the milk being changed into a double salt, calcium-sodium caseinate, a compound which is changed by rennet extract into calcium-sodium paracaseinate and this latter compound, owing to the presence of sodium, is not curdled. (b) The cause of acidity in fresh milk has been attributed to both the casein and phosphates in milk. Our work shows that casein does not have any relation to the acidity of fresh milk but that the acidity is caused chiefly or solely by acid phosphates in solution. In determining the acidity of milk by titration with alkali, the presence of the soluble calcium salts interferes with the accuracy of the work. We find that this difficulty can be overcome by treating the milk with a saturated solution of neutral potassium oxalate (2 cubic centimeters per 100 cubic centimeters of milk) and thus removing the soluble calcium before determining acid with alkali. The acidity as determined by this method is found to be about half that previously reported by other investigators. (c) The phosphorus content of casein has been previously found to be 0.85 per ct., but our work shows former methods to be inaccurate; the true percentage is about 0.71. (d) The action of rennet extract (rennin) in curdling casein to form paracasein is shown to be a process of hydrolysis, one molecule of casein splitting into two molecules of paracasein. (e) There has been controversy over the composition of milk as to what constituents are in true solution. Investigation made here by improved methods shows that (1) sugar, citric acid or citrates, compounds containing chlorine, potassium and sodium are entirely in solution; (2) albumin, inorganic phosphates and compounds of calcium and magnesium are in part

in solution and in part in suspension or colloidal solution; and (3) fat and casein are wholly in suspension or colloidal solution.

ENTOMOLOGICAL DEPARTMENT.

*The cranberry toad-bug.*— Bulletin No. 377 contains an account of an investigation to determine the cause of a peculiar dying of the new growth of cranberry vines. Previous to this study the trouble was commonly ascribed to diseases known as “cranberry scald” and “cranberry rot.” At the initiation of the work it was soon discovered that the causal agent was not a fungus but an insect (*Phylloscelis atra* Germ.) of the family of Fulgoridae. The cranberry appears to be its sole host plant. If the insect attacks the new growth both branch and fruit are killed, but if it feeds on the old wood the berries and branches beyond the feeding point are shriveled and dwarfed. As a result of this injury the yield from certain varieties has been reduced to one-half or one-fourth of a normal crop.

There is but one brood of the insects during the year. The egg is elongate-oval in shape, with a short stalk at one end. The egg-laying period extends from September 1 to the middle of October. Hatching begins on June 25 to 30 of the following summer, and a few may not hatch until early in August. Nymphs usually group together to feed, and may live a long time on the same branch if not disturbed. The insect has five nymphal instars. The first adults appear about the first of August, the males maturing first.

The habits of the insect suggest two methods for the prevention of injuries: Flooding and spraying, which are discussed with considerable detail on the concluding pages of the bulletin.

*The cabbage maggot.*— The third contribution by this Station to the knowledge of this destructive pest is made in Bulletin No. 382, and deals especially with the activities of the maggot in relation to the growing of early cabbage.

Of the insecticides that are employed to destroy maggots about the roots of the plants, carbolic-acid emulsion has generally been regarded as the most efficient. Tests with the emulsion at recommended strengths have demonstrated that it will prevent the hatching of the eggs and is fatal to the younger stages of the larvæ. It may, however, cause injury to young seedlings and is not a safe remedy for the treatment of plants recently set in the field.

The value of tar pads, or hexagonal tar-paper collars, for the purpose of preventing the adult of the cabbage maggot from placing eggs about the stems of the plants has been previously demonstrated, but, in spite of its effectiveness, this method of protecting cabbage has not been generally adopted by truck growers. The tests herein described show that tar pads will protect early cabbage from the pest at a cost of about \$1.40 per thousand plants. Truck growers who are subject to losses by the cabbage maggot are urged to test the tar pads experimentally as a basis for more extensive operations against this pest.

*Susceptibility to spraying mixtures of hibernating pear psylla adults and their eggs.*— Bulletin No. 387 deals with investigations on the pear psylla to ascertain the susceptibilities of the hibernating adults and their eggs to spray mixtures. Studies of the seasonal history and habits of the insect showed that this pest passes the winter as an adult, or "fly", and that the creature deposits its eggs in the spring within a short period after its emergence from hibernating quarters.

The practice of clean culture and the removal and destruction of rough bark left the flies with few opportunities of escape from applications of contact mixtures. The best means of killing the flies is spraying during a period of warm weather, preferably in November or December, or during March or early in April. The most satisfactory mixture, from the standpoints of safety to fruit and leaf buds and effectiveness against the insect is three-fourths of a pint of tobacco extract (40 per ct. nicotine) in 100 gallons of water to which are added from three to five pounds of dissolved soap.

