TWENTY-FIRST ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

ALABAMA POLYTECHNIC INSTITUTE

AUBURN, ALABAMA

JANUARY 31, 1909

OPELIKA, ALA:
THE POST PUBLISHING COMPANY
1909

ALABAMA POLYTECHNIC INSTITUTE.

Auburn, Ala., Jan. 31, 1909.

GOVERNOR B. B. COMER,

Executive Department,

Montgomery, Ala.—

SIR:—I have the honor herewith, to transmit to you the Twenty-first Annual Report of the Agricultural Experiment Station of this College.

The report of the Treasurer, herewith included, is for the fiscal year ending June 30, 1908.

This report is made in accordance with the provisions of the act of Congress (approved March 2, 1887), establishing Agricultural Experiment Stations in the several States and Territories.

It contains the report of the Director, the Chemist, the Veterinarian, the Agriculturist, the Biologist, the Horticulturist, the Entomologist, and the Professor of Animal Industry, for the year ending December 31, 1908.

Respectfully,
CHAS. C. THACH.
President.

AGRICULTURAL EXPERIMENT STATION.

TRUSTEES.

His Excellency, B. B. Comer, President.....Ex-Officio.
H. C. Gunnels, Superintendent of Education.....Ex-Officio.
R. F. Ligon, Jr ..... Montgomery, Ala.
Tancred Betts .....Huntsville, Ala.
Wm. C. Davis .....Jasper, Ala.
A. W. Bell ..... Anniston, Ala.
N. D. Denson ..... LaFayette, Ala.
W. F. Feagin ..... Montgomery, Ala.
H. L. Martin .....Ozark, Ala.
W. K. Terry ..... Birmingham, Ala.
J. S. Frazer .....Mobile, Ala.
R. B. Barnes ..... Opelika, Ala.

STATION COUNCIL.

Chas. C. Thach, M. A., LL. D.....President
J. F. Duggar, M. S.....Director and Agriculturist
B. B. Ross, M. S.....Chemist
C. A. Cary, D. V. M., B. S.....
.....Veterinarian and Director Farmers' Institutes
J. T. Anderson, Ph. D.....
.....Chemist in Charge of Soil and Crop Investigation
R. S. Mackintosh, B. Agr.....Horticulturist
W. E. Hinds, Ph. D.....Entomologist
F. E. Lloyd, A. M.....Plant Physiologist and Pathologist
C. L. Hare, M. S. M A.....Physiological Chemist
D. T. Gray, M. S.....Animal Industry
A. M. Ransom, M. S., M. A.....Associate Chemist

ASSISTANTS.

L. N. Duncan, M. S.....Assistant Agriculturist
Thos. Bragg, M. S.....Assistant Chemist
E. F. Cauthen, B. S.....Superintendent of Farm and Recorder
J. W. Ridgway, B. S.....Assistant in Animal Industry
P. F. Williams, B. S.....Assistant in Horticulture
N. E. Bell, B. S.....Assistant in Chemistry
I. S McAdory, B. S., D. V. M.....Assistant in Veterinary Science
L. E. Case, D. V. M.....Assistant in Veterinary Science
W. F. Turner, B. S.....Assistant in Entomology

REPORT OF HATCH AND ADAMS FUND FOR 1907-1908.

RECEIPTS.

	Hatch.	*Adams.*
To amount from U. S. Treasury	$15000.00	$9000.00

DISBURSEMENTS.

By Salaries	$7602.14	$5565.84
By labor	1549.59	538.33
By publications	1402.70	
By postage and stationery	294.33	84.07
By freight and express	318.04	81.84
By heat, light, and water	363.64	28.60
By chemical supplies	637.97	40.39
By seeds, plants, and sundry supplies	810.03	477.30
By Fertilizers	624.07	30.20
By Feeding stuffs	73.14	97.90
By library	634.85	26.44
By tools, implements, and machinery	132.79	1.60
By furniture and fixtures	14.60	60.50
By scientific apparatus	100.37	1288.06
By live stock		18.60
By traveling expenses	31.47	345.59
By contingent expenses	15.00	
By building and repairs	395.22	314.74
Total	$15000.00	$9000.00

STATE OF ALABAMA,
Lee County

Personally appeared before me, Welborn Jones, a Notary Public in and for said county, M. A. Glenn, known to me as Treasurer of the A. P. Institute of Alabama who being duly sworn, deposes and says that the above and foregoing account is true and correct.

Witness my hand this 10th day of February, 1909.

(Seal) WELBORN JONES,
Notary Public.

This is to certify that I have compared the account with the ledger account of the Treasurer, and this is a correct transcript of the same.

C. C. THACH,
President A. P. Institute.

REPORT OF DIRECTOR AND AGRICULTURIST.

J. F. DUGGAR.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I respectfully submit the following report for the past year of the work under my charge as Director and Agriculturist of the Alabama Experiment Station.

PUBLICATIONS.

Within the past twelve months two bulletins, one circular, two press bulletins, and one annual report have been issued. Two other bulletins are in course of preparation. The titles and authors of the publications of the past year are listed below:

Bulletin No. 142, Corn Breeding in Alabama; by the Botanist.

Bulletin No. 143, Feeds Supplementary to Corn for Southern Pork Production; by the Chief and Assistant in Animal Industry and the Director.

Circular No. 2, Cedar Apples and Apple Leaf Rust; by the Assistant Botanist.

Press Bulletin No. 32, Tests of Varieties of Corn, (1907); by the Director and the Assistant Agriculturist.

Press Bulletin No. 33, Tests of Varieties of Corn, (1908); by the Director and the Assistant Agriculturist.

The mailing list now contains about 18,000 names, and it has been entirely re-arranged preparatory to the introduction of a new mailing system.

I stated in my last report that a large per cent. of the bulletins of the Alabama Experiment Station were then either completely or practically out of print.

STAFF.

The following changes in the staff have occurred during the past year:

In July 1908, Dr. E. M. Wilcox resigned as Botanist to accept a position in the University of Nebraska. After an interim Professor F. E. Lloyd was appointed as his successor.

In October, 1908, R. E. Stone resigned to accept a promotion in another institution.

In the Agricultural Department, C. M. Floyd resigned July 1, 1908, to engage in private work. His successor is Mr. E. F. Cauthen, who is also charged with the duties of Recorder. The position of Farm Foreman was created, and filled by the appointment of W. A. Wood.

In Entomology, the position of Assistant Entomologist was created, and filled by the appointment of W. F. Turner.

In the Veterinary Department Dr. Ward Giltner resigned to accept another position, and his successors are I. S. McAdory and L. E. Case.

The separate reports of the heads of departments make it necessary to mention in detail only the work of the Agricultural Department.

Agricultural Department.

The work in this Department has been largely a continuation of field experiments begun several years ago, so that conclusions may be based on the results of a number of years.

In cotton breeding, extensive plant-to-row tests have been made with the variety Cook Improved, and selection of plants for a continuation of the experiment is made annually from the best of the hundred rows, and from the best plants on each of these best rows. The aim is not only to improve the yield and quality of the variety, but also to ascertain what qualities can be combined with other desirable characters, so as to establish additional principles of plant breeding that may be followed in most rapidly improving the cotton plant. A large number of crosses between the most promising varieties have been made with a view to uniting in certain of the offspring the good qualities of both parents.

Considerable information has been gained as to the best method to employ in the manipulation connected with cotton breeding. Investigation in cotton breeding has required the separate ginning of more than 400 samples of cotton and the making of several thousand weighings. Notable improvement has already been effected in some of the qualities desired, but several years longer will probably pass before all undesirable qualities can be eliminated and the new strains made entirely stable and uniform.

Progress has been made in corn breeding, not only with reference to improving the varieties employed, but also in a fundamental study of correlation of characters in the corn plant, as a means of pointing plant breeders in the future to the best means of improving any variety.

In the breeding of oats, the crop now growing represents the third generation of pedigreed seed, all from the best individual plants among several thousands of plants grown under absolutely uniform conditions as to space, fertilization, etc. Not until there shall occur one or more winters severe enough to kill all but the hardiest of the plants, will we be able to make the final selection of the best strains, which should combine extreme hardiness with the productiveness and other good qualities which are now being improved. Special additional experiments are being made to increase resistance to winter killing, but the success of these latter experiments cannot be determined until a severe winter again occurs.

In addition to plant breeding, some of the most important lines of experiments in progress during the year 1908 in the Agricultural Department are the following:

Cotton, local fertilizer experiments.
Cotton, continuation of the study of varieties.
Cotton, shedding.
Cotton and corn, relative fertilizer requirements.
Corn, variety and fertilizer experiments.
Oats, variety and culture experiments.
Crimson clover, fertilizer value.

Cowpeas, variety tests.

Sorghum, variety tests.

Relative amounts of food produced by various crops suitable for hogs.

Various forage plants, alfalfa, vetches, clovers, and grasses.

Rotation of crops.

Experiments in the manufacture on the farm of drain tile.

Effects of lime on acid soils, using a number of crops.

Comparison of cotton seed meal, cotton seed, stable manure, nitrate of soda, sulphate of ammonia, and calcium cyanamid, as fertilizers for Johnson grass and alfalfa.

Co-operative experiments with the U. S. Department of Agriculture to determine the relative values of crimson clover and vetch on a number of different soils.

Respectfully submitted,

J. F. DUGGAR,

Director and Agriculturist.

REPORT OF VETERINARIAN.

C. A. CARY.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—The following is a brief report of the work of the Veterinary Department for the year of 1908:

The work on the life-history and habits of the cattle tick is being continued by Mr. W. M. Lewallen, an agent of the Bureau of Animal Industry. Such work should cover a period of several years in order to obtain an accurate average under the climatic variations of the different years. Since the work of tick eradication in Alabama is now in operation by the State and Federal authorities, the work on the character, habits, and life-history of the cattle tick will be of great practical value in the efficiency and rapidity of cattle tick eradication.

The work on the toxic effects of cotton seed meal on hogs and the pathological changes in the organs accompanying or following the feeding of cotton seed or cotton seed meal to hogs, has been continued. In this work we are always on the lookout for the cause of death, the toxic material. It is surprising to see that not a few persons print articles claiming that cotton seed meal will not kill pigs or hogs when a number of the experiment stations have proven that it will.