Eggs about to hatch and newly emerged nymphs proved also very vulnerable to an application of the lime-sulphur solution. By postponing the dormant treatment for the San Jose scale until the blossom cluster-buds are beginning to separate at the tips, very effective work can be done against the eggs. The lime-sulphur should be used in the proportion of one gallon of the concentrate, 32° B., to eight gallons of water.

*Tree crickets injurious to orchard and garden fruits.*— Bulletin No. 388 is a report of studies on various tree crickets, in which attention is directed especially to the more common and injurious species in plantings of garden and tree fruits in the State of New York. One of the most important forms is the snowy tree cricket (*Ecanthus*

*niveus* De Geer), which oviposits in a great variety of plants. In the region about Geneva eggs are most abundant in apple, plum and cherry, and they are somewhat common in raspberry and walnut. The eggs occur singly in soft, fleshy bark. On raspberry, oviposition takes place in the fleshy area at the side of the bud in the axils of the leaves, and usually there is not more than one egg on each side of a bud. This species subsists on a rather wide assortment of foods of animal and vegetable origin. In addition to other species of insects, microscopical examinations of crop contents have shown that the San Jose scale may, under certain conditions, form a large part of the diet of this cricket. It has also been observed to eat holes in raspberry and apple leaves, and is reputed to attack ripening fruits. This species derives its reputation as an orchard pest chiefly from the occurrence of diseased areas about oviposition wounds in the bark of apple trees. The areas of infection in their external appearances and effects resemble superficially certain stages of the common apple cankers. Cultural and microscopical studies indicate that during 1913 a fungus, *Leptosphaeria coniothyrium* (Fckl.) Sacc., was, in the majority of cases, the infecting organism.

The narrow-winged tree cricket (*E. angustipennis* Fitch.) has feeding habits quite similar to the foregoing species, and while common in apple orchards it has also been observed in considerable numbers on alders and scrub and burr oaks. Unlike the preceding species, the striped tree cricket (*E. nigricornis* Walker) prefers for the reception of its eggs plants which have a central pith surrounded by a woody outer layer. Among the plants preferred for oviposition are raspberries, which are sometimes seriously damaged. The injuries are due to slitting of the canes as a result of excessive deposition of eggs, which weakens a stalk so that it dies or breaks at the point of the wounded area from the weight of the foliage or as a result of a strong wind.

Tree crickets are amenable to standard orchard operations. Cultivation to destroy foreign vegetation, as weeds and brush in and about plantings of fruit, and to keep the ground about trees and vines clean is an efficient measure for the prevention of damages. While the susceptibility of these insects to arsenicals has not been conclusively demonstrated, it is believed that the numbers of the tree crickets are reduced by summer applications of these poisons. Raspberry canes showing extensive oviposition should be removed

in the course of winter or spring pruning and burned to destroy eggs contained in them.

*Cabbage aphis.*— This species of aphid, regarded as one of the principal enemies of cabbage, is the subject of Circular No. 30. This is a popular treatise, illustrated with two plates and two text figures, in which the different stages are described and figured and the seasonal history is discussed. The circular closes with a brief discussion of the merits of spraying mixtures and on the selection of a spraying machine for effective work against the pest.

#### HORTICULTURAL DEPARTMENT.

*Tillage and sod mulch in the Hitchings orchard.*—For ten years this Station has been comparing sod mulch and tillage in apple orchards. Bulletin No. 375 is a brief account of the experience in the Hitchings orchard, the most notable exception which proves the rule that tillage is the most profitable method for orchard culture under general conditions. From the work in this orchard the following conclusions were reached:

While unquestionably tillage is the best method of caring for the majority of the apple orchards in New York, yet there are particular places, soils and economic conditions under which the Hitchings method of sod-mulching apple trees may be used advantageously:

1st. Orchards on steep hillsides where land would wash badly under tillage may often well be kept in sod.

2nd. On land covered with rocks, trees may best stand in sod.

3rd. The Hitchings method is adapted only to soils having suitable depth. On shallow soils it will usually prove a failure.

4th. Soils must be retentive of moisture. On land that annually suffers from summer droughts the sod-mulch treatment will almost certainly prove less beneficial to trees than tillage.

5th. Economic conditions may decide the choice between tillage and some mulching treatment, since the cost of caring for an orchard is so much less under the Hitchings mode of mulching than by tillage. Thus a larger acreage in sod may be made to counter-balance a greater productiveness under tillage, thereby bringing the net income to the same level.