The study of the milk flora, the udder flora, and of the pathological changes and etiology of disease of the udder is being continued. Much of this work requires time and we can not expect to obtain great results in one or two years. However, we believe the results will justify the cost in time, labor, and other expenses in pursuing these researches.

Observation and records on the sanitary conditions of farms and farm homes and premises are being made with the aim in view of publishing a bulletin on Farm Sanitation in Alabama.

Our search for the cause of big-head (Osteo-porosis) in horses and mules has not been relinquished. We are satisfied that it is far more common and produces a greater loss of mules and horses than the average man recognizes. But as long as its cause remains unknown, the means of prevention and cure will be uncertain.

We are still collecting animal parasites of farm animals and at a future date we shall publish a complete list of our collection.

When possible, we have rendered aid to all cities in Alabama that have a system of meat and milk inspection and have consulted with the authorities of towns and cities that are preparing to institute meat and milk inspection.

Our records of other infectious diseases are giving us a knowledge of the prevalent diseases of the state. A study of these records points to several new lines for original research work.

During the year, hog cholera has been more common in Alabama than usual. This suggests that the immunizing method developed by the workers in the Bureau of Animal Industry should be employed in Alabama. This immunization process will be put into operation when the state can furnish the necessary funds.

The following is a summary of the Farmers' Institutes for 1908:

Number of institutes	17
Number of counties visited	17
Number of sessions	33
Total attendance at all sessions	3625
Average attendance at each session	110

The Summer School or Round-up Farmers' Institute was held at Auburn, July 29 to August 5, 1908. The total enrolled attendance was 599 which was 88 more than the en-

rollment for the previous year. Farmers from 35 Alabama counties and from several other states were in attendance. The interest was beyond our most sanguine expectations. The farmers attended lectures from 8 a. m. to 10 p. m. every day. All of this was done at a minimum expense.

Respectfully submitted,

C. A. CARY,
Veterinarian.

REPORT OF THE CHEMIST.

B. B. Ross.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

Sir:—The work of the Chemical Department of the Experiment Station for the past year has embraced work carried on under the provisions of the original Hatch Act, investigations conducted under authority of the Adams Act, and inspection work performed under the requirements of State laws, while, in addition, a considerable amount of miscellaneous analytical work has been done.

The essential features of the work being carried out under the provisions of the Hatch and Adams Acts are given in the reports submitted by Dr. J. T. Anderson and Prof. C. L. Hare, and in addition to work accomplished upon the projects outlined by them, the usual amount of routine work has been done in connection with analyses of feeds and forage materials and other farm products.

Some introductory work has been done in connection with a study of the question of the feasibility of the production of industrial alcohol from some of the starchy and saccharine products of the State, and a representative of this department visited Washington during the progress of the experiments of the United States Department of Agriculture in the demonstration plant operated by that department for the purpose of showing the possibilities of producing alcohol from various agricultural products.

Among the farm products of Alabama which appear to be the most promising raw materials for use in the manufacture of alcohol may be mentioned the sweet potato and cassava, while still other materials from which alcohol is largely produced elsewhere, viz, corn, Irish potatoes, etc., can, of course, be successfully grown upon a large scale in this section.

The cost of an experimental plant, including distillation apparatus, would be too great to permit of the installation of a complete outfit in this department, and so the work projected in connection with the investigation of this subject will for awhile, at least, be confined to the hydrolysis of the various starchy materials employed, and to the fermentation of the saccharified product with a view to ascertaining what yield of alcohol can be secured.

The fertilizer work of the past season included analyses of more than 1,000 samples of fertilizers, and as all of these analyses are made in duplicate, the total work of the season was equivalent to more than 2,000 analyses. The results of these analyses were reported as usual in the annual fertilizer bulletin issued by the State Department of Agriculture, and a discussion of the composition, properties and sources of the fertilizing materials consumed in the State was also included in the same bulletin.

In addition to fertilizer work referred to, there were performed in this laboratory analyses of a large number of specimens of miscellaneous materials sent in from different portions of the State, including soils, marls, ores, waters, feed stuffs, phosphate rock, etc.

Very respectfully,

B. B. ROSS, Chemist.

REPORT OF CHEMIST OF SOILS AND CROP INVESTIGATIONS.

J. T. ANDERSON.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I respectfully submit the following report as Chemist of Soils and Crop Investigations for the year 1908:

The work is a continuation of that given in former report and is divided into two projects, one under the Hatch, and the other under the Adams Fund.

Hatch Project.—These investigations are conducted in clay cylinders imbedded in the ground and have for their purpose the determination of the effect of the humification of such nitrogenous substances as cow manure, peavine hay, cotton seed, and cotton seed meal, in rendering insoluble phosphoric acid available to growing plants. The details of the investigation have been given in a former report and need not be repeated here. The work has not progressed far enough to justify the publication of the results.

Adams Project.—The purpose here is to ascertain whether the analysis of the plant may not be used as a means of determining the fertilizer requirements of the soil in which the plant has grown. For the present the investigations are limited to the cotton plant and to a single constituent. The plan involves the analysis of a large number of plants at different stages of growth and under a variety of soil conditions, in plots in the open field, in wire baskets and in clean sand in cylinders imbedded in the ground. A study of the data thus obtained, it is believed, will furnish criteria for forming a reasonbaly accurate estimate of the fertilizer needs of the soil. At the close of

another season, it is expected that the first installment of the accumulated results will be ready for publication.

In conclusion, it is proper to state that about five months of the years is required for official fertilizer work. The Assistant in this division gives his entire time to Experiment Station work.

Respectfully submitted,

JAMES T. ANDERSON.

REPORT OF CHEMIST.

C. L. HARE.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I have the honor to submit herewith report of work during the year ending Dec. 31, 1908:

The first portion of the year, continuing to August 1st, was devoted almost exclusively to analytical work in connection with the State fertilizer contract.

The latter portion of the year was given to investigation of the following subjects:

1.—The influence of different feeds upon the chemical and physical characters of the fat of hogs.

Awakening interest in pork production in this State gives promise of a future extensive market for this product in the State.

Furthermore, in view of the fact that the soils of the State may be made to produce so great a variety of food products which may be profitably used in pork production, it becomes imperative that the farmer know the influence of the different feeds upon the quality of the pork.

This problem is being studied by this Department through the examination of many samples of lard furnished by the Department of Animal Industry of the College.

Much information of practical and scientific value is being collected and it is believed that the final results will prove of wide value to pork producers.

2.—This Department is at present conducting a series of experiments having in view the isolation and identification of the supposed toxic principle in cotton seed meal.

3.—The third line of investigation undertaken is the problem of increasing, by contracted breeding, the oil con-

tent of cotton seed. An increase of only two or three per cent. of the total amount of cotton oil produced in the State would mean a very material increase in the farm values of the State.

If this can be done and at the same time the quality and yield of the staple be maintained the result should be of great practical benefit to the agricultural interests of the State.

Progress on each of the above lines of investigation is slow for the reason that they cannot receive the undivided attention which the importance of each demands for most successful pursuit.

It is believed, however, that useful information on each subject is being secured.

Respectfully submitted,

C. L. HARE.

REPORT OF HORTICULTURIST.

R. S. MACKINTOSH.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—I respectfully submit the following report of the year 1908. The work in this Department for the year has been along the same lines as in the past. The fruit crop was only an average and very few of our new varieties fruited. The test of cotton seed in heating hotbeds in comparison with horse manure was continued.

Several varieties of citranges fruited for the first time. We hope to set out a large number of the new varieties developed by the U. S. Department of Agriculture. I believe this fruit is destined to become very important in this section and that we should aid its advance as much as we can.

The site selected for the agricultural building on the horticultural grounds means that our work will have to be rearranged during the coming year. A part of the apple orchard will have to be removed in order to make the approach to the building attractive. The new greenhouses for the horticultural department will aid very much in conducting experiments, both with winter vegetables and flowers and in the breeding of peaches.

The nurseries in the state have been inspected as in the past and this work has been done by Mr. P. F. Williams, of this Department and W. F. Turner, of the Department of Entomology. A list of the certificates granted this year follows:

ALABAMA CERTIFICATES.

1. Huntsville Wholesale Nurseries, Huntsville.
2. Fraser Nursery Company, Huntsville.

3. J. O. Kelly & Sons, Jeff.
4. Oak Lawn Nursery, Huntsville.
5. Chase Nursery Company, Huntsville.
6. Rolfe Nursery Company, Huntsville.
7. A. E. Welch, Madison.
8. C. A. Hughes, Getup.
9. Fort Payne Nursery & Orchard Company, Fort Payne.
10. J. P. Jones & Company, Fabius.
11. C. S. Biggers-Joppa Nursery, Joppa.
12. Orchard Hill Nursery, Cullman.
13. J. H. Parker, Vinemont.
14. Gravlee Nursery Company, Newtonville.
15. Waverly Nursery, Paul Hoffman, Prop., Waverly.
16. W. G. Joiner, Ashland.
17. W. L. Owen, Ashland.
18. Magnolia Heights Nursery, St. Elmore.
19. Little Gem Floral Gardens, Mobile.
20. Industrial School Gardens, Mobile.
21. W. F. Probst, Oakman.
22. Cullman County Nursery, Hanceville.
23. C. H. Kennedy-Arley Nursery, Arley.
24. A. E. O'Barr Nursery Company, Odenville.
25. J. J. Waldrep, Roanoke, Route 4.
26. Kent & Slay, Buffalo.
27. F. E. Welch, Rose View Nursery, Chunchula.
28. J. M. Joiner, Wedowee.
29. Colmant Nursery, Birmingham.
30. W. L. Morris, LaFayette.
31. S. B. Stern & Company-Fernhill Greenhouses, Montgomery.
32. Rosemont Gardens, Montgomery.
33. Elkdale Greenhouse Company, Selma.
34. Eagle Pecan Company, Pittsview.
35. G. W. Lipp, Roanoke.
36. Carlos Reese, Birmingham.
37. J. B. Earnest, Roanoke.
38. Alabama Nursery Company, Huntsville.
39. J. C. Edwards, Opelika.
40. John C. Carter, Montgomery.

NURSERYMEN OUTSIDE OF STATE.