*A comparison of tillage and sod mulch in an apple orchard.*— Bulletin No. 383 is the third account of studies by the New York Agricultural Experiment Station to determine whether the apple thrives better

under tillage or in sod. The experiment of which this bulletin is a report was begun in 1903 in the orchard of W. D. Auchter near Rochester, New York. This orchard is far more typical than the Hitchings orchard of the apple-growing regions of New York, in both soil and climate, and the results obtained have much wider adaptability than those set forth in Bulletin No. 375. The conclusions reached were that not only should apples not be grown in sod but that for the best good of the trees there should be no sod near them. Grass militates against apple-growing in sod in several ways which act together, as:

- (1) Lowering the water supply.
- (2) Decreasing some elements in the food supply.
- (3) Reducing the amount of humus.
- (4) Lowering the temperature of the soil.
- (5) Diminishing the supply of air.
- (6) Affecting deleteriously the beneficial micro-flora.
- (7) Forming a toxic compound that affects the trees.

*Ten years' profits from an apple orchard.*— Bulletin No. 376 shows the outgo and the income from an apple orchard for a period of ten years. The orchard was one of Baldwin apples, ten acres in area, situated a few miles west of Rochester, known to many as the Auchter orchard, in which the Geneva Experiment Station has carried on a comparative test of sod mulch and tillage during the last ten years. The average yield of the orchard for the ten years was 79.2 barrels of barrelled stock per acre and 37.6 barrels of evaporator and cider stock. The cost sheet for a barrel of apples was as follows:

Interest on investment.....	\$0.21
Taxes.....	.012
Tilling.....	.063
Pruning.....	.03
Spraying.....	.096
Cover crop.....	.023
Superintending orchard.....	.25
Picking, packing, sorting and hauling.....	.244
Barrel.....	.36
	<hr/>
	\$1.29
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The average price received for the apples for the ten years was \$2.60 per barrel for all the barrelled stock sold and 72 cents per barrel for the evaporator and cider stock.

The balance sheet is as follows: Subtracting \$1.29, the cost of a barrel of apples, from \$2.60, the amount received, a net profit of \$1.31 per barrel remains for firsts and seconds. Multiplying by 79, the number of barrels per acre, gives \$103.49 as the profit per acre for firsts and seconds. Subtracting 72 cents from 93 cents, gives 21 cents as the difference between average cost of production and average selling price of culls. Multiplying 37.6, the number of barrels of culls per acre, by 21, gives a loss of \$7.89 per acre on the culls, leaving the average net profit per acre in this orchard for the past ten years \$95.60; add to this the \$25 interest on the investment and we have \$120.60 net, or 24.12 per ct. on \$500, as the annual ten-year return from this orchard and the money invested in it.

*New or noteworthy fruits.*—The New York Agricultural Experiment Station attempts to test all the new varieties of fruit which will grow in New York. The results of this work are published from time to time in the fruit books issued by the Station and in a series of bulletins entitled "New or Noteworthy Fruits." Bulletin No. 385 is the second of the serial reports on these fruit tests. Beside giving an account of several meritorious fruits it contains suggestions to buyers of fruit trees. The following fruits are recommended to fruit growers as worthy of test either for home use or for commercial purposes: King David apple, Edgemont peach, Abbessé D'Oignies cherry, French plum, Hicks grape, Chautauqua gooseberry, Chautauqua currant and the Indiana and Barrymore strawberries.

*Distribution of Station apples.*—Circular No. 28 describes twelve new varieties of apples for distribution in 1914. These varieties are the outcome of experimental work in plant breeding. They have been grown and compared with practically all of the standard sorts of their kind and are equal or superior in one or more respects to apples of their season, as grown on the Station grounds. The distribution of these varieties is undertaken that their value and adaptability in the different fruit regions of New York may be ascertained. A fuller description of most of the varieties listed has been published in Bulletin No. 350 from this Station.

*Culture of sweet corn.*—A brief treatise on the culture of sweet corn is given in Circular No. 29, in which the needs of the plant as

to climate, soil and fertilizer are discussed, together with cultural operations and the selection and care of seeds.

*Strawberries.*—Circular No. 31 discusses the culture of the strawberry. In it may be found a consideration of the following topics having reference to this fruit: Location and soil; preparation of the soil; manures and fertilizers; sex of plants; selection of plants; time of planting; systems of planting; setting the plants; management of the plantation; pests and their control; harvesting and marketing; and a description of the best varieties for New York.

*Currants.*—The culture of the currant, covering essentially the same topics as those discussed in the circular on the strawberry, is presented in Circular No. 32.

#### PUBLICATIONS ISSUED DURING 1914.

##### BULLETINS.

No. 373. February. A comparison of the microscopical method and the plate method of counting bacteria in milk. James D. Brew. Pages 38, colored plates 2, figures 2.

Popular edition (with No. 380), pages 15, colored plates, 2.

No. 374. February. Does *Cronartium ribicola* over-winter on the currant? F. C. Stewart and W. H. Rankin. Pages 15, plates 3, map 1.

Popular edition, pages 4.

No. 375. March. Tillage and sod mulch in the Hitchings orchard. U. P. Hedrick. Pages 28, plates 7.