1. Southern Nursery Company, Winchester, Tenn.
2. The Storrs & Harrison Company, Painsville, Ohio.
3. A. C. Oelschig & Sons, Savannah, Ga.
4. H. M. Simpson & Sons, Knox Nurseries, Vincennes, Ind.
5. P. J. Berckmans Company, Augusta, Georgia.

6. W. W. Harper, Andorra Nurseries, Philadelphia, Pa.
7. J. Van Lindley Nursery Company, Pomona & Kernersville, N. C.
8. J. H. Boyd, McMinnville, Tenn.
9. Shenandoah Nurseries, D. S. Lake, Prop., Shenandoah. Iowa.
10. Giles County Nursery Company, Pulaski, Tenn.
11. Hoopes Brothers & Thomas Company Company West Chester, Pa.
12. Cedar Hill Nursery & Orchard Co., Winchester, Pa.
13. Jackson & Perkins, Newark, N. Y.
14. George S. Josselyn, Fredonia, N. Y.
15. Chase Brothers Company, Rochester, N. Y.
16. T. S. Hubbard Company, Fredonia, N. Y.
17. Ellwanger & Barry, Rochester, N. Y.
18. McElveen & McLendon, Pike County Nurseries, Concord, Ga.
19. G. H. Miller & Son, Excelsior Nurseries, Rome, Ga.
20. Thos Meehan & Sons, Germantown, Pa.
21. Will A. Vick Nursery Company, Murfreesboro, Tenn.
22. Smith Brothers, Concord, Ga.
23. M. L. Spivey, Lynnville, Tenn.
24. J. G. Harrison & Sons, Berlin, Md.
25. W. N. Scarff, New Carlisle, Ohio.
26. Henry A. Dreer, Inc., Dreer Nurseries, Riverton, N. J.
27. Thomas Meehan & Sons, Dresher, Pa.
28. Peter Henderson & Company, Jersey City, N. J.
29. Joe Shadow Nursery Company, Winchester, Pa.
30. Donaldson Company, Willadean Nurseries, Warshaw, Ky.
31. Stark Brothers' Nursery & Orchard Company, Louisiana, Mo.
32. T. V. Munson & Son, Denison, Texas.
33. Knoxville Nursery Company, Knoxville, Tenn.
34. Blanche Nursery Company, Blanche, Tenn.
35. W. W. Twitty & Sons, Blanche, Tenn.
36. T. J. Anderson, Temple Nursery, Bremen, Ga., Route 2.
37. James Cureton, Austell, Ga.
38. Pecan Grove Farm Nursery, J. B. Wright, Prop., Cario, Ga.
39. H. C. & F. M. Hatten, Gem Nursery, New Carlisle, Ohio.
40. Valdesian Nurseries, Bostic, N. C.
41. Continental Plant Company, Kittrell, N. C.
42. H. G. Hastings & Co., Atlanta, Ga., Kittrell, N. C.
43. Alexander Seed Co., Augusta, Ga., Kittrell, N. C.
44. Heikes-Biloxi Nursery Company, Biloxi, Miss.
45. Keltonburg Nursery, Smithville, Tenn., Route 2.
46. The Nut Nursery Company, Monticello, Fla.
47. William H. Moon Company, Morrisville, Pa.

48. W. T. Hood & Company, Richmond, Va.
49. United States Nursery Company, Rich, Miss.
50. Redman Brothers, Smithville, Route 2, Tenn.
51. George A. Sweet, Dansville, N. Y.
52. Lewis Roesch & Son, Fredonia, N. Y.
53. Easterly Nursery Company, Cleveland, Tenn.
54. The G. M. Bacon Pecan Company, DeWitt, Ga.
55. Tennessee Wholesale Nurseries, Winchester, Tenn.
56. Franklin Davis Nursery Co., Mullikin, Maryland.
57. Summit Nurseries, Monticello, Florida.
58. Chattanooga Nurseries, Chattanooga, Tenn.
59. The Gardner Nursery Co., Osage, Iowa.
60. New Fruit Nursery Co., Smithville, Tenn., Route 5.
61. Smithville Nursery Company, Moore & Hicks, Smithville, Tenn.
62. Carl Sonderegger, The German Nurseries, Beatrice, Neb.
63. J. H. Gircardeau, Jr., Arcadia Nurseries, Monticello, Fla.,
64. Wild Brothers Nursery Company, Sarcoxie, Missouri.
65. J. H. Skinner & Company, Topeka, Kansas.
66. Union Nursery Company, Smithville, Tenn.
67. Glenn Cliff Nursery, Winchester, Tenn.
68. B. P. Wagner, Wagner Park Conservatories, Sidney, Ohio.
69. W. W. Thomas, Anna, Illinois.
70. Commercial Nursery Company, Winchester, Tenn,, Route 2.
71. Murrell Nursery Company, Cabot, Arkansas.
72. Barber-Frink Company, Macclenny, Florida.
73. Estes Brothers, Caney Fork Nursery Co., Smithville, Tenn.
74. Griffing Brothers Co., Pomona Nurseries, Macclenny, Fla.
75. Will Halliday, Deckerd, Tenn.
76. A. D. Williams, Yatesville, Ga.
77. Ramsey Pecan Company, Ocean Springs, Miss.
78. S. W. Peek, Hartwell, Ga.
79. Tullahoma Nursery & Orchard Co., Tullahoma, Tenn.
80. Biltmore Nurseries, Biltmore, N. C.
81. Glen Saint Mary Nurseries Co., Glen Saint Mary, Fla.
82. James Vaughn & Sons, Smithville, Tenn.
83. Mt. Olive Nursery Co., Smithville, Tenn., Route 2.
84. B. W. Stone & Co., Thomasville, Ga.
85. J. B. Westbrook, Bremen, Ga.
86. J. G. Justice, Jackson County Nursery , Jefferson, Ga.
87. Columbia Nurseries, P. B. Simmons, Prop., Gainesville, Ga.
88. The J. Steckler Seed Co., Ltd., New Orleans, La.
89. Cumberland Mountain Nursery Co., Smithville, Tenn.
90. Pure Fountain Nursery, Smithville, Tenn., Route 1.
91. Bobbink & Atkins Nurseries, Rutherford, N. J.
92. John Lightfoot, East Chattanooga, Tenn.

93. Stinson Nursery Company, Meridian, Miss.
94. C. Forkert, Ocean Springs, Miss.
95. J. W. Adams & Co., Springfield, Mass.
96 Mount Arbor Nurseries, E. S. Welch, Prop., Shenandoah, Iowa.
97. James A. Bear's Pecan Nurseries, Palatka, Fla.
98. Missing Link Apple Co., Clayton, Ill.
99. George H. Mellen Co., Springfield, Ohio.
100. Ocean Springs Pecan Co., Ocean Springs, Miss.
101. F. W. Dixon, Holton, Kansas.
102. Sneed's Wholesale & Retail Nurseries, Tyler, Texas.
103. Peachwood Nurseries, State Line, Miss.
104. Bechtel Pecan Nurseries, Ocean Springs, Miss.
105. George H. Peterson, Fair Lawn, N. J.
106. Southern Floral Nursery Co., Waynesboro, Miss.
107. Lake View Nursery, Sheridan, N. Y.
108. Phoenix Nursery Co, Bloomington, Ill.
109. Newton Nursery Co., Newton, Miss.
110. Charles P. Turner, Carrollton, Georgia.
111. Southern Nut Nursery Co., Ocean Springs, Miss.
112. Gillgrove Pecan Nurseries, Albany, Georgia.
113. W. W. Wallace, Harriman, Florida.
114. Livingston Seed Co., Columbus, Ohio.

DEALERS' CERTIFICATES.

1. J. M. Schoggins, Ashland.
2. A. M. Preston & Son, Cullman.
3. W. F. Propst, Oakman.
4. C. R. Long, Andalusia.
5. J. M. Colmant, Birmingham.
6. M. M. Dawson, Montgomery.
7. John B. Stroud, Mobile.
8. J. J. Holmes, Montgomery.
9. Jodson Strock, Clanton.
10. Orchardists' Supply Co., Huntsville.
11. Homer N. Sneed, Pronto, Ala.
12. A. Swift, Fairhope, Ala.
13. G. W. DeVaugn, Prichard, Ala.

Respectfully submitted,

R. S. MACKINTOSH,

Horticulturist.

REPORT OF ENTOMOLOGIST.

W. E. HINDS.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

SIR:—The following is a brief and partial report of the work of the Department of Entomology during the year 1908:

The work of the department has grown steadily during the past year. In line with the general development of the work, Mr. W. F. Turner has been engaged as Assistant Entomologist beginning his duties July 1st, 1908. Since that time he has been engaged in the inspection of nurseries, in routine station work, and in special Adams Fund investigations. At present it does not seem advisable to attempt the development of the usual lines of station work, although this is unquestionably much needed by the agricultural and horticultural interests of the State. With increased facilities it is certain that a large amount of good might be done, particularly in an educational way, in familiarizing the planters with their most important insect pests, and proper methods for their control. It is needless to say that such work is worth many times its cost. Any further investment in the facilities of the department must be considered as certain to result in a net return of several hundred per cent. in the prevention of damage and in the ultimate profits secured to the agricultural and horticultural interests of the State. In the new agricultural building now under construction provision is being made for this department in four rooms, with a green house nearby. This arrangement will be of great aid in future work.

General Station Work:—For several important reasons the principal effort of the department has been centered

upon investigational work, rather than upon an extension of the general station work. The correspondence during the year has amounted to about one thousand letters. For the major part of this no stenographic assistance was available, but since October 1st, 1908, this need has been partially filled through the employment of a student assistant. The correspondence shows that there has been a steady growth in the interest of crop growers in their insect enemies, as requests for our publications have been frequent. Much time might be saved in correspondence by further publications answering more fully the questions which are commonly asked. There is considerable need for extension in entomological bulletins and circulars of information.

No serious or unusual outbreak of insects has been reported during the year, though numerous specimens have been submitted for identification. The collection of insects has been materially increased during the past year, and particular attention is being paid to making it of economic value. At the present time the facilities for caring for the collection are inadequate, and material changes will be made in the near future.