Popular edition, pages 8.

No. 376. March. Ten years' profits from an apple orchard. U. P. Hedrick. Pages 12, plate 1.

No popular edition issued.

No. 377. March. The cranberry toad-bug. F. A. Sirmine and B. B. Fulton. Pages 24, plates 8, figures 4.

No popular edition issued.

No. 378. March. Seed tests made at the Station during 1913. M. T. Munn. Pages 27.

Popular edition, pages 4.

No. 379. March. Potato-spraying experiments at Rush in 1913. F. C. Stewart. Pages 9.

Popular edition, pages 4.

No. 380. March. Cells in milk derived from the udder. Robert S. Breed. Pages 64.

Popular edition (with No. 373), pages 15, colored plates 2.

No. 381. March. A test of commercial fertilizers for grapes. U. P. Hedrick and F. E. Gladwin. Pages 32, plate 1.

Popular edition, pages 8.

No. 382. April. The cabbage maggot in relation to the growing of early cabbage. W. J. Schoene. Pages 19, plates 6, figures 5.

Popular edition, pages 12, plates 2, figures 5.

No. 383. April. A comparison of tillage and sod mulch in an apple orchard. U. P. Hedrick. Pages 35, plates 6, diagram 1.

Popular edition, pages 7.

No. 384. April. Analyses of materials sold as insecticides and fungicides. Page 22. No popular edition issued.



- No. 385. April. New or noteworthy fruits, II. U. P. Hedrick. Pages 12, colored plates 4.  
 No popular edition issued.
- No. 386. May. Inspection of feeding-stuffs. Pages 72.  
 No popular edition issued.
- No. 387. May. Susceptibility to spraying mixtures of hibernating pear-*psylla* adults and their eggs. H. E. Hodgkiss. Pages 32, plates 3, figures 2.  
 Popular edition, pages 10, plates 1, figures 4.
- No. 388. May. Tree crickets injurious to orchard and garden fruits. P. J. Parrott and B. B. Fulton. Pages 47, plates 10, figures 9.  
 Popular edition, pages 8, plates 4, figures 2.
- No. 389. July. Dead-arm disease of grapes. Donald Reddick. Pages 30, plates 6, figures 8.  
 Popular edition, pages 4, plates 2.
- No. 390. October. Report of analyses of samples of commercial fertilizers collected by the Commissioner of Agriculture during 1914. Pages 96.  
 No popular edition issued.
- No. 391. December. Ringing fruit trees. G. H. Howe. Pages 12, plate 1.  
 Popular edition, pages 4.
- No. 392. December. Some facts about commercial fertilizers in New York State. L. L. Van Slyke. Pages 43.  
 Popular edition, pages 8.
- No. 393. December. Director's report for 1914. W. H. Jordan. Pages 33.  
 No popular edition issued.

#### TECHNICAL BULLETINS.

- No. 32. January. A contribution to the chemistry of phytin. R. J. Anderson. Pages 44.
- No. 33. February. Preparation, composition and property of caseinates of magnesium. Lucius L. Van Slyke and Orrin B. Winter. Pages 7.
- No. 34. May. I. Why sodium citrate prevents curdling of milk by rennin. Alfred W. Bosworth and Lucius L. Van Slyke. II. The use of sodium citrate for the determination of reverted phosphoric acid. Alfred W. Bosworth. Pages 12.
- No. 35. July. Bacteria of frozen soil. H. Joel Conn. Pages 20.
- No. 36. July. Organic phosphoric acids of wheat bran. R. J. Anderson.
- No. 37. December. Studies relating to the chemistry of milk and casein. Lucius L. Van Slyke and Alfred W. Bosworth. Pages 11.
- No. 38. November. Culture media for use in the plate method of counting soil bacteria. H. Joel Conn. Pages 34.
- No. 39. December. Condition of casein and salts in milk. Lucius L. Van Slyke and Alfred W. Bosworth. Pages 16.

#### CIRCULARS.

- No. 26. January 12. The use of commercial fertilizers. J. F. Barker. Pages 20.
- No. 27. January 20. Ground limestone for soil improvement. J. F. Barker. Pages 14.
- No. 28. March 9. Distribution of Station apples. U. P. Hedrick. Pages 3.
- No. 29. May 10. Culture of sweet corn. J. W. Wellington. Pages 3.
- No. 30. June 15. The cabbage aphid. P. J. Parrott and B. B. Fulton. Pages 4, plates 2, figures 2.
- No. 31. November 15. Strawberries. O. M. Taylor. Pages 10.
- No. 32. November 20. Currants. O. M. Taylor. Pages 7.

GENEVA, N. Y., December 31, 1914.

Respectfully submitted,

W. H. JORDAN,  
*Director.*