The San Jose Scale is very generally distributed throughout the State, attacking peach and apple trees particularly. Many orchards are being seriously injured, and will be very soon completely destroyed unless prompt measures for remedial treatment are employed. No data are at hand by which we may estimate the damage now being done to the orchards of the State by this single species of insect, but without question it must be measured by hundreds of thousands of dollars.

Although numerous insects have been mistaken for the Mexican cotton boll weevil, we are glad to be able to say that this most serious of cotton pests does not, so far as we now know, occur in Alabama. Attention should, however, be called to the steady approach of this species. The weevil crossed the Mississippi River into Western Mississippi in the Fall of 1907. During the past season it has spread over or into about eighteen counties in the western part of that State, besides many more counties in Louisiana,

Arkansas, and Oklahoma. It has now reached the western edge of Rankin County, Mississippi. This shows that the weevil has advanced fully fifty miles during the past season. This is its usual average advance. This advance is accomplished by flight and emphasizes the fact that in about two years more it will in all probability reach the western boundary of Alabama. There is no possibility of greatly retarding this annual advance by flight.

There is imminent danger, however, of the introduction of this pest, either accidentally or maliciously, far ahead of the general line of infestation. Such isolated occurrences have this year been discovered in Mississippi. These form new centers of infestation from which weevils may spread in all directions. Such isolated colonies occurring two or more years ahead of the general line of infestation may be effectually controlled or eradicated if their presence is soon discovered, and thus the severe damage which the weevil is liable to do wherever it exists may be practically postponed throughout one or more counties for one or more years. The proper safeguarding of the interests of cotton planters within a radius of many miles of some isolated advance colony urgently demands certain changes in the laws of this State which shall provide necessary legal authority, and funds sufficient to deal promptly and effectively with such emergency cases. The saving in a single instance might easily amount to many times the cost of inspection and eradication. It would certainly be far better to have the means for dealing with such a situation without having occasion to employ them than to be suddenly confronted with the need and lack the power to act. This question deserves the consideration of the State Legislature at the earliest possible moment.

A bulletin dealing in a general way with the advance of the weevil, the recognition of the insect and the prompt reporting of its earliest occurrence, together with methods of control, and the proper preparation for its coming, is being prepared, and will be issued at an early date. A general educational campaign must be waged by all agricultural in-

terests to prepare the Alabama cotton planters for the coming of the boll weevil.

Adams Fund Investigations.—Three distinct projects have been outlined for this department and approved by the United States Office of Experiment Stations. Work is, however, being confined particularly to project No. 3, which is entitled: An investigation of the factors governing the production, diffusion, and insecticidal efficiency of Hydrocyanic acid gas and Carbon disulfid vapor as used in economic entomology. The field of investigation in this project is so broad that co-operation with other departments is advisable. Arrangements have been made by which the phases of the subject lying more particularly in the field of physiological and analytical botany will be undertaken in the department of botany in this station under the direction of Prof. F. E. Lloyd. Some work will also be done, it is expected, in the department of chemistry.

In the department of entomology the work thus far has dealt principally with Carbon disulfid, and we have investigated particularly its effect upon the germination of corn and its insecticidal efficiency for grain infesting insects.

It has been found that the recommendations which have usually been given for the use of this fumigant are not satisfactorily effective. It will be the ultimate object of the work to determine under precisely what conditions each of these gases may be most economically and effectively employed.

In regard to this project and the results thus far obtained two papers were recently presented at the meeting of the Association of Economic Entomologists held in Baltimore, Md., and these will be published in forthcoming issues of the Journal of Economic Entomology.

The importance of this investigation may be judged by the fact that a conservative estimate of the annual insect damage for which some method of fumigation treatment might be applied, as in the fumigation of nursery stock, the treatment for insects attacking stored grains and other products, for pests of greenhouse crops and for household

insects, will undoubtedly amount to between two and three hundred millions of dollars. Much of this might be prevented with the employment of proper fumigation treatment. The results of this investigation will be of wide application in Economic Entomology. Other stations are depending upon us for the completion of this work. It becomes evident, therefore, that this station should use every possible means to facilitate the investigation of this project. It is for this reason, and also because our funds are at present mainly derived from the Adams Fund that we feel the necessity of concentrating our efforts upon this important investigational work.

Respectfully submitted,

W. E. HINDS.

REPORT OF BOTANIST.

FRANCIS E. LLOYD.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

DEAR SIR:—I beg to present herewith my first report as a member of the staff of the Alabama Polytechnic Institute and Agricultural Experiment Station. This must of necessity strike a note of anticipation, as I have been on the ground only since the first of November last. Since that date my energies have been largely engrossed in the work of teaching, inasmuch as the assistant, Mr. R. E. Stone, resigned his position before my arrival.

Steps have been taken toward the reorganization of the department and the rehabilitation of the herbarium, which is of paramount importance for Experiment Station work as a source of information in matters pertaining to the flora of this section of the country. It is hoped that during the present academic year the material will be brought into proper shape for use.

At the present moment I am engaged in writing, under joint authorship with Dr. Theodore Whittelsley, Adjunct Professor of Chemistry in the Northwestern University, and Dr. J. E. Kirkwood, formerly Professor of Botany in Syracuse University, a monograph on the Guayule, a desert rubber plant of Mexico, known as Parthoniumb argentatum, A. Gray. This monograph is to be published by the Carnegie Institution of Washington. The bearing of the work may be judged from the circumstance that the plant in question inhabits large areas in Southwestern Texas, and should be the source of a considerable income to that State. The work is based upon the joint investigations of the authors as members of the Department of Investigation of the

Continental Mexican Company, at Hacienda de Cedros, Zacatecas and at Torreon Coahuila, Mexico.

I am also completing a study of the development and behavior of tannin in the fruit of the date palm. This work is of importance as bearing on the general phenomenon of the ripening of fruits, a subject little understood and of very considerable importance. I commenced this investigation as Cytologist of the Agricultural Experiment Station of Arizona, and the results will appear as part of an extensive bulletin to be published this year from that Station on the subject of the Date Palm, which has been successfully introduced into Southwestern North America.

During the recent meeting of the Botanical Society of America and of Section G. (Botany) of the American Association for the Advancement of Science the following papers were presented by me:

"Induced Vegetative Reproduction by Root Regeneration in the Guayule" (Parthenium argentatum), and "The Vegetation of the Northern Zachatecas, Mexico," both of which will shortly appear in print.

The work especially pertaining to this Experiment Station and which has either been begun or is projected is as follows:

A joint project with Professor W. E. Hinds, looking towards the solution of the problem of fumigation of plants by certain gases which are injurious to both the plants themselves and to the insect pests which it is desirable to destroy. My particular part of the problem is to determine how far plants may be able to resist the injurious action of the fumigants employed and what conditions in plants contribute toward their successful use. It seems likely that a thorough understanding of the reactions of the stomata of plants will have a considerable bearing upon the successful solution of the problem.

I have begun a study of the biology of the "nut grass", a weed which has proved extremely refractive toward any attempts at eradication. Whether this consummation may be hoped for cannot at this moment be said, but it seems

possible in view of the successes which have been had with some other weeds.

As soon as the greenhouses shall have reached completion a series of experiments will be begun with a view of establishing certain data fundamental to the successful selection and improvement in certain directions of the cotton plant. These experiments will have for their immediate object the solution of problems connected with the size and shape of the leaves, their color, rate of transpiration and of photosynthesis.

Yours respectfully,

FRANCIS E. LLOYD,

Professor of Botany, and Botanist to the Experiment Station.

ANIMAL INDUSTRY DEPARTMENT.

DAN T. GRAY.

DR. C. C. THACH,

President Alabama Polytechnic Institute, Auburn, Ala.

DEAR SIR:—During the last year the experimental work in the Animal Industry Department has been made more efficient and satisfactory as a result of building a new swine experimental shed, a new 65-ton cement silo, and laying a cement floor in the dairy barn.

One bulletin has been issued from the department—bulletin 143, entitled "Feeds Supplementary to Corn for Southern Pork Production". This bulletin summarized the past three years' work in finishing hogs for the market.

On February 1st, 1908, this department and the Dairy Department at Washington began a co-operative work with the dairymen of the State. The object of the work is to visit the dairymen of the State, become acquainted with their conditions, and help them in any way possible. Mr. A. K. Risser inaugurated the work. He was later promoted and Mr. S. D. Dow now has the Alabama work in charge. Much good is coming from the work to both the dairymen of the State and to the departments that are carrying forward the work. Since the work began the field men have helped or superintended the building of ten dairy barns, nine cement silos, one stave silo, seven dairy houses, and compiled daily records for twelve dairy herds.

Arrangements have been about perfected so that the department can undertake excellent experimental work in feeding work mules. This will involve the use of 100 mules which have been under known uniform conditions for several years.

The work with hogs, sheep, and beef cattle has been continued about as reported in last year's report.

The swine work has progressed more satisfactorily than in years past and this is due to the fact that the hogs can be fed and handled much better in the new shed than in the old one. Fifty hogs, divided into nine lots, have been used in the work this year. Of this number forty-two have been slaughtered and samples of fat and bones taken from each carcass. The objects of the work are the same as reported in the twentieth annual report; in addition to the objects enumerated there, one other point is under consideration now—to determine the amount of grain that should be fed to a hog when he is grazing a green crop, as soy beans.

The co-operative beef work between this department and the animal husbandry department at Washington continues satisfactorily. The lines of work continue as reported last year. Last winter 81 head of two and three year old steers were divided into three lots and carried through the winter upon various feeds, the object being to learn the best method to winter such cattle when they are to be finished upon pasture the following summer. This winter, the work is being repeated, in part, with 100 head of cattle divided into four lots. During the summer of 1908, the 81 head of cattle, which had been wintered the winter before, were redivided into three lots and finished upon pasture. The steers that are in this winter's work will also be again divided into four lots and finished upon pasture during the summer of 1909.

The work with sheep continues with the flock that has been used for two years. This winter the flock was divided into two lots and fed upon different amounts of cotton seed meal to make a further study of the effect upon the ewes of feeding cotton seed meal. The department is still engaged in studying the whole subject of early lamb production and grading up a scrub flock of ewes by the use of a pure bred ram. There are about fifty sheep in the flock.

Very respectfully submitted,

DAN T. GRAY